Sustainability Accounting:
Towards Improved Information Management and Management Control

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Summary of the results of the doctoral thesis entitled "Sustainability Accounting: Towards Improved Information Management and Management Control"

The challenges of sustainable development have spurred the complexity of management reality, unveiling considerable risks and opportunities for companies. The past twenty years of development in management science and practice have refined the understanding of the linkages between corporate success and sustainability aspects of business. Nevertheless, numerous management tools and concepts have been criticised for failing to contribute to improved sustainability performance.

Management accounting is an indispensable system for generating, preparing and providing information for recognising decision situations and informing decisions. Building on the relevance of information, sustainability accounting has received considerable attention in the past decade. Related research has emphasised the contribution of sustainability accounting to tackling sustainability challenges in specific settings. A systematic investigation of the role of sustainability accounting is virtually non-existent to date.

To overcome this limitation and provide an insight into the practice of sustainability accounting and its role in sustainability management and ultimately in corporate success, this doctoral thesis approaches the question

How does sustainability accounting contribute to improved information management and management control?

The direct contribution is two-fold. First, a number of decision situations are explicated. Examples for such decision situations include utilising certain types of information for specific decisions, engaging various functions in different ways, etc. Making a decision within these decision situations was observed to contribute to achieving corporate goals.

Second, the overarching view on the results reveals an interesting pattern. It is the existence of this pattern that supports the view that sustainability accounting can help companies in the pursuit of improved sustainability performance and (thereby) corporate success.

The findings enable both practitioners and researchers gain an insight into how sustainability accounting can be deployed so that the company's limited resources are focused on the crucial decisions in information management and management control. Subsequent recommendations are supported by up-to-date examples. The nature and the scope of the research constituting this doctoral thesis also highlight the path for future research to expand and refine the propositions made herein.

SUSTAINABILITY ACCOUNTING:
TOWARDS IMPROVED INFORMATION MANAGEMENT
AND
MANAGEMENT CONTROL

This paper and the publications listed on the following page
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submitted by

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Prof. Dr. Roger Burritt

The individual articles constituting this paper-based doctoral dissertation meet the formal requirements for a paper-based dissertation. They have been published as follows.

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The following publications are not part of the formal requirements but support the argumentation:

Bennett, M., Schaltegger, S. & Zvezdov, D. (2011): Environmental management accounting, in: Abdel-Kader, M. (Ed.) Review of management accounting research, Palgrave MacMillan, Hampshire, pp. 53-84.

Burritt, R.L., Schaltegger, S. & Zvezdov, D. (2011): Carbon management accounting: Explaining practice in leading German companies, Australian Accounting Review, Vol. 21, No. 1, 80-98.

Lüdeke-Freund, F. & Zvezdov, D. (2012, in review): The manager's job at BP: Decision making and responsibilities on the high seas, International Journal of Case Studies in Management.

Schaltegger, S. & Zvezdov, D. (2011a): Konzeption und Praxis des Nachhaltigkeitscontrollings: Ansatzpunkte in großen deutschen Unternehmen, Controlling, Vol. 23, No. 8-9, 430-435.

Schaltegger, S. & Zvezdov, D. (2011b): Management klimarelevanter Reportinginformationen: Eine explorative Untersuchung in deutschen Unternehmen, Zeitschrift für Controlling & Management, Vol. 55, No. 2, 92-96.

Schaltegger, S. & Zvezdov, D. (2012a): Strategisch fundiertes Nachhaltigkeitscontrolling – Konzeption und Umsetzung in der Praxis, in Gleich, R., Bartels P. & Breisig, V. (Eds.) Nachhaltigkeitscontrolling - Konzepte, Instrumente und Fallbeispiele für die Umsetzung, Haufe Mediengruppe, Freiburg, pp. 45-66.

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Schaltegger, S. & Zvezdov, D. (2012c): Ignorant or gatekeeper? What role do accountants play in the sustainability accounting practice?, 2nd ISC, Basel.

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Schaltegger, S., Gibassier, D. & Zvezdov, D. (2011): Environmental management accounting: A bibliometric literature review, Centre for Sustainability Management, Lüneburg.

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Zvezdov, D. & Schaltegger, S. (2012): Nachhaltigkeitscontrolling: mehr als nur ein Konzept?, Controlling & Management, Vol. 56, No. 4, 2-4.

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Abstract

The challenges of sustainable development have spurred the complexity of management reality, unveiling considerable risks and opportunities for companies. The past twenty years of development in management science and practice have refined the understanding of the linkages between corporate success and sustainability aspects of business. Nevertheless, numerous management tools and concepts have been criticised for failing to contribute to improved sustainability performance.

Management accounting is an indispensable system for generating, preparing and providing information for recognising decision situations and informing decisions. Building on the relevance of information, sustainability accounting has received considerable attention in the past decade. Related research has emphasised the contribution of sustainability accounting to tackling sustainability challenges in specific settings. A systematic investigation of the role of sustainability accounting is virtually non-existent to date.

To overcome this limitation and provide an insight into the practice of sustainability accounting and its role in sustainability management and ultimately in corporate success, this doctoral thesis approaches the question

How does sustainability accounting contribute to improved information management and management control?

The direct contribution is two-fold. First, a number of decision situations are explicated. Examples for such decision situations include utilising certain types of information for specific decisions, engaging various functions in different ways, etc. Making a decision within these decision situations was observed to contribute to achieving corporate goals.

Second, the overarching view on the results reveals an interesting pattern. It is the existence of this pattern that supports the view that sustainability accounting can help companies in the pursuit of improved sustainability performance and (thereby) corporate success.

The findings enable both practitioners and researchers gain an insight into how sustainability accounting can be deployed so that the company's limited resources are focused on the crucial decisions in information management and management control. Subsequent recommendations are supported by up-to-date examples. The nature and the scope of the research constituting this doctoral thesis also highlight the path for future research to expand and refine the propositions made herein.

Key words: sustainability accounting, information management, management control, contribution, corporate success, management accounting,

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1. Introduction

1.1 Sustainability accounting: indispensable management support in a complex world

1.1.1 Measuring and managing corporate success

Despite being the natural reasoning behind business, corporate success can be defined in many ways. Common mile markers for success range from satisfied own reasons for starting or engaging with the business to measures of profitability and industry connections. For the purpose of this paper, corporate success is understood as the extent to which the corporate goals of competitiveness, customer satisfaction, securing the continuance of the firm, and long-term profitability are achieved (Fritz 1996). Achieving these objectives depends on the ability to steer them in the desired direction. Both recognising the need to act promptly and the effective use of the corrective measures have challenged managers (e.g. Aragón-Correa 1998).

Accordingly, the areas of *information management* and *management control* have not only found justification for developing as separate research domains but have also had a significant contribution to achieving corporate goals and thus to corporate success (Picot *et al.* 2008; Otley 1994). The two concepts are briefly introduced to highlight their relevance for corporate success.

The importance of information for corporate success is not subject to doubt (Fransman 1998; Gordon & Narayanan 1984). However, information *per se* does not provide any advantage or benefit (*ibid.*). It is its use that renders it useful; the successful utilisation of information requires a profound understanding of information management. For at least four decades, this view has been supported and explicated in numerous attempts to capture the practice of *information management*, to identify related challenges, and to develop solutions to approaching these challenges (Ackoff 1967; Currie & Galliers 1998; Baskerville & Myers 2009).

With the growing recognition of the relevance of control techniques, *management control* has enjoyed several decades of extensive research (e.g. Anthony 1965; Tsamenyi *et al.* 2011). Mockler (1970) defines management control as a systematic effort by business management to compare performance to predetermined standards, plans, or objectives. This is done to determine whether performance is in line with these standards while also safeguarding the effectiveness and efficiency of human and other corporate resources by taking remedial action.

With the increasing understanding of sustainability challenges, the domain of corporate success has expanded to encompass managing and measuring corporate sustainability.

1.1.2 Measuring and managing corporate sustainability

The sustainability discussion has picked up pace since the 1980s (De Bakker *et al.* 2005) and has also been translated to the domain of management (e.g. WBCSD 2002; Schaltegger & Wagner 2006). Subsequently, the term corporate sustainability management has been coined. In the understanding of Schaltegger and Burritt (2005, 194), beside the consideration of social and environmental aspects of business towards achieving success, sustainability management enables companies to contribute towards sustainable development of the economy and society.

Earlier research on sustainability management (e.g. BMU & BDI 2002; Dyllick & Hockerts 2002; Gladwin *et al.* 1995a, 1995b; Hart 1997) does not thereby collide with this understanding; on the contrary: it contributes essential elements such as corporate performance beyond solely financial performance. More recent research has mostly investigated how this concept is and can be applied in practice (e.g. Lozano 2011, 2012) as well as how this is done in companies in various specific situations (e.g. Seuring 2010; Kang *et al.* 2010; Lee & Saen 2012).

The relevance of sustainability management for organisations is probably at best captured in unveiling an increasingly complex reality (Johnson 2007). This complexity is marked by a multitude of decision situations that require informed decisions (Luhmann 1991, 2006). The past twenty years of development in both management science and practice acknowledge the relevance of sustainability management for tackling this increased complexity and thus for corporate success (e.g. Schaltegger *et al.* 2010; Hegarty *et al.* 2011; García *et al.* 2006; Korhonen 2007; Sterling 2004). The impact of neglecting sustainability issues on corporate success has been exemplified by events such as the Gulf of Mexico oil spill in 2010 or the child labour scandal that hit Adidas a decade earlier (Hoffman & Jennings 2011; Lustgarten 2012).

The increasing complexity cannot, however, be approached by simply considering more information in decision making. It is precisely the abundance of potentially relevant sustainability information that calls for a systematic approach to generating, managing and using such information. A major role in approaching the challenge of measuring, managing and communicating corporate sustainability has been played sustainability accounting.

1.1.3 Sustainability accounting

Strictly speaking, the understanding of sustainability accounting is marked by a lack of clear consensus on what constitutes it and what it's contribution to improving corporate sustainability performance is (Gray & Schaltegger 2011). In the managerial context, Schaltegger and Burritt (2010) develop an interpretation of sustainability accounting, upon which this doctoral thesis is largely based. In the core of this interpretation lies the understanding that sustainability accounting is a goal or target-driven pragmatic perspective requiring that addressees and key stakeholders as well as core topics and expected contributions of sustainability are identified (*ibid.*, 376).

Focusing on its managerial relevance, sustainability accounting can be said to have emerged as an approach to improving corporate economic performance by focusing on environmental performance, and particularly on the linkages between environmental and economic performance (Schaltegger & Burritt 2000). This is rendered visible by the majority of the publications in the field and their emergence around the understanding of cost accounting (Schaltegger *et al.* 2011).

Today, sustainability accounting has developed to achieve recognition among both academics and practitioners (Bennett *et al.* 2011). The growing academic recognition is highlighted by the very fact that the latter publication is printed along other 'main stream research' in a recent edition of *Review of Management Accounting Research* (Abdel-Kader 2011). The practice relevance can be observed e.g. as a measure of the number of companies that pursue objective achievement by means of sustainability accounting. Also, the fact that several accounting institutes have addressed the issue in their agenda (e.g. ICAEW 2004; Moon *et al.* 2011) highlights the growing acknowledgement of sustainability accounting in practice.

1.2 Research question

Despite the increasing body of literature on measuring, managing and communicating corporate sustainability (e.g. Burritt & Saka 2006; Gladwin *et al.* 1995b; Parker 2005; Unerman *et al.* 2007) this research has largely focused on individual cases (Schaltegger *et al.* 2011). These studies have mostly – if not entirely – focused on the sustainability accounting practice framed within the individual context within which the research was conducted (*ibid.*). Hence, extant literature has been criticised for failing to explicate the extent to which the identified aspects can be transferred to other situations. This limits their explanatory power and renders them of limited use to practitioners and management science researchers (Gray 2010). Apart from few exceptions (e.g. Herzig *et al.* 2012), an in-depth investigation of corporate practice to address this gap is virtually non-existent to date (Bennett *et al.* 2012, 4). This unveils the need to systematically depict and analyse possible situations of relevance to other companies and decision situations by analysing them beyond their specific context.

Therefore, this paper (as well as the research presented therein) draws a comprehensive account of numerous aspects of sustainability accounting that contribute to improved information management and management control. By putting together the findings, the paper approaches the question

How does sustainability accounting contribute to improved information management and management control?

1.3 Research approach

Approaching this research question is particularly revealing for the effects of sustainability accounting on corporate success. In doing so, this doctoral thesis focuses on the linkages between corporate sustainability and information management and management control [1] in *Figure 1*.

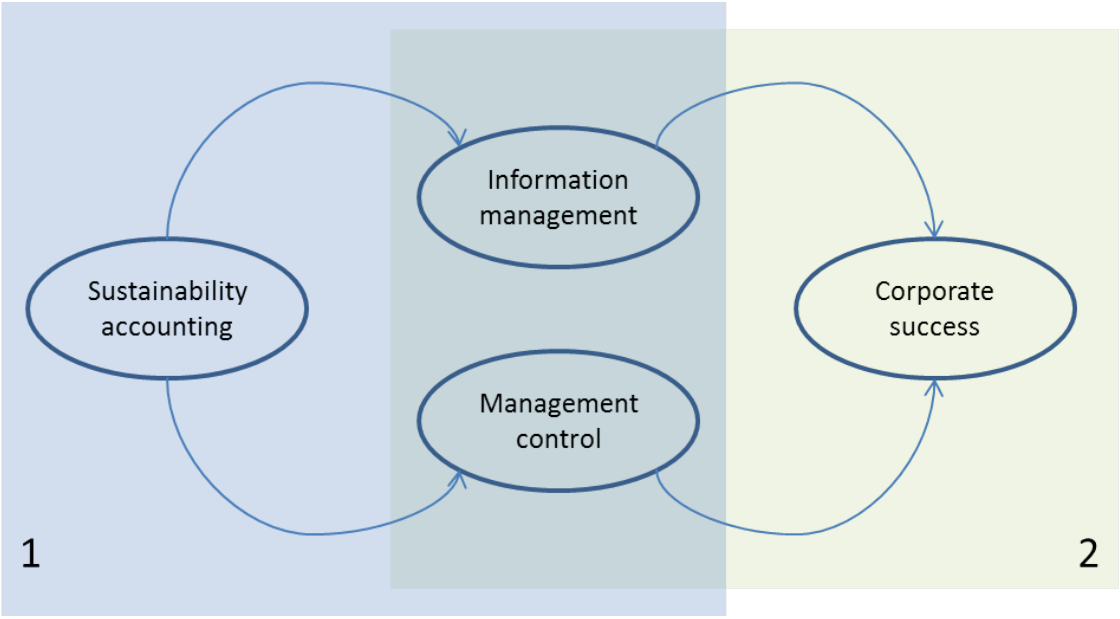

Figure 1: The research scope focuses on the contribution of sustainability accounting towards improved information management and management control [1].

The contribution of both information management and management control to corporate success was briefly outlined in section 1.1.1. Further justification for the assumed linkage between the latter two on the one hand and corporate success on the other hand [2, *Figure 1*] is superfluous for the purposes of this doctoral thesis.

Since the in-depth analysis of the researched phenomenon sought to inform management action, the boundaries of the research were set to focus on the organisational components of sustainability accounting (*Figure 2*). Aspects relevant for explaining the practice of sustainability accounting but outside these boundaries such as personal motivation and interpersonal relationships were purposely blurred out. Similarly, factors outside the *immediate* responsibility and influence of managers (Choudhury 1986), such as updates in legislation or a rising societal awareness of social and environmental impacts of business, were also deliberately omitted.

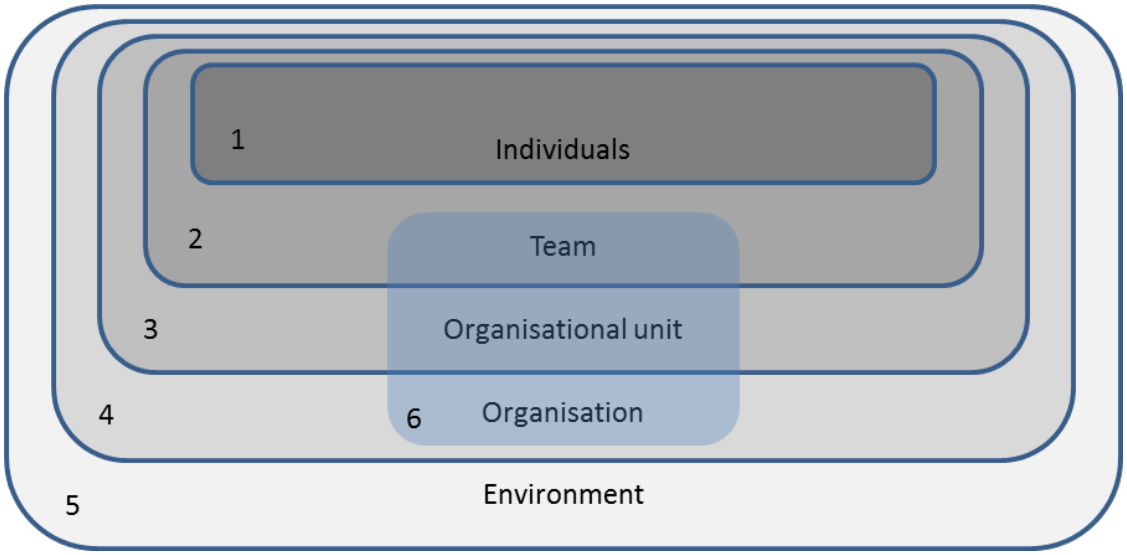

Figure 2: Levels of organisational structure [1 through 5] and research boundaries of this doctoral thesis [6]

A recent review of contribution of the environmental performance accountability special issue of *Accounting, Auditing & Accountability Journal* recognises a publication bias "towards academic rather than practitioner appreciation" (Burritt 2012, 370). This statement – albeit based on the author's "subjective assessment" (*ibid.*, 370) – highlights the necessity to a more practitioner-orientated development in the area. A similar debate on the need of a single, uniform theory has been recently led in *Management Accounting Research*.

In their academic debate on the state of management accounting research and theory with *Management Accounting Research* editor-in-chief Quattorne, Malmi and Granlund (2009a) criticise the fact that theories "borrowed" to understand and explain specific aspects of management accounting do not provide a (single) holistic insight into "what systems or techniques to use, how and in which circumstances" (*ibid.*, 615). The purpose and role of management accounting research and theory, they argue, is the contribution towards a comprehensive, practice-oriented, complete in itself management accounting (Malmi & Granlund 2009b;

Quattrone 2009). A similar discussion can be found in the more general management literature (e.g. Bansal *et al.* 2012).

In agreement with the above discussion, this doctoral thesis seeks to contribute to the body of literature that constitutes a practice-orientated theory of corporate sustainability management. Accordingly, the objectives are to expand the existing body of literature, thus developing an own theory of sustainability accounting towards informing action. This is achieved by refining and amending the existing understanding of relevant phenomena and their mutual interactions.

The paper proceeds as follows. *Section 2* starts off by approaching the lead question of this doctoral thesis. It does so by firstly presenting the picture that is revealed by analysing extant research, and subsequently going into details to back up the thus constructed argument. Sections *2.1* through *2.3* present the supporting arguments for the contribution to each of information management, management control, and sustainability accounting. To emphasize the individual arguments, each of these sections is broken down into third-level sections.

The opening in *section 3* sums up the analysis presented in *section 2*. *Section 3.1* captures the essence of the doctoral thesis by recapping the contribution made to theory and practice. *Section 3.2* summarises the research limitations and gives an account of their potential relevance in interpreting the presented arguments. *Section 3* concludes with an outline of future research needed and anticipated challenges thereof.

2. The contribution of sustainability accounting to information management and management control

As elucidated in *section 1.2*, previous research does claim that sustainability accounting can contribute to corporate success (e.g. Jasch 2003; Burritt *et al.* 2009). Due to the methodological approach, the majority of the presented conceptual and empirical work therein has met criticism for failing to provide explicit evidence (e.g. in the form of generic patterns) of the contribution of sustainability accounting to improved corporate sustainability performance (Gray 2010). For instance, decisions, that have been observed to support management activities in company A, may be of little or no value for company B (e.g. as the latter operates in a different business environment).

Against that background, and being aware of fundamental organisational differences yet to be researched, this doctoral thesis focuses on the *decision situations* (as opposed to the decisions made within these decision situations) that can be identified by means of or can become apparent in the course of applying sustainability accounting. To achieve this, the research discerns a number of similarities and dissimilarities in information management and management control across the researched companies. Examples of relevant decision situations which influence corporate success include decisions on what information to focus on, how it is to be used and who (which functions) can benefit from using this information.

There are various approaches to linking the components of accounting: information management, management control and external reporting (Johnson & Kaplan 1991; Johnson 2002). Schaltegger and Wagner (2006a) propose an ‘inside-out’ approach that locates the information management as a starting point. The information collected and prepared is then used for management control. Subsequent external

reporting can is based on the information and the outcome of management control. This inside-out approach serves as a framework in linking and presenting the outcomes of this doctoral thesis.

Accordingly, the following two sections deliver arguments that back up the reasoning in view of information management (*section 2.1*) and management control (*section 2.2*). The concluding section (*2.3*) discusses the impact of voluntary and mandatory external sustainability reporting on information management and management control. *Figure 3* graphically depicts the structure of the section as well as the underlying logic.

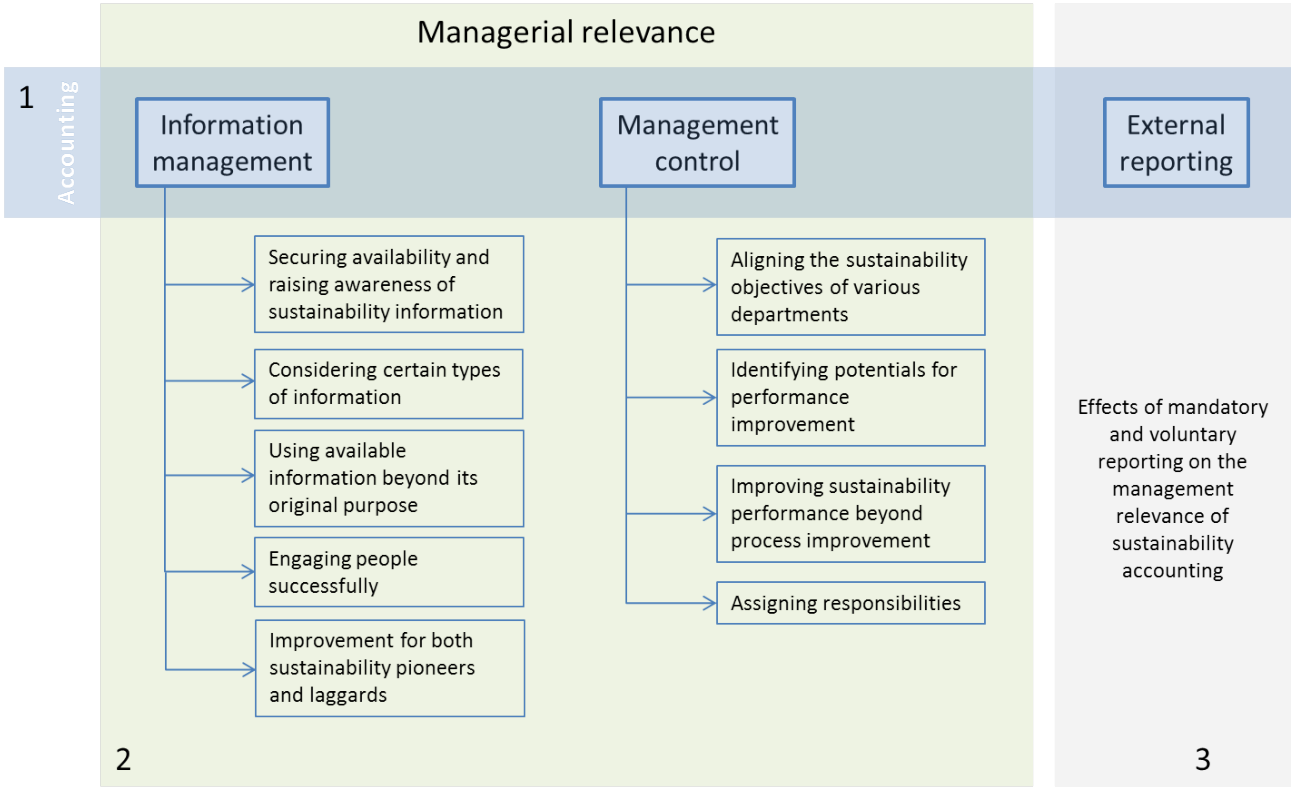

Figure 3: The structure of the argument is framed in accordance with the logic of the inside-out approach to sustainability accounting [1]. This research focuses on the managerial relevance of accounting [2], while also unveiling effects of sustainability reporting [3] on information management and management control.

2.1 Contribution of sustainability accounting to improved information management

Various aspects of using sustainability information have enjoyed the attention of practitioners and researchers alike (e.g. Melville & Ross 2010). For instance Schaltegger and Burritt (2000, 66ff.) present a detailed list of responsibilities (e.g. procurement manager, environmental manager, HR manager, etc.) within an organisation who can benefit from different (presentations of) sustainability information.

Similarly to the development in other management areas (Whetten 1989), a major share of the work in the area of sustainability accounting has been developed or refined by researchers to be adopted by practitioners (Schaltegger *et al.* 2011). Exploratory research on the practice of sustainability accounting shows, however, that companies develop, test and evaluate innovative tools and approaches to managing

and using sustainability information. Bennett *et al.* (2012) demonstrate that companies have invested considerable efforts in reacting to the lack of established methods and tools, thus developing own ones to meet the growing need of managing and using sustainability information. Particularly interesting is the observed convergence of sustainability information management approaches across different companies. This suggests that these practices do have managerial value beyond gaining legitimacy and are likely to turn out to be more than a managerial fad (Burritt & Schaltegger 2010).

The following sections present arguments that underscore the usefulness and contribution of sustainability accounting to improved information management and thus to achieving corporate goals effectively and efficiently.

2.1.1 Securing availability and raising awareness of sustainability information

The importance of the availability and use of sustainability information for corporate success is largely undisputed – both for external communication (rating, rankings, regulation) (e.g. Perrini & Tencati 2006; Morsing & Schultz 2006) and for internal use. Due to the volume of information, decision-makers of various levels tend to focus on the type of information that explicitly contributes to their work, thereby leaving an overarching perspective to the sustainability management department (Bennett *et al.* 2012). This approach to information management enables information to be effectively utilised, since users are aware of its meaning (*ibid.*). The function of the sustainability department in sustainability accounting is, in this case, focused on making various decision makers aware of the availability of relevant information and also on setting up (and supporting the establishments) of information systems that enable the flow of such information.

2.1.2 Considering certain types of information

The multitude of sustainability issues that can be measured and managed within the constraint of corporate resources is rather challenging. The decision to focus on certain types of information (e.g. social or environmental) helps focus resources on particularly important and/or urgent issues. The findings shed light on the measurability of social aspects, as the latter are less tangible and thus more difficult to measure and manage (Sánchez *et al.* 2000). The results suggest, however, that managing the linkages between social and financial performance do not present a challenge more difficult than managing the linkages between environmental and financial performance (Bennett *et al.* 2012). Since the research builds upon the field of environmental management accounting, a question of central relevance here is to what extent companies measure and manage other sustainability aspects such as social ones. Bennett *et al.* (2012) do not find any notable patterns in the type of information – social, environmental or economic – used by managers in informing decisions. In other words, all three types of information appear to be utilised to a similar extent.

Breaking down the information, e.g. to electricity consumption, carbon emissions, etc., however, reveals a few interesting observations that suggest that applying sustainability accounting techniques measurably improves corporate sustainability (and as a part of it: financial) performance. A closer look at the topical issue of carbon accounting practice in German companies (Burritt *et al.* 2011) analyses the use of management information based on the environmental management accounting framework (Burritt *et al.* 2002). The findings suggest that various kinds of carbon accounting information support a multitude of decision situations and utilised for both performance evaluation and decision making.

The above observations are also supported in different context (Asian medium-sized enterprises) and for different aspects (energy and water consumption). Building up on the application of the environmental management accounting framework, Schaltegger *et al.* (2012a, 2012b) develop two case studies whose analysis reveals a significant potential contribution of applying sustainability accounting techniques towards improved information management and use. A distinction between physical and monetary information in particular reveals that using both kinds of information results in improved usability (*ibid.*).

Investigating the information used to manage sustainability performance in accordance with the five perspectives of the sustainability balanced scorecard (Hansen & Schaltegger 2012) reveals that information on all five perspectives – financial, market, process, learning, and non-market – is collected and used, although to different extent (Schaltegger & Zvezdov 2011a). Process and finance related information appears far more common than market and non-market information. The findings also suggest that using information on each of the five perspectives has a measurable positive impact on corporate success in addition to promoting more sustainable corporate practices.

2.1.3 Using available information beyond its original purpose

The publications in this doctoral thesis also reveal the dual nature of sustainability information. Depending on who is using the information for what, it can serve to inform decision as well as for developing an understanding of sustainability issues on corporate success. For example, Bennett *et al.* (2012) show that the very existence of sustainability information has played an important role beyond its (originally) intended area of deployment and has contributed to uncovering potentials by the new perspective revealed.

Bennett *et al.* (2012) also show that various bits of sustainability information are often available but not explicitly branded as such and are thus only used by the department or unit within which they were created. The role of the sustainability accounting has in turn been observed to allocate such information and provide it to users other than the originally intended ones.

2.1.4 Engaging people successfully

Understanding the involvement and non-involvement of various actors in sustainability management has been of interest to researchers and practitioners alike (Schaltegger *et al.* 2010; Sarkis 2001; Fraser *et al.* 2006). These studies, however, observe the involvement from the overarching perspective of the whole population investigated. The role, engagement and exact function of the people involved in sustainability management have thereby remained under-researched.

This doctoral thesis also addresses the importance of the *people* in generating, passing over and using sustainability information (Bennett *et al.* 2012; Burritt *et al.* 2011). This section investigates why some people are involved and others not, and attempts to explain this behaviour from an organisational viewpoint.

Bennett *et al.* (2012) identify a number of (groups of) actors whose involvement in sustainability information management and use was identified to play a significant role in the success of these activities. The research identifies the engagement of the various groups, whereby the major information managers

and users appear to be sustainability and general managers. The role of the accountant appears, at first glance, relatively limited.

Other than the necessity to involve certain people and departments for reasons of effectiveness, the research also highlights the positive effects of active exchange between the involved actors (*ibid.*). That is, the involvement of certain person or department *per se* does not secure an improvement in sustainability accounting activities. It is much more the exchange and coordination between departments and people that appears to generate and capture value.

2.1.5 Involving the accountant 'the right way'

Dealing with sustainability accounting raises the question on the role of the accountant in sustainability management. Starting with the earlier literature in the field, a call for engaging the accountant has been made numerous times (Gray *et al.* 1993, Burritt & Lehmann 1995; Davey & Coombers 1996; Schreuder & Ramanathan 1984, Wilmshurst & Frost 2001). The reasons for this engagement have been rather generic, mainly including various aspects of professional expertise (Zvezdov 2011).

Corresponding with previous – predominantly logical – arguments, successful sustainability accounting will ultimately involve the accountant (Zvezdov 2011). Contrary to previous criticism of the non-involvement of the accountant, Zvezdov *et al.* (2010) develop an approach to measuring this involvement in practice. They find out that the accountant is actually involved (in the sample companies). The findings also suggest that the accountant may be more heavily involved in sustainability accounting than suggested in non-empirical or case-study based research.

Both the empirical evidence collected and the conceptual work in the field support the view that the accountant can play an important role in sustainability accounting. However, Zvezdov (2011) argues that previous literature has neglected major benefits of the potential involvement of the accountant in sustainability management. These benefits arise from the accountant's position in an organisational structure, which results in his power expertise. The logical argumentation suggests that the accountant needs to be involved in a certain way in order to contribute rather than just be involved for the sake of being involved (Zvezdov 2011).

Expanding the above logic by empirical data supports this view. Schaltegger and Zvezdov (2012) come across an interesting observation with regard to the accountant's role in sustainability management. Despite a more limited involvement compared to other functions, the empirical data supports the proposition that the accountant's involvement is focused on information gatekeeping. Understanding the resulting function of the accountant can help improve practice. Involving the accountant 'properly' and reducing the potential for retaining current power structures, which may object or hinder a transition towards more sustainable businesses, turns out to be a success factor of sustainability accounting activities.

2.1.6 Improvement for both sustainability pioneers and laggards

Understanding the current status of development is essential for accelerating the development and adoption of sustainability accounting from an economic and from a corporate perspective (Viere 2012). Extant literature, however, does not provide a detailed insight into the current state of corporate

sustainability practice that serves to discern between the progress of different companies. This hinders a systematic approach to improving sustainability accounting practice.

Based on a sample comprising 16 leading sustainability companies, Zvezdov (2012b) identifies and analyses significant differences between companies, which were expected to be similar in terms of progress. Particularly essential findings to inform corporate practice include the need to recognise where effort needs to be focused: on preparing for the change, on introducing it, or on integrating it seamlessly in day-to-day activities. As the paper argues, the majority of the companies needs to focus efforts on the first of the three proposed phases of development – unfreezing, changing, and refreezing – in developing sustainability accounting efficiently.

Also the challenges for companies at the forefront of sustainability accounting were investigated (Zvezdov 2012a). The challenges identified herein appear company-specific, yet a generalisation is provided. For instance, information aggregation that meets the needs of the intended user without making it irrelevant for other users is likely to be a central challenge to deal with. The issue of information overload has been revived in recent research (Bawden 2009; Volnhals & Hirsch 2008), and it is particularly strengthened in the sustainability context, which adds complexity to the discussion. It is therefore important to enable users of various levels to make use of sustainability information. Examples include operational aspects of lower and middle managers (Bennett *et al.* 2012) who need to be fed back detailed information in order to be able to utilise it. Senior management on the other hand, needs to focus on information that supports their decisions without losing focus on operational aspects that lie outside their explicit responsibility (Lüdeke-Freund & Zvezdov 2012).

2.2 Contribution to improved management control

Following the inside-out logic, tracing the contribution of sustainability accounting to improved sustainability performance leads to a subsequent investigation of sustainability management control practice. Unlike conventional management control, which has enjoyed several decades of extensive research (e.g. Anthony 1965), research in the area of sustainability management control has been rather limited (Henri & Journeault 2010; Moon *et al.* 2011). Among the topics of large potential relevance to research and practice have been conceptual frameworks to understand the roles and uses of control systems in the integration of sustainability within companies as well as the importance of integrating sustainability within management control (Moon *et al.* 2011, 1). Being an under-researched area in terms of both practical and conceptual development, Schaltegger (2004; 2011) develops a concept for sustainability management control that was adopted in investigating related practice in this doctoral thesis.

Both for implementing sustainability strategies and for exercising responsibility and accountability for sustainability related matters, managers at all levels benefit from being aware of and committed to the implementation of informed corporate sustainability policy and strategy (Frow *et al.* 2005; Ballantyne & Gerber 1994). Against this background, management of internal company sustainability information is introduced (e.g. Bruining *et al.* 2004; Hopwood & Unerman 2010) and subsequently institutionalised to support the implementation of social and environmental strategies and measures of performance (e.g. Malinaa & Selto 2004). A key aspect of the management process involves introduction of new management control systems that encourage generation and use of sustainability information (Durden 2008).

Based on international research in the field, a recent analysis of the development and status quo of sustainability management control argues that sustainability management control *can* contribute to improved sustainability performance provided it is used wisely (Zvezdov & Schaltegger 2012). Particularly insightful is the fact that sustainability management control need not necessarily result in improved sustainability performance; it can also result in performance deterioration (*ibid.*, 4). The overview concludes that a relationship (without cause-and-effect direction) between corporate sustainability performance and the application of management control can be proposed.

The following sections present decision situations whose consideration in designing and deploying sustainability management control is likely to result in improved sustainability performance and thus to corporate success.

2.2.1 Aligning the sustainability objectives of various departments

It is a commonly made observation that the various departments in a company do not interact sufficiently. This is particularly critical in sustainability management since it presents a more complex set of challenges to companies. Resolving these challenges requires an inter-departmental as well intra-departmental collaboration (Hofmann 2001; Darnall *et al.* 2008; Epstein 2008, p. 96). This in turn results in misalignment of sustainability-related practices, thereby reducing their effectiveness and efficiency. One solution to aligning the varying departmental goals is using a sustainability balanced scorecard, which can be adjusted to the needs and the context of the specific application (Hansen & Schaltegger 2012). The sustainability balanced scorecard is, however, a demanding and resource-intensive approach that can overtax managers, hence it may not be considered suitable for sustainability departments of limited resources. For this reason Schaltegger (2004) proposes a sustainability management control approach, which – albeit based on the sustainability balanced scorecard – does not require that the latter is used.

Although not explicitly branded as such, sustainability management control is (at least partially) used in companies in tackling sustainability challenges and issues. For example, Schaltegger and Zvezdov (2011a; 2012a, 63) analyse the management control in improving carbon performance and provide empirical evidence that managers work towards aligning the activities of various departments to secure effective and efficient operations. The paper also shows that the various departments are not equally involved yet, although the observed activities suggest that effort is invested to overcome this inequality.

2.2.2. Identifying potentials for performance improvement

The idea behind sustainability management control allows it to be used to support the identification of sustainability performance improvement potentials and successively unleashing them. In practice, this is achieved by making iterative use of lagging and leading indicators (Schaltegger & Zvezdov 2011a). The former allow identifying the effects of achieving sustainability objectives on different departments' performance, whereas the latter allow achieving congruence between the department's objectives and the overarching sustainability targets. The usefulness of using management control is supported by the different advancement with regard to the five management control perspectives. The need for such a management approach is highlighted by empirical findings, which indicate that companies do invest significant resources in organising their sustainability activities and aligning them with overarching corporate strategy.

2.2.3 Improving sustainability performance beyond process improvement

Process improvement has had a foreground position when it comes to improving overall corporate performance or gaining legitimacy (Dowling & Pfeffer 1975) as well as in improving corporate sustainability performance (e.g. Azapagic & Clift 1999). Sustainability accounting activities, too, have been documented to focus on process improvement (Schaltegger & Zvezdov 2011a; 2012a, 57). This poses the question whether other success drivers have been neglected by sustainability accounting.

An insight into the usefulness of sustainability management control for improving success drivers other than process is brought by an analysis framed by the five perspectives of the balanced scorecard (Schaltegger & Zvezdov 2012a). Comparing the use of leading and lagging indicators in the five perspectives unveils significant differences between these perspectives. On the one hand, the observed over-proportional use of lagging indicators in perspectives such as market or non-market suggests that various managers are working on figuring out how certain sustainability activities in their area affect corporate success and vice versa. The predominant use of leading indicators in the process and finance perspectives, on the other hand, suggests that significant amount of effort has been spent on steering performance in these dimension, thereby (possibly neglecting) the previously mentioned ones. Against this background, sustainability management control can serve the important purpose of supporting the other perspective in contributing to improved corporate sustainability performance.

2.2.4 Assigning responsibilities

A major strength of a management control approach to steering sustainability performance lies in the balance of sustainability challenges and related measures to deal with them (Schaltegger 2004). Thus, by explicitly considering sustainability challenges, the approach enables managers to identify or develop activities which are in the best interest of the company (Henri & Journeault 2010; Moon *et al.* 2011). However, the sustainability balanced scorecard postulates a hierarchy or architecture (e.g. Schaltegger & Hansen 2012) that is typically headed by the financial perspective. Therefore, the risk that sustainability performance is neglected in the pursuit of improved financial performance arises. In other words, the balanced (as in *balanced* score card) use of sustainability information to manage all discerned perspectives of sustainability performance is threatened.

An investigation of the various roles in sustainability management control thus provides an initial effort in overcoming this issue. Based on information demand of various roles (sustainability manager, financial manager, HR, etc.), Schaltegger *et al.* (2012) argue that an overarching position is necessary to ensure sustainability management control in the best interest of sustainability rather than of financial performance. The identified empirical relationships between various types of sustainability information suggest that sustainability management control can contribute to developing information strategies to assist in the development of congruent relationships between managers allocated or assuming individual roles (*ibid.*) Given the observation that the kind of information collected, processed, internally communicated and used for decision making is to a large extent influenced by management roles, manager need to develop an understanding of the links between these sustainability information needs and the different roles. From a practitioner viewpoint, this consideration underscores the need to consider what roles need to be an explicit part of the sustainability management team to ensure its effective operation.

2.3 The impact of external reporting on sustainability accounting practice

The research focuses on the managerial relevance of sustainability information. However, information management, management control and external reporting are intertwined (Johnson & Kaplan 1991), exhibiting tight relations among each other. The relevance of sustainability reporting for shaping corporate practice requires that some words on corporate sustainability reporting are spent at this point.

Despite being focused on the managerial value of using sustainability accounting, the research inevitably brought insights into the impact of external reporting on how management information is managed and used. Analysing the motives behind engaging with carbon accounting, Burritt *et al.* (2011) identify external accountability – both voluntary and mandatory – among the central factors shaping carbon accounting practice. However, positive spill-over effects are also recognised. For example, the cost of collecting and using information for managerial purposes is drastically reduced as it is already available for external reporting purposes (even though a useful presentation of this information may require additional processing).

Another positive effect of sustainability reporting on management practice is that management information is often collected based on external reporting guidelines such as those provided by the Global Reporting Initiative, but not necessarily used for the purpose of reporting (Bennett *et al.* 2012). This is interpreted as an initial attempt to approach the issue of measuring and managing sustainability performance (*ibid.*).

An observation on the potentially negative influence of external reporting and sustainability communication is highlighted when the responsibilities in sustainability accounting are analysed. Bennett *et al.* (2012) identify a number of situations where sustainability accounting is located and mainly supported from within the communication or marketing department. Such an organisation of responsibilities is likely to result in a bias of sustainability activities and projects. Similarly, Schaltegger *et al.* (2012) identify and discuss disadvantages of sustainability accounting being managed under the supervision of the financial department.

Another negative impact of external reporting on management control is the overemphasis of managing non-market performance by means of reporting rather than actually involving relevant stakeholders (Schaltegger & Zvezdov 2011a, 2011b; Schaltegger 2012). As the arguments suggest, relying too much on reporting may lead to degrading relations with relevant stakeholders.

Last but not least, research into developing incentives for improving eco-efficiency reveals that sustainability information is often available not only in corporations but also in small and medium enterprises. The previously suggested lack of such information in small and medium sized enterprises (e.g. Herzig 2008, 40ff.) appears to be largely negated by the growing recognition of the relevance of sustainability information on corporate financial performance (Görlach & Zvezdov 2010). This suggests that the practicability of sustainability accounting can be extended beyond large companies.

3. Concluding remarks and future outlook

Now that the supporting evidence has been presented in *section 2*, ideally the reader has gathered two main points. The first one is the large potential of sustainability accounting to contribute to corporate success. This view is supported throughout the presented findings, arguments and explanations.

The second take-home message is the overall pattern (as opposed to the stand-alone arguments) of how sustainability accounting contributes to improved information management and management control. This paper highlights a number of decision situations, whose consideration is likely to provide such contribution. Within the validity of the logical and empirical argumentation presented above, considering these (and likely further) decision situations is fairly probable to influence corporate success positively. In other words, the analysis does not focus (and cannot do so at this point) on revealing the conditions under which a contribution has been observed. Instead, the act of piecing together the findings of the research reveals a pattern that allows that the aforementioned assumption to be made, from an *ex post* perspective. In other words, it is not only the content of the findings but the observable existence of a pattern that is revealed when the findings are assembled. It is this very pattern that unveils the potential contribution of sustainability accounting. This underlying logic of this approach is similar to the logical and factual deliberations that led to the discovery of the ozone hole as described by Zehr (1994).

3.1 Contribution: towards a sustainability accounting theory

The arguments presented in *Section 2* add new insights to and refines the existing understanding of the managerial relevance of sustainability accounting. The presented research expands extant research in terms of comprehensiveness by revealing a number of relevant decision situations (Dubin 1978). Putting together the pieces of research on decision situations whose consideration contributes to improved corporate success reveals additional aspects. These have either remained unidentified in previous research or have been identified but their relevance for the success of management activities has been only insufficiently understood. This deepens the domain of sustainability accounting thus justifying and even suggesting a logical separation of the field from others due to its specific assumptions, methods, application, and target readers and users.

This doctoral thesis adds to a 'practice-orientated theory' (*section 1.3*) by listing the various components of sustainability accounting's contribution to corporate success and proposes how these are related. The explorative nature of this doctoral thesis does not leave much room for adequately testing the causality proposed here; however "such restrictions in methods do not invalidate the inherent causal nature of [thus built] theory" (Whetten 1989, 491). Thus, it is the task of future research to test and refine the causality suggested herein.

The arguments developed in this doctoral thesis draw on research whose psychological, economic, and social dynamics are acknowledged in contemporary management science. The reasonableness of the proposed conceptualisation of the decision situations highlighted throughout *section 2* does not contradict any fundamental views of human nature, organisational requisites, or societal processes. The presented research either builds upon generic theoretical models (e.g. in explaining manager's need for sustainability information to overcome information asymmetries and potential risk of opportunistic behaviour) or builds analogies to specific phenomena observed in related areas (e.g. sustainability information gatekeeping as an approach to retaining power structures in organisations).

3.2 Research limitations

In presenting and interpreting the above results, several limitations need to be considered. In each of the papers constituting the main line of argument, a set of limitations and considerations related to research

method, approach, and context are presented. For this reason, these limitations are not discussed here. Instead, this section focuses on the contextual limitations of the propositions developed and argued for throughout *section 2*.

While the decision to focus on organisational aspects of sustainability accounting (*Figure 2*) is justified in *section 1.3*, possibly relevant aspects influencing practice were left under-exposed. The extensive, yet partial understanding of the practice of sustainability accounting gained by doing so potentially obstructs a view that might enable finding answers to the questions raised throughout the research constituting this doctoral thesis. Gaining a more elaborate understanding of the phenomena and their relationships requires that individual-level as well as external (to the company) factors are investigated integratively.

Second, the influence of the contextualist perspective on the approach and the findings needs to be considered. Gergen (1982) argues that meaning is derived from context. Translating Gergen's argument to this doctoral thesis: in an effort to understand the researched phenomenon of sustainability accounting practice, the latter is unavoidably considered in the surroundings and context familiar to the researchers (e.g. the existence of multi-level hierarchies of organisation, urgency of societal and environmental issues) and at the indicated point in time (2008-2012). The validity of the predictions in other settings (e.g. in Japan, with a blue-collar population) or across time periods needs to be subsequently researched. Thus the challenge is to understand what is observed and analysed by appreciating where and when it is observed.

3.3 Future outlook

The research presented here is extensively based on logical argumentation. In the course of supporting or disproving the validity of this argumentation, logic will be replaced by data (Whetten 1989). The theoretical model proposed serves as a useful guide for research, due to a multitude of relationships that have been proposed but not tested yet. Subsequent research on operationalising and testing this model could challenge, expand and refine the propositions made in this doctoral thesis. It is, however, important that the propositions derived in this doctoral thesis are extended by conceptual work rather than by 'straight' measurement. Focusing the discussion on the implications of the study's results requires that the statements be tested under consideration of the logic that underlies the models proposed herein, rather than merely measuring its validity empirically.

As depicted in *Figure 2*, the system boundaries were set to explore the circumstances from a managerial perspective. Hence, an in-depth analysis of the individual's influence on sustainability accounting practice is likely to be particularly informing. Also, an investigation of the influence of external stakeholders such as competitors, regulating organisations, industry bodies, customers, etc. is likely to be revealing. External incentives for and obstacles to engaging with sustainability accounting are one example of a potentially relevant area of research. As demonstrated in *section 2.3*, although the effects of mandatory reporting and environmentally-related regulation on sustainability accounting practice were not an explicit part of this research, relevant aspects of external reporting that shape sustainability accounting practice were identified.

Lastly, this doctoral thesis focuses on the questions 'what' and 'how', thereby leaving the 'how' question in the background. Finding and developing explanations for the observed phenomena presents a lot of potential for future research. Generating a detailed account of the motives for the observed practice could facilitate focusing on essential contribution of sustainability accounting and thus provide action guidance to

managers as well as support policy makers in stimulating sustainability accounting development and practice.

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SCHWERPUNKTTHEMA

Ressourceneffizienz in der Praxis: Zur Anreizsituation aus Sicht von Unternehmen und Intermediären

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1 Einleitung

Auf die Bedeutung verschiedener unternehmensnaher Instrumente zur Stimulierung ressourceneffizienten Wirtschaftens sowie die Rolle einzelner Intermediäre konzentrierten sich Praxisgespräche, die im Rahmen des Arbeitspakets „Ressourcenpolitik auf Unternehmensebene“ des MaRess-Projektes unter der Leitung des Wuppertal-Institutes im Sommer 2009 durchgeführt wurden. Neben den Interaktionen zwischen Intermediären und Unternehmen spielten noch das grundsätzliche Verständnis über die Ressourceneffizienzthematik sowie die wahrgenommene Anreizsituation im Handlungsfeld Ressourceneffizienz seitens der Gesprächspartner eine zentrale Rolle.

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Unter Intermediären werden Organisationen und Personen verstanden, die zwischen Unternehmen und Staat angesiedelt sind und zwischen beiden Systemen vermitteln können, wenn es um die Erreichung von Zielen, wie etwa der Steigerung der Ressourceneffizienz, geht. Neben Wirtschaftsverbänden, Beratungsunternehmen und Bildungseinrichtungen können auch Finanzinstitute, Förderinstitute oder Think Tanks als Intermediäre auftreten. Da Intermediäre teilweise sehr nahe am Unternehmen agieren, stellen sie einen wichtigen Partner für die Politik dar, um gesellschaftlich bzw. gesamtwirtschaftlich relevante Ziele wirksam zu erreichen.

2 Untersuchungsdesign

2.1 Ausgangspunkt

Startpunkt der empirischen Untersuchung, die in Form ausführlicher Praxisgespräche erfolgte, war die Frage nach der Wahrnehmung der Anreizsituation im Handlungsfeld Ressourceneffizienz durch verschiedene Akteure aus der Praxis. Das Ziel dieses explorativen Ansatzes war, einen Einblick in die Unternehmenspraxis in Bezug auf den Umgang mit Ressourcen zu gewinnen. Dabei wurden die Gesprächspartner nicht gezielt auf bereits bekannte bzw. vermutete Defizite im Umgang mit der Thematik befragt, sondern sollten von sich aus Defizite, aber auch Erfolgsfaktoren beschreiben. Assoziative Stellungnahmen der Gesprächspartner waren ausdrücklich erwünscht.

Neben Unternehmen wurden weiterhin Expertenmeinungen von Intermediären einbezogen. Beide Sichtweisen, d. h. von Unternehmen sowie Intermediären, sollten schließlich die praxisorientierte Weiterentwicklung von Maßnahmen und Instrumenten zur Stimulierung ressourceneffizienten

Wirtschaftens ermöglichen und über die Rolle einzelner intermediärer Akteure Aufschluss geben. Durch die Gespräche konnten nicht nur die Erfahrungen von Praxisvertretern mit dem Thema eingefangen werden, sie ermöglichten auch einen ex-post Abgleich mit bestehenden, theoriegeleiteten Annahmen (Schwegler et al. 2007; Görlach et al. 2009). Die Ergebnisse der Gespräche sollten schließlich die Arbeiten auf dem Gebiet unternehmensnaher Ansatzpunkte durch Anregungen aus der Praxis unterstützen.

2.2 Gesprächsleitende Themen

Innerhalb der Vorarbeiten haben sich drei zentrale Themengebiete herauskristallisiert, die verschiedene Unteraspekte beinhalten, und schließlich die Praxisgespräche inhaltlich leiten sollten:

1. Public Efficiency Awareness & Performance: Stärkung der öffentlichen Wahrnehmung und Schaffung von Verhaltensangeboten:
   - Kommunikation über Ressourceneffizienz;
   - Ressourceneffizienzbezogene Beratung;
   - Rolle von Verbänden bei der Kommunikation und Verbreitung ressourceneffizienten Wirtschaftens;
   - Ressourceneffizienz als Thema in der Aus- und Weiterbildung.
2. Innovation und Markteinführung: Unterstützung von Innovationsaktivitäten von der Invention bis zur Markeinführung:
   - Innovationsförderung, d. h. Gestaltung des institutionellen Rahmens (Förderprogramme) für Innovationstätigkeiten;
   - Innovationslabore als Netzwerke zur Unterstützung der Innovationstätigkeit insbesondere von KMU;
   - Innovationsagenten, die als externe bzw. interne Schlüsselakteure das unternehmerische Innovationsmanagement durch persönlich-wissensbezogene (Innovationscoaches) und/oder finanzielle Unterstützung (Business Angels) begleiten und professionalisieren.
3. Finanzwirtschaft: Schaffung von finanzwirtschaftlichen Anreizen zur Steigerung der Ressourceneffizienz auf Unternehmensebene:
   - Rolle von Finanzdienstleistern bei der Steigerung der Ressourceneffizienz;
   - Ressourceneffizienzbezogene Berichterstattung.

Die gelisteten Themenbereiche inklusive der Unteraspekte wurden zwecks Anleitung der Gespräche in Form eines Gesprächsleitfadens näher ausgeführt. Bei der Auswahl der Gesprächspartner wurde darauf geachtet, dass sowohl der externe Blick auf die oben genannten Themen als auch Innenansichten von sogenannten Insidern einfließen konnten. Ging es bspw. um die Ressourceneffizienz-Beratung, so sollten nicht nur Unternehmen und Verbände, sondern ebenso Berater als Insider direkt befragt werden. Für die sehr ausführlichen Praxisgespräche konnten insgesamt 11 Unternehmen unterschiedlicher Größe und 15 Intermediäre gewonnen werden.

3 Gesprächsergebnisse

Im Folgenden werden die aus Sicht der Autoren wichtigsten Aussagen der Gesprächspartner, geordnet nach den oben genannten Themen und Unteraspekten, vorgestellt. Während zu Beginn der einzelnen Themenfelder die Vorstellung jeweils übergreifender Gesprächsaussagen erfolgt, wird am Ende eines jeden Themengebiets ein kurzes Fazit gezogen. Eine detailliertere Darstellung der Gesprächsergebnisse inkl. einzelner Unternehmenssteckbriefe findet sich in Görlach und Zvezdov (2010).

3.1 Public Efficiency Awareness & Performance

3.1.1 Übergreifende Aussagen

Unstrittig war der Begriff Ressourceneffizienz. Er wurde von den Intermediären u. a. als „rationaler Einsatz von Roh-, Hilfs- und Betriebsstoffen“ oder „gleicher Nutzen mit weniger Material“ beschrieben. Ebenso wurde seine Energie- als auch Stoffbezogenheit hervorgehoben.

Seitens eines Gesprächspartners erfolgte ein interessanter thematischer Rückblick: Nachdem die Abfall- bzw. Reststoffproblematik Anfang der 1990er Jahre ein großes Thema gewesen und damit die materielle Seite betont worden sei, habe dieses Thema dann zunächst an Bedeutung verloren. Die Diskussion um Reststoffe sei durch die Klima- und Energiedebatte abgelöst worden. Sie dominiere bis heute, sowohl in Politik als auch in den Medien. Dies wurde auch durch andere Intermediäre und Unternehmen hervorgehoben.

Die Priorisierung des Energiethemas hänge auch damit zusammen, dass die Energieproblematik insbesondere über einzelne Energierechnungen mit z. T. hohen Beträgen transparenter und über die rasante Preissteigerung klarer sei. Dahingegen weise der Ressourcenbereich eine gewisse Komplexität auf, so dass die Bedeutung des Themas den Unternehmen zunächst einmal zu erklären wäre. Neben dem Energiethema hätten Pflichtthemen, wie z. B. REACH, große Bedeutung für Unternehmen.

Insgesamt, so die Einschätzung der Mehrheit der Intermediäre, sei Ressourceneffizienz als Thema noch nicht im Bewusstsein der Unternehmen verankert. Die Dominanz des Alltagsgeschäfts wurde mehrfach betont: In wirtschaftlich

guten Zeiten seien die Kapazitäten in Unternehmen vollständig ausgelastet, wohingegen in wirtschaftlich schlechten Zeiten die Auftragsakquisition oberste Priorität habe.

Um Unternehmen zu erreichen, müsse insbesondere, so die Mehrheit der Intermediäre, über die ökonomische Bedeutung von Ressourceneffizienz aufgeklärt werden. Dagegen sei die Kommunikation von Ressourceneffizienz als „grünes Thema“ zu vermeiden. Auf die handlungsleitende Bedeutung eines klaren ökonomischen Nutzens in Bezug auf Maßnahmen zur Steigerung der Ressourceneffizienz wiesen auch die interviewten Unternehmen hin.

Das mangelnde Problembewusstsein sei schließlich, so die Einschätzung einiger Intermediäre, ein psychologisches Problem: Die mangelnde Problemwahrnehmung auf Unternehmensebene wurde mit der schleichenden Kostensteigerung bei Rohstoffen in Verbindung gebracht. Der Wendepunkt sei erst vor wenigen Jahren eingetreten, als innerhalb kürzester Zeit hohe Preissteigerungsraten zu verzeichnen waren.

Damit das Problembewusstsein in Unternehmen wachse, müssten seitens Externer insbesondere solche Themen aufgegriffen werden, die Unternehmen bereits beschäftigen, wie z. B. das Verhindern von großen Lagerbeständen. Im Allgemeinen, so die Mehrheit der Intermediäre, sei aber noch viel Überzeugungsarbeit bei Unternehmen notwendig. Diese müsse als „Vertrauen durch Leistung“, d. h. insbesondere durch ökonomische Argumente und Ergebnisorientierung, erarbeitet werden. Hierbei sei zudem „ein langer Atem“ notwendig, um Vertrauen aufzubauen und die Unternehmen insbesondere dann zu erreichen, wenn sie sich schließlich für das Thema geöffnet haben.

3.1.2 Kommunikation über Ressourceneffizienz

Die Mehrheit der Unternehmensvertreter berichtete, dass sie bisher entweder gar nicht oder nur kaum über das Thema Ressourceneffizienz informiert worden sei. Weder Staat noch Medien würden auf die Bedeutung des Themas aufmerksam machen. Hierdurch komme es dazu, dass Unternehmen nur zufällig über themenrelevante Aktivitäten erführen und bspw. themenbezogene Förderprogramme häufig unbekannt blieben.

Die befragten Intermediäre machten beim Thema Kommunikation mehrheitlich auf die wichtige Rolle von Initiatoren aufmerksam. Außerdem wiesen sie auf die Bedeutung der persönlich-informalen Kommunikation sowie regionaler Vertrauenspersonen hin. Viele unternehmensrelevante Informationen würden eher im Rahmen persönlich-vertrauensbasierter Beziehungsnetze und damit auf informalem Wege wirksam vermittelt. Eine eher geringere Wirksamkeit attestierten sie hingegen der Themenvermittlung über formale Kommunikationswege wie etwa rein formalisierte (und ggf. über Förderprogramme unterstützte) Kooperationsnetze.

3.1.3 Ressourceneffizienzbezogene Beratung

Sowohl das Angebot an ressourceneffizienzbezogenen Beratungen als auch die diesbezüglich bestehende staatliche Förderung waren nur wenigen Unternehmen bekannt. In diesem Zusammenhang wiesen einige Intermediäre darauf hin, dass bisher kein flächendeckendes Beratungsangebot zum Thema Ressourceneffizienz bestehe. Zudem wurde erwähnt, dass aufgrund eines vermeintlich unklaren ökonomischen Nutzens hinsichtlich Ressourceneffizienz die in einer Beratung empfohlenen Maßnahmen häufig nicht umgesetzt bzw. Investitionen unterlassen würden.

Die Intermediäre betonten weiterhin, dass Beratungen zum Thema Ressourceneffizienz aktuell vor allem von technisch qualifizierten Beratern durchgeführt würden, wohingegen soziale Aspekte, d. h. vor allem Fragen der Organisationsentwicklung, überwiegend unberücksichtigt blieben. Der Einstieg in ein Unternehmen durch Berater solle aber grundsätzlich betriebswirtschaftlicher Natur sein und zunächst auf die Entdeckung so genannter „low hanging fruits“ abstellen, so die Meinung einzelner Intermediäre. Zwar sei letztlich das technische Personal für die Umsetzung von Maßnahmen zur Effizienzsteigerung verantwortlich, dennoch wurde die Bedeutung des leitenden kaufmännischen Personals herausgestellt und insbesondere die Rolle der Geschäftsleitung als „Nadelöhr für Beratungsprojekte“ betont.

Von Bedeutung ist weiterhin die Einschätzung mehrerer Intermediäre, dass der Beratungsmarkt, der aktuell im Handlungsfeld Ressourceneffizienz entstehe, stark fördergeldbasiert sei, d. h. die ressourceneffizienzbezogene Beratung sei bisher nicht selbsttragend. Die über die Beratungsförderung stimulierte Schaffung eines Beratungsangebots zum Thema Ressourceneffizienz wurde allerdings sowohl von den Unternehmen als auch von den Intermediären als positiv bewertet.

3.1.4 Rolle von Verbänden

Hinsichtlich der Rolle von Verbänden ging das Meinungsbild auseinander. Nicht-verbandliche Intermediäre wiesen auf das geringe Ressourcenbewusstsein auch auf Ebene der Wirtschaftsverbände hin. Auch einige Unternehmensvertreter berichteten, dass Verbände das Thema bisher kaum aufgriffen. Ob sich ein Verband mit einem bestimmten Thema befasst, sei insgesamt stark personenabhängig, so die Einschätzung einiger Intermediäre. Ein Verbandsvertreter erklärte in diesem Zusammenhang, dass Themen nur dann verbandlich behandelt würden, wenn ein konkreter Bedarf, d. h. Nachfrage seitens der Mitgliedsunternehmen, bestehe. Auch einige der befragten Unternehmen betonten die Bedeutung der Interessen der Mitgliedsunternehmen für die inhaltliche Ausrichtung der Verbandsarbeit, wiesen hier-

bei aber zugleich auch auf die dominierende Rolle größerer Unternehmen hin. Andere der befragten Verbände sowie einige Unternehmensvertreter betonten hingegen, dass Ressourceneffizienz als Thema in Verbänden immer schon behandelt worden sei, wenn auch nicht explizit unter dieser Bezeichnung. Mit den branchenbezogenen Ressourceneinsparpotentialen habe man sich aber bisher nicht befasst, so die Verbandsvertreter.

Unabhängig von den unterschiedlichen Einschätzungen wurden Fachverbände aufgrund ihrer Nähe zu Unternehmen und ihres fachlichen Know-hows von der Mehrheit der Befragten als geeignete Multiplikatoren für die Thematik erachtet.

3.1.5 Ressourceneffizienz als Thema in der Aus- und Weiterbildung

Im Hinblick auf die Bildung für Ressourceneffizienz wurde insgesamt die erforderliche Schulung sowohl des interdisziplinären als auch des Lebenszyklusdenkens hervorgehoben. Der „Blick über den eigenen Tellerrand“ und eine „Stoffstromintelligenz“ müssten im Zentrum stehen. Diese Aspekte sollten über alle Bildungsstufen, jedoch insbesondere in Universitäten und Berufsschulen, integriert werden. Neben der Führungsbildung, in der traditionelle Managementthemen dominierten, sollten Angebote im technischen Bereich, die bisher einzeltechnologisch ausgerichtet seien, mit themenübergreifenden, ressourceneffizienzbezogenen Inhalten bereichert werden.

3.1.6 Zwischenfazit

Die Praxisgespräche haben insgesamt gezeigt, dass viele Unternehmen kaum bzw. nur unzureichend von außen über das Thema Ressourceneffizienz informiert werden. Das gipfelt z. B. in der Feststellung, es gäbe keine flächendeckenden Beratungsangebote, was so de facto nicht stimmt (vgl. z. B. Angebote der DEMEA oder landesspezifische Angebote). Dennoch: Das Interesse der Unternehmen am Thema Ressourceneffizienz sowie der Wunsch nach diesbezüglichen Informationen nehmen offensichtlich zu.

Daraus folgt, dass – neben der reinen Beratung – vor allem die Kommunikation über Ressourceneffizienz an Bedeutung gewinnt. Dabei stellt die Herausbildung einer „Public Efficiency Awareness“ (Schmidt 2009, S. 170) eine notwendige, wenn auch nicht hinreichende Bedingung für die Realisierung ressourceneffizienten Handelns dar. Die Gesprächspartner haben in diesem Zusammenhang auf einzelne Erfolgsfaktoren wie z. B. die Bedeutung regional-unternehmensnaher Strukturen (Stichworte: Fachverbände, flächendeckende Beratungsangebote) sowie der persönlich-informalen Kommunikation, das Thema Vertrauen, die Rolle von Initiatoren sowie die Ausbildung interdisziplinär-lebenszyklusorientierten Denkens und Handelns aufmerksam gemacht. Diese Aspekte betreffen das „Wie“ der Ressourceneffizienz-Kommunikation.

In Bezug auf das „Was“ wurde folgendes deutlich: Ressourceneffizienz ist ein vielschichtiger Thema, das viele Bereiche in Unternehmen berührt. Zudem besteht Unklarheit hinsichtlich des konkreten ökonomischen Nutzens aus Ressourceneffizienz. Und schließlich wird Ressourceneffizienz bislang als rein technische Aufgabe betrachtet. Die künftige Herausforderung besteht insofern darin, Klarheit hinsichtlich Inhalt, Nutzen und Reichweite von Ressourceneffizienz-Programmen zu schaffen.

3.2 Innovation und Markteinführung

3.2.1 Innovationen im Allgemeinen

Prinzipiell ist zu sagen, dass Innovationen durch die Mehrheit der Gesprächspartner mit unternehmerischen Technik- und Prozessinnovationen gleichgesetzt wurden. Während nun vor allem größere Unternehmen Innovationen als notwendig erachteten, wiesen kleinere Unternehmen darauf hin, dass Innovationen aufgrund der Unternehmensgröße und bspw. auch aufgrund des Spezialisierungsgrades kaum eine Rolle spielten. Ebenso wurde betont, dass bei bestimmten Technologien mitunter keine weiteren Möglichkeiten für Innovationen bestünden.

(Technik-) Innovationen, so die Aussage einiger Intermediäre, gehörten grundsätzlich zu den Kernaktivitäten einer jeden Unternehmung. Dahingegen: Bei den meisten der befragten Unternehmen seien, laut Selbsteinschätzung, Innovationen kein integraler Bestandteil der unternehmerischen Tätigkeit. Sie würden häufig nur dann forciert, wenn es absolut notwendig sei. Neben den bereits erwähnten Aspekten wurde seitens einzelner Intermediäre und Unternehmen auch auf den unternehmerischen Handlungsspielraum hingewiesen, welcher bei so genannten Lohnfertigern, d. h. Unternehmen, die im Auftrag anderer arbeiten, aufgrund von Kundenvorgaben kaum bis gar nicht vorhanden sei. Hier spiele vor allem die Produktqualität eine wichtige Rolle. Neben technischen Innovationen wurde aber auch vereinzelt durch Intermediäre auf den Mangel an sozialen Innovationen auf dispositiver Ebene hingewiesen.

3.2.2 Innovationsförderung

Bei Unternehmen, die Erfahrungen bei der Inanspruchnahme einer Förderung hatten, war die Einschätzung hierüber unterschiedlich. Einerseits wurde der teilweise sehr hohe Aufwand, der durch die Suche nach passenden Angeboten, beim Ausfüllen von Formularen und beim Erfüllen von Nachweispflichten entstehe, hervorgehoben. Andererseits berichteten einige Unternehmen, dass sich der Aufwand

durchaus gelohnt habe. Ein Intermediär hob sogar hervor, dass sich im Bereich der Förderprogramme (konkret: ZIM – Zentrales Innovationsprogramm Mittelstand) viel getan habe und die Antragsgestaltung vereinfacht worden sei. Förderungen wurden schließlich insgesamt als bedeutsam und seitens der Unternehmen als „nice-to-have" bezeichnet. Bei der grundsätzlichen Entscheidung für ein Innovations- oder Investitionsprojekt sei eine Förderung aber nicht ausschlaggebend. Dahingegen beeinflusse eine Förderung die Höhe eben dieser, d. h. es würden mitunter teurere, dafür aber effizientere Anlagen angeschafft. Förderungen beschleunigten zudem die Umsetzung bereits anvisierter Projekte. Mehrere Unternehmen äußerten, dass neue Technologien mit gewissen Risiken verbunden seien, welche durch eine Förderung gemindert würden.

Überdies bewerteten einige Intermediäre die existierenden Förderprogramme als ausreichend, hoben aber in diesem Zusammenhang hervor, dass die verfügbaren Fördergelder im Bereich Ressourceneffizienz bislang nicht ausgeschöpft würden. Mehrheitlich wurden zudem die nebeneinander bestehenden Fördertöpfe – Material, Energie, Innovation – kritisiert. Dieses Nebeneinander erschwere den Beantragungsprozess, weil die Förderfähigkeit von ganz bestimmten Kriterien abhängig gemacht werde, und erhöhe so den Aufwand für Unternehmen.

Darüber hinaus wurde darauf hingewiesen, dass die Energiethematik auch im Bereich der Förderung dominiere, d. h. Mittel vor allem in Projekte zur Klima-/Energiethematik liefen. Dennoch herrschte der Grundtenor, dass Förderungen als „Türöffner" bzw. „Initialzündung" für die Ressourceneffizienzthematik eine wichtige Bedeutung besitzen.

3.2.3 Innovationslabore

Grundsätzlich waren Innovationslabore bei den befragten (vor allem kleineren) Unternehmen kaum bekannt. Auch die Einschätzung dieser variierte. Größere Unternehmen erachteten sie als sinnvollen Zusatz zur eigenen Forschungs- und Entwicklungsarbeit. Für die kleineren der befragten Unternehmen seien Innovationslabore hingegen nicht attraktiv. Hier gelten die gleichen Gründe wie sie bereits anfangs (vgl. „Innovationen im Allgemeinen") erwähnt wurden: Unternehmensgröße, Spezialisierungsgrad, geringes Innovationspotential.

3.2.4 Innovationsagenten

Ebenso wie bei Innovationslaboren war die Bekanntheit von Innovationsagenten bzw. den dahinter liegenden Business Angels und Innovationscoaches sehr gering. Deren Nutzen wurde unterschiedlich bewertet (vgl. auch Einschätzungen „Innovationslabore"). Einige, vor allem größere Unternehmen erachteten deren potenziellen Beitrag als interessant. Insgesamt aber wurden die konkreten Aufgaben und Funktionen solcher Agenten sowohl durch Unternehmen als auch Intermediäre kritisch hinterfragt. Hierbei wurde konkret die Frage nach der Rolle von Innovationsagenten aufgeworfen – schließlich sei Innovationsmanagement die Aufgabe der Unternehmensleitung bzw. zuständiger Führungskräfte oder bestünden andere Faktoren (vgl. „Innovationen im Allgemeinen"), die Innovationen behinderten.

3.2.5 Zwischenfazit

Die obigen Aussagen liefern einige interessante Erkenntnisse. Einerseits wurde zwar der Aufwand, der mit der Inanspruchnahme einer Förderung verbunden ist, betont. Hieraus kann geschlussfolgert werden, dass eine Aufwandsreduktion sinnvoll wäre. Mehr Transparenz sowie integrierte Förderstrukturen unterstützen sicherlich den Einstieg in eine Förderung. Andererseits konterkariert aber der unklare Nutzen aus Ressourceneffizienz-Maßnahmen oft diesbezügliche Anstrengungen. Dies weist zum Einen wieder auf ein Kommunikationsproblem, zum Anderen auf einen Mangel an geeigneten Bewertungsverfahren und –instrumenten in der Praxis hin. Statt des Aufwandes, der mit Ressourceneffizienz-Projekten und entsprechenden Investitionen bzw. der Inanspruchnahme diesbezüglicher Förderprogrammen verbunden ist, sollte vielmehr der Nutzen von Ressourceneffizienz herausgestellt bzw. vermittelt werden. Ansonsten wird der Aufwand stets überbewertet.

Die Nutzendimension sollte auch im Hinblick auf Innovationslabore und -werkstätten näher betrachtet und herausgestellt werden. Denn häufig wurden die Vorteile dieser unternehmensnahen Ansatzpunkte aufgrund mangelnder Erfahrungen als sehr gering eingeschätzt.

Für unternehmensnahe Unterstützungsstrukturen müsste vor allem auch das Innovationspotential einzelner Branchen und Technologiefelder näher untersucht werden. Denn es hat sich gezeigt, dass das Innovationspotential mitunter als weitgehend ausgeschöpft erachtet wird. Vorliegende Studien (vgl. ADL et al. 2005) haben allerdings auf teilweise noch hohe Potentiale aufmerksam gemacht. Deshalb sollten weitere Untersuchungen hierzu forciert und vor allem die Ergebnisse an die Wirtschaft vermittelt werden.

3.3 Finanzwirtschaft

3.3.1 Allgemeine Aussagen

Finanzierungs*bedingungen* haben – so die häufige Aussage der Unternehmensvertreter – keinen vorrangigen Einfluss auf die grundsätzliche Entscheidung eines Unternehmens, ob eine Maßnahme durchgeführt und dabei auf eine Fremdfinanzierung zurückgriffen wird. Die wesentlichen Determinanten seien Wirtschaftlichkeit der Maßnahme, technische

Notwendigkeit etc. Allerdings spiele die Ressourceneffizienz bei der finanzwirtschaftlichen Bewertung von Projekten bislang auch keine Rolle. Demgegenüber werde die Klima- und Umweltthematik von der Finanzwirtschaft zunehmend aufgegriffen, insbesondere durch Versicherungen.

3.3.2 Rolle von Finanzdienstleistern bei der Steigerung der Ressourceneffizienz

Finanzdienstleister könnten über die Integration von ressourceneffizienzbezogenen Leistungsindikatoren, insbesondere bei der Kreditvergabe, die Wirtschaft sensibilisieren und schließlich einen (indirekten) Beitrag zur Steigerung der Ressourceneffizienz leisten, so die Meinung der Mehrheit der Befragten. Allerdings fänden nicht-finanzielle Leistungsindikatoren bislang keine Berücksichtigung, es dominierten traditionelle, d. h. finanzielle Leistungsindikatoren.

Insgesamt wurden Hausbanken mehrfach als geeignete Kanäle zur Verbreitung der Ressourceneffizienzthematik erachtet, da zwischen diesen und KMU enge Kontakte bestünden. Weil aber Hausbanken das Thema bisher nicht aufgriffen, müssten zunächst stärkere Anreize für diese geschaffen bzw. „Informations- und Überzeugungsarbeit" geleistet werden, so die Meinung einzelner Intermediäre.

3.3.3 Ressourceneffizienzbezogene Berichterstattung

Berichterstattung über Ressourceneffizienzaspekte findet bei den befragten Unternehmen bisher nur vereinzelt und ansatzweise statt. Wenn sie stattfindet, dann habe sie einen „weichen" und unverbindlichen Charakter, so die Einschätzung einiger Intermediäre. Entsprechende Erhebungen würden oft nur für interne Zwecke genutzt. In diesem Zusammenhang wurde von Unternehmensvertretern erwähnt, dass allein eine Berichterstattung kaum in der Lage sei, die Entwicklung der Ressourceneffizienz zu beeinflussen. Auch Intermediäre bestätigten, dass die Unternehmen die Chancen und die Notwendigkeit einer Berichterstattung über Ressourceneffizienz nicht sehen würden.

Nur einzelne Unternehmen wiesen auf den potenziellen Mehrwert der freiwilligen, ressourceneffizienzbezogenen Berichterstattung hin. Zwei produzierende Unternehmen hatten aufgrund ihrer Kommunikation in vergangenen Ausschreibungen den Zuschlag erhalten.

Es wurde zudem geäußert, dass prinzipiell eine Standardisierung fehle, die letztlich eine Vergleichbarkeit von Daten zwischen Unternehmen ermöglichen würde. In Bezug auf die freiwillige Berichterstattung haben die Gespräche gezeigt, dass der hierfür notwendige Aufwand im Vergleich zum Nutzen als recht hoch eingeschätzt wird, insbesondere wenn es sich um eine standardisierte Berichterstattung handle. Der Erfolg der freiwilligen Berichterstattung wurde aufgrund des (standardisierungsbedingten) Zusatzaufwandes seitens einiger Gesprächspartner bezweifelt. Eine Berichtspflicht wurde durch die Mehrheit sowohl der Intermediäre als auch Unternehmen abgelehnt. Was die fehlenden Berichtsstandards betrifft, so wurde grundsätzlich die Anbindung von Auskünften an bestehende Berichte wie z. B. Jahresabschluss-, Lage-, Umwelt- oder Nachhaltigkeitsbericht als wünschenswert hervorgehoben. Die Notwendigkeit, gänzlich neue Berichtssysteme zu schaffen, sei insgesamt zu vermeiden, so die Mehrheit der Befragten.

3.3.4 Zwischenfazit

Die Gespräche haben verdeutlicht, dass das Thema Ressourceneffizienz im Finanzsektor bisher keine Relevanz hat. Allerdings wurde die Bedeutung von um Ressourceneffizienzaspekte erweiterte Finanzierungskonditionen weitgehend positiv eingeschätzt. Doch auf der Ebene der Finanzdienstleister mangelt es an einem entsprechenden Bewusstsein. Insofern besteht die Herausforderung, diese Akteure für die Thematik zu sensibilisieren. Der Nutzen eines zusätzlichen Engagements müsste aufgezeigt werden.

4 Zusammenfassung und Ausblick

Die Gespräche haben insgesamt gezeigt, dass das Thema Ressourceneffizienz in der Wirtschaft an Bedeutung gewinnt. Die interviewten Akteure sind zunehmend an der Thematik interessiert, da es eine wirtschaftliche Rolle spielt. Dennoch: Eine inhaltliche Beschäftigung damit bedeutet einen zeitlichen und finanziellen Aufwand, der oftmals, insbesondere aus Unwissenheit hinsichtlich des konkreten ökonomischen Nutzens, gescheut wird. Besonders deutlich wird damit die Notwendigkeit, über Inhalt und Nutzen von Ressourceneffizienz stärker aufzuklären und einen breiten Konsens herzustellen.

Neben förderlichen staatlichen Rahmenbedingungen, wie z. B. Förderprogrammen, sind auch weitere Anreizfaktoren im unternehmensnahen Bereich wichtig. Dazu zählen das Verhalten und Einwirken von Intermediären sowie Verhaltensangebote, die in einem angemessenen sozialen Umfeld, z. B. in regionalen Strukturen und informellen Netzwerken, vermittelt werden.

Es bestehen grundlegende Hemmnisse, die die Schaffung einer umfassenden öffentlichen Wahrnehmung des Themas – einer Public Efficiency Awareness – konterkarieren. Als zentrale unternehmensnahe Defizite haben sich in den Praxisgesprächen die folgenden herauskristallisiert:

- unvollständige Kosten-Nutzen-Einschätzung mit unterschätztem Nutzen
- Dominanz der Klima- und Energiethematik sowohl in Politik, Medien sowie im unternehmensnahen Umfeld

- unterrepräsentiertes politisches Commitment im Bereich Ressourceneffizienz
- fehlende mediale Präsenz
- intransparente sowie nebeneinanderstehende statt integrierte Aktivitäten und Förderstrukturen
- Technikzentriertheit in Bezug auf Ressourceneffizienz sowohl bei Beratern als auch in der Förder- und Innovationspolitik
- fehlende regionale Unterstützungsstrukturen

Die Ergebnisse aus den Praxisgesprächen setzten wichtige Impulse für die vor allem theoriegeleiteten Arbeiten im MaRess-Projekt zu den unternehmensnahen Ansatzpunkten für eine Steigerung der Ressourceneffizienz. Erste Vorschläge hierzu wurden erarbeitet und inzwischen veröffentlicht (Görlach und Schmidt 2010; Lemken et al. 2010; Onischka 2010).

Die vorgestellten Arbeiten wurden für das MaRess-Projekt durchgeführt, das im Rahmen des UFOPLAN durch das BMU und das UBA gefördert wurde (FKZ 370793300). Die Verantwortung für den Inhalt dieser Veröffentlichung liegt bei den Autor(inn)en.

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Tapping environmental accounting potentials of beer brewing Information needs for successful cleaner production

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ABSTRACT

Improving established production processes towards Cleaner Production can be a demanding challenge as the actors involved in these processes – both management and technical staff – often need a fresh perspective on how business and the business environment are developing. Whether existing potentials are effectively and efficiently uncovered largely depends on the availability of information as well as on knowing how to make use of it. An often observed problem is the lack of tools to obtain useful Cleaner Production information efficiently. Against the background of a case study of a major Vietnamese beer producer, this paper highlights the importance of decision-making information and demonstrates how considerable performance improvement potentials can be uncovered using environmental management accounting (EMA) techniques and tools. Particular attention is paid to the information needs of the various users of such information and how these needs can be fulfilled. The analysis of the results suggests a pattern of action that increases the efficacy and efficiency of information management and use in corporate practice.

1. The role of information in improving economic and environmental performance

An inherent objective of conventional management activities is to (continuously) improve the economic efficiency of the company. Environmental management in turn aims at improving environmental performance which ideally should result in economic improvements at the same time. Empirical research indicates that significant efficiency improvement potentials exist with regard to both, environmental and economic performance, particularly in the producing industry (e.g. Jasch, 2009; Schaltegger et al., 2008; Hallstedt et al., 2010).

In this context, Cleaner Production (CP) has shown to be a valuable approach to improving economic performance by considering the impacts of the business on the environment and vice versa (e.g. Hobbs, 2000). Although various approaches exist for CP (Jasch, 2006), their applicability depends on available and retrievable information in the company where CP is applied. However, managers pursuing CP often seem to be hindered by the lack of tools which provide information and support decision making. A major challenge is thus the acquisition and interpretation of available CP information (see e.g. Jasch, 2006).

Although the information availability problem is generic and applies to corporate practice as a whole (e.g. Scavone, 2006), in-depth research on information needs of decision makers has developed only recently (e.g. da Silva and Amaral, 2009). To better understand the environmental and economic information needs of decision makers and how these needs can be met by internal information providers an environmental management accounting (EMA) framework has been proposed by Burritt et al. (2002). This framework distinguishes 16 different types of decision situations, based on core attributes of the information used such as time frame and routineness of generation. However, this framework, like the multitude of proposed environmental accounting tools, does not explain the processes how corporate decision makers design their environmental information management and use processes.

Against the background of a case study conducted in the Vietnamese beer brewing facility of *Sai Gon Beer*, this paper focuses on the challenge of identifying what information can serve the needs of managers in the course of applying CP and how relevant information can be provided at a minimum cost. For a discussion of the case study approach in general see Yin (2009), in management accounting research see e.g. Kaplan (1986), Parker (1994) or Ryan et al. (2002), and in EMA see e.g. Burritt et al. (2009) or Gale (2006). In particular, this case study looks into the decision

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situations that arise when applying material and energy flow accounting for corporate decision making and identifies suitable tools for providing the required decision-making information as well as for reducing the cost of doing this. The example of a Vietnamese company is particularly interesting as various authors have outlined the higher potential of CP for economic and environmental improvement of activities in developing countries (e.g. Burritt et al., 2009). The higher potentials have been explained with external (e.g. economic and political conditions) and internal factors such as lack of know-how and resources (e.g. Lee et al., 1999). This paper focuses on internal factors.

Section 2 provides an overview of different EMA decision situations, discusses the settings of doing research in developing countries, and explains the relevance of analysing improvement potentials of beer production. Section 3 presents the methods and the research approach adopted. The core of this paper is Section 4, which demonstrates how EMA was used to support the process of designing and implementing CP at the case study company and what can be learned from the case. Section 5 concludes with the main implications and observations in applying EMA tools to support CP.

2. Different CP information needed in different decision situations

2.1. EMA as a set of different tools

To design and implement CP, managers need information which relates to their decision situations. In this context, environmental management accounting (EMA) embraces a wide set of tools of environmental information management which support different decision situations. The multitude of EMA tools is classified by the EMA framework (Burritt et al., 2002) which systematically integrates two major components of EMA: monetary environmental management accounting (MEMA) addressing environmental aspects of corporate activities expressed in monetary units, and physical environmental management accounting (PEMA) measuring and analysing a company's impact on the natural environment, expressed in physical units (Fig. 1). To support business actors the framework identifies different EMA tools for various decision situations, according to (cp. Burritt et al., 2002):

		Environmental Management Accounting (EMA)			
		Monetary Environmental Management Accounting (MEMA)		Physical Environmental Management Accounting (PEMA)	
		Short Term Focus	Long Term Focus	Short Term Focus	Long Term Focus
Past/ Present Orientated	Routinely generated information	1. Environmental cost accounting	2. Trend analysis of environmentally induced [driven] costs, revenues, etc.	9. Material and energy flow accounting	10. Environmental (natural) capital impact accounting
	Ad hoc information	3. *Ex post* assessment of relevant environmental costing decisions	4. Post-investment assessment of individual projects	11. *Ex post* assessment of short term environmental impacts	12. Post-investment assessment of physical environmental investment appraisal
Future Orientated	Routinely generated information	5. Monetary environmental operational and capital budgeting	6. Environmental long term financial planning	13. Physical environmental budgeting	14. Long term physical environmental planning
	Ad hoc information	7. Relevant environmental costing	8. Monetary environmental project investment appraisal	15. Relevant environmental impacts	16. Physical environmental investment appraisal

Fig. 1. EMA framework (Burritt, et al., 2002, p. 42) including EMA tools applied at Sai Gon Beer (shaded).

- the type of information – monetary or non-monetary (physical) information;
- the time frame – past or future: looking at whether the focus of the decision is oriented towards measuring past performance or making decisions for the future;
- the length of time frame – short or long term: whether the decision setting involves strategic information concerning several years or whether it is more operational, thus covering a shorter period such as months, weeks or days, and
- the routineness of information provision – regular or ad hoc: whether the required information is gathered regularly for a recurring purpose or only when required, e.g. to support a specific and non-recurring need.

The framework serves for conceptual classification purposes but also provides a pragmatic structure for the identification of the appropriate EMA tool for any given corporate decision setting. It can therefore serve as a basis for managers and staff to reflect whether an EMA tool already in use is the most appropriate one for the intended decision-making purposes.

From an organisational and methodological point of view, environmental aspects have often been dealt with in parallel organisational structures and departments separate from conventional business management (Schaltegger and Burritt, 2005). This detachment of environmental responsibilities can result in inadequate attention of complementarities and conflicts with other parts of the organisation (e.g. Herzig et al., 2006). Furthermore, it can lead to a total or at least partial failure to address environmental issues (ibid.).

With its concepts and tools, EMA may provide a good starting point for a successful integration in the organisation. EMA tools offer the opportunity to analyse the environmental impacts of the company on the natural environment, and address the environmentally driven monetary impacts on the company. By linking environmental issues with conventional management tools, EMA avoids the establishment of environmental management systems and tools which are rarely connected with day-to-day business and which run parallel to already existing corporate management systems. Furthermore, whereas it may seem to be a luxury privilege of developed countries to discuss the optimal choice of EMA tools to support CP, the same issues can be a question of economic and environmental survival in developing countries.

2.2. CP research in developing countries

Developing countries face greater difficulties in implementing CP than developed countries (e.g. Gale, 2006) because they usually do not have the institutional capacity in place to promote environmental protection, or to encourage the inclusion of environmental costs in decision making (Davy, 1997, p. 179; Burritt et al., 2009). A growing part of global industrial production takes place in Southeast Asia. This is particularly true for, amongst others, globally traded goods such as textiles, electronic goods and plastics (cp. CIA, 2011 for statistics on Southeast Asian countries).

With the accompanying production growth of food, paper, and mobility for domestic consumption, the Southeast Asian region is characterised both by rapid economic growth and increasing environmental problems. Countries in the region have shown substantial annual economic growth rates in recent years, boosting purchasing power and consumption along with significantly increasing energy consumption, traffic volume, waste disposal, and environmental impacts (ibid.). Decoupling environmental impacts from economic growth, a prerequisite for sustainable development (Weizsäcker et al., 1997), seems to be a distant prospect as "incremental improvements in environmental regulatory policy typically have been over-ridden by the scale effects of increased production, consumption and resource use" (Angel and Rock, 2003, p. 4).

A typical example of this development is the Vietnamese beer industry with its rapid growth of production and consumption. The annual beer output grew from 8.7 million hl in 2002 to 17 million hl in 2006, an annual growth rate of 18%. The Ministry of Industry announced plans to double this output by the end of 2010 up to 35 million hl, and predicted a beer consumption of 28 l per capita, expecting it to double compared to the 2006 consumption of 15 l (cp. Mekong Securities, 2007; Datamonitor, 2008; Timberlake, 2010). This fast growth of the beer industry has been fostered by the Vietnamese government by privatising the biggest breweries prior to encouraging international brewing companies such as Carlsberg and Anheuser Busch to establish joint ventures as the Vietnamese laws do not allow for 100% foreign investment (Mekong Securities, 2007).

2.3. Beer: untapped economic and environmental potential in production

Beer was one of the first good whose production was mechanised during the industrial revolution. In comparison to pharmaceutical, petrochemical or other industrial products, brewing beer is usually not considered to be particularly harmful to the environment since it uses only natural ingredients – typically malt, barley, hops and water. However, a closer look at the environmental life cycle of beer reveals its environmental importance (Cordella et al., 2008; Narayanaswamy et al., 2005; Talve, 2001). By far the largest ecological impacts are caused by agricultural processes to produce the basic ingredients of beer. According to Talve (2001, p. 297, Table 3), the agricultural production contributes almost 80% to the total environmental impact of the beer life cycle, followed by transportation (~8%), production of auxiliaries (~6%), and beer production (~5%). From a life-cycle perspective, brewers are not the focal point for environmental improvement: "[…] beer production did not seem to be a problematic activity, consistent with the widely held opinion that breweries have to be considered as small energy consuming and less polluting companies in the industrial sector" (Cordella et al., 2008, p. 137).

Numerous life-cycle assessment (LCA) studies on beer production, however, conclude that certain aspects of beer production have a significant environmental impact, in particular in terms of energy consumption and the related environmental contribution to global warming. A weighted assessment of all environmental impacts by Talve (2001, p. 297, Table 3) shows that the global warming contribution (GWC) is the most important environmental impact of brewing, contributing to roughly one third of the overall life cycle's GWC. Given that other life-cycle steps are more important in general and energy use is the crucial issue for brewers, Cordella et al. (2008, p. 139) arrive at the following recommendations for environmental management measures of breweries:

- "monitoring, registering and analysing the input and the output streams of the brewery system;
- choosing carefully the suppliers, especially those of barley and glass bottle;
- improving energy saving policies;
- optimizing solutions for the product delivery;
- setting up marketing strategies in favour of reusable packaging rather than non-returnable ones".

This paper thus investigates the use of EMA for applying a CP methodology in optimising beer production. From a global perspective, beer consumption and production is decreasing in developed countries but increasing strongly in many developing

countries (Timberlake, 2010; Talve, 2001). This is why CP and the measurement of environmental impacts and related economic effects are of major relevance for the beer production in developing countries with a high growth in beer production, and often with shortages of electric power, water, and raw materials.

3. Research approach

The analysis conducted in Section 4 is based on the results of a four-year case study research project on environmental management accounting in Southeast Asian small and medium-sized companies. Beside their wide-spread application for teaching purposes, case studies have become quite common in management accounting research in general (Ryan et al., 2002) and in EMA research in particular (e.g. Burritt, 2004).

This case study based project investigated the applicability of EMA tools for management decision making and accountability by different groups of management, and in different organisations. Based on the EMA framework (Burritt et al., 2002) the project analysed the process of establishing environmental information management with EMA tools. In total 16 in-depth company case studies were conducted in Indonesia, the Philippines, Thailand and Vietnam. These case studies were designed to contribute to a comparative research (Yin, 2009) analysing decision-making situations and potentials for EMA implementation in businesses in developing countries. In addition, factors influencing the application of EMA tools were analysed. Thus this case study of the Vietnamese beer brewer *Sai Gon Beer* dealt with here, is embedded in a broader context of exploring different decision situations. Given the higher proportion of energy and material costs (due to lower labour costs compared to industrialised countries) to the overall costs in Vietnamese settings, it was expected that applying CP is likely to result in relatively high economic and environmental performance improvement.

The case study research design was chosen to better understand complex decision-making processes and contexts and to examine and explain their outcomes. This case-orientated approach analyses the specific types of environmental data which managers of various business functions may need when making decisions in different decision situations.

Based on the EMA framework the specific decision-making context of the company was analysed to identify the most suitable EMA tool(s). This was done by asking company managers about their decision situations and information needs. The managers were not aware of the EMA framework until the case study was finalised. Rather than elaborating on the usefulness of specific EMA methods for various businesses, the research approaches EMA by focussing on the needs and the specific decision situations company managers face. This approach helps explore current practice, increase the benefit of EMA for management and meet the reality of management accounting, where internal decisions about varied and rather different issues have to be prepared, assessed, and made independent of predefined systems or standardised tools.

To capture a wide range of phenomena and for the purpose of data triangulation, the study drew from multiple data sources including:

- a large spectrum of contact persons (environmental, production, and financial managers, accountants, representatives from environmental and industry associations such as, for instance, chambers of commerce);
- a variety of research methods (direct observation, documentation, archival records, interviews, and questionnaires);
- different groupings of researchers (interviewing and observing in pairs) and
- various cases within and between sectors (e.g. electroplating, food, paper and pulp, etc.).

The case studies were conducted with the help of so-called 'local resource persons' who were involved in conducting the case studies to promote EMA in Southeast Asia. These were mainly environmental management and engineering consultants as well as trainers multiplying EMA knowledge and experience they gained from the case studies. The following case study of *Sai Gon Beer* illustrates the EMA approach to identify CP potentials in beer brewing, its strengths and weaknesses.

4. Applying EMA for CP

4.1. The case of Sai Gon Beer

Sai Gon Beer was established as an equity joint venture of one of the largest and former state-owned brewing companies and a newly privatised Vietnamese import–export company, with a total capital investment of roughly € 5 million. The joint venture company started its production of bottled and barrelled beer in 1999. Employing some 200 people, the brewery has increased beer output year by year up to almost 200,000 hl/a, with plans to grow further. This required the construction of an additional brewing facility which was in planning when the case study was conducted.

The management considers *Sai Gon Beer* to be an "environmental flagship company" of central Vietnam. The company uses state-of-the-art brewing equipment and has implemented an environmental management system which led to proper waste separation, recycling of broken bottles and other materials, wastewater treatment, etc. Consequently, *Sai Gon Beer* was certified in accordance with ISO 9001 and ISO 14001 and does not face any legal penalties relating to environmental issues. It has won several Vietnamese quality awards for its products. Furthermore, as stated in its environmental management report, the company is motivated to reduce its environmental impacts such as the use of water, energy consumption, noise, dust, and pollutants in effluent wastewater.

The production facilities of *Sai Gon Beer* were constructed in 1998. Almost the entire brewing equipment was imported from German suppliers and installed by a German engineering company. Beer is filled in bottles and kegs and delivered to retailers with a small portion going to large customers such as restaurants in the Tuy Hoa province. The company operates a return system for bottles and kegs, i.e. empty bottles and kegs are collected, sorted and washed.

The main production steps include grinding (of malt and rice), brewing, fermentation, filtration and storage, and keg and bottle filling. All steps include various detail processes and activities. Unlike most European and North American breweries, *Sai Gon Beer* uses rice instead of barley as one of the main beer ingredients. Important supply or utility processes from an environmental point of view include chilling, air compressing, heat supply (boiler), and wastewater treatment. These activities require facilities and devices such as the office building, the air conditioning system of the factory building, etc.

4.2. In-plant assessment

As a first impression of its economic performance, *Sai Gon Beer* provided the budgeted and the actual figures for sales and net profit (Table 1). While the company met its sales targets, it failed to meet the net profit target. The accounting department identified the main culprit: higher than expected operational expenses on raw materials and energy.

Table 1
Sai Gon Beer sales and profit.

Sai Gon Beer	Budget figure	Actual figure	Actual performance relative to target
Sales	200,000 hl	203,000 hl	101.5%
Sales	7,250,000 €	7,299,100 €	100.7%
Net profit before taxes	475,600 €	180,000 €	37.8%

Given *Sai Gon Beer*'s ISO 9001 and ISO 14001 certification, its quality awards, and its up-to-date equipment, a state-of-the-art brewery was to be expected. The production manager, though, was alarmed by international benchmark figures for electricity and water consumption of beer brewing as he noticed that the company was performing poorly. In fact, he observed that the total water and energy demand per unit beer produced was at least twice as high as the international benchmark figures. Hence, to get a better idea of the drivers of energy and water consumption and to develop improvement options, the production manager emphasised his interest in applying EMA. Interestingly, the manager had a focus on the improvement of physical performance, anticipating that this would also positively affect financial performance. Furthermore, both the production the environmental managers were keen to link these physical performance issues to environmental management activities, to support continual improvement as required by their environmental management system. Both managers showed a strong interest in monitoring performance on a regular basis and gathering ideas for the new plant, which was being planned.

The analysis of the decision situation based on the EMA framework (Fig. 1) showed that the managers searched for information that:

- is generated routinely (to monitor improvements in performance);
- relates to the past (consumption of previous month, year, etc.);
- takes a short term perspective (monthly or at least on an annual basis) and
- is measured in physical units.

The decision-making situation is therefore linked to Box 9 of the EMA framework (cp. Fig. 1) and, in part, to Box 1 of Fig. 1 as any improvement in energy and water efficiency has regular financial consequences period by period. Taking the plans for a new plant into consideration, a long term, future-oriented perspective was also considered relevant for *Sai Gon Beer*'s long-term decision making (Boxes 8 and 16 of the EMA framework in Fig. 1). Although these decision situations were stated clearly by the managers, they nevertheless focused on current plant performance. As a matter of course, any conclusions drawn from the assessment of current operations would be included in the planning process for the new plant (Boxes 6 and 14 in Fig. 1).

To fulfil the environmental and production managers' need for information and to obtain a better understanding of *Sai Gon Beer*'s operations in general as well as the drivers of environmental performance in particular, a material and energy flow accounting (MEFA) system (Fig. 1, Box 9) was agreed upon.

MEFA is a physical accounting approach (e.g. Jasch, 2009; Burritt et al., 2002) which allows creating material and energy balances. It serves to calculate consumption and production figures and is thus also an essential basis for costing, while also being useful for dimensioning and designing facilities and equipment (e.g. Schmidt, 2010; Schaltegger and Burritt, 2000). Especially with increasing production costs resulting from rising resource prices, the inefficient use of materials often causes hidden costs which can easily account for 10–15% of the total economic value of produced goods (Schmidt, 2010). Applying MEFA helps to bridge between engineering and economics and to systematically identify and realise economic and environmental benefits. It is therefore not surprising that MEFA has developed as an important basis for economic and ecological assessments alike in many areas of business (For an overview on MEFA and its current status of research, see Ayes, 2010; Jasch, 2009; Prasad and Calis, 1999). In production logistics for example, it serves as the basis for planning production facilities or for improving manufacturing cycles.

The MEFA system at *Sai Gon Beer* was linked to financial performance (Fig. 1, Box 1) and assessed in terms of options for improvement (Fig. 1, Boxes 8 and 16). The database required for establishing material and energy flow accounting was comparatively good; i.e. most data was available, but scattered among different sources. The accounting, environmental management, quality management, and engineering/production departments all contributed some data.

Thus, the following main production steps were considered for the MEFA (Fig. 2):

- grinding (or milling) – malt and rice are crushed into smaller pieces;
- brewing – the grist (ground material) is mashed (mixed with water), heated up and mixed with hop in kettles, and finally cooled down. A by-product generated during brewing is trub, which can be used as farmland fertiliser;
- fermentation – yeast is added to convert sugars into alcohol in order to produce unfiltered (also called young or green) beer;
- filtration and storage – fermentation continues at slow speed and low temperatures to remove undesired compounds. The beer is then filtered through diatomaceous earth to take out yeast and other leftovers;
- bottling – beer is mainly bottled into 33 cl bottles. This step also includes pasteurisation of filled beer bottles and cleaning of returned bottles and
- barrelling – beer is filled into kegs (barrels) of various sizes, e.g. 30 l, 50 l, and 100 l.

In addition to these production steps, several supply processes were identified as relevant:

- steam supply – fuel oil is burned in a boiler to generate steam;
- air supply – an air compressor run by electric energy provides the required air pressure;
- chiller – electric energy is used to provide cooling for several production steps;
- wastewater treatment – all wastewater is collected and treated bio-mechanically before being disposed of into the public sewage system and
- other facilities – this includes the electricity demand of offices, the factory building air conditioning and other overhead electricity consumption.

For all of the above processes, input–output tables were created listing the inputs of energy (electricity, steam, compressed air, cooling), water, raw materials, and intermediates as well as outputs of intermediates, products, solid wastes, wastewater, and other items. Input–output tables covered a period of six months, but were averaged to one month to assist comparison. Finally, inputs and outputs of each process were mapped onto a production flowchart using Sankey diagrams which enabled the depiction of flows in terms of physical proportionality (cp. Schmidt, 2008).

Fig. 2 depicts the average monthly material and energy flows of *Sai Gon Beer*. The supply process of wastewater treatment was not considered since its energy demand is negligible and the bio-

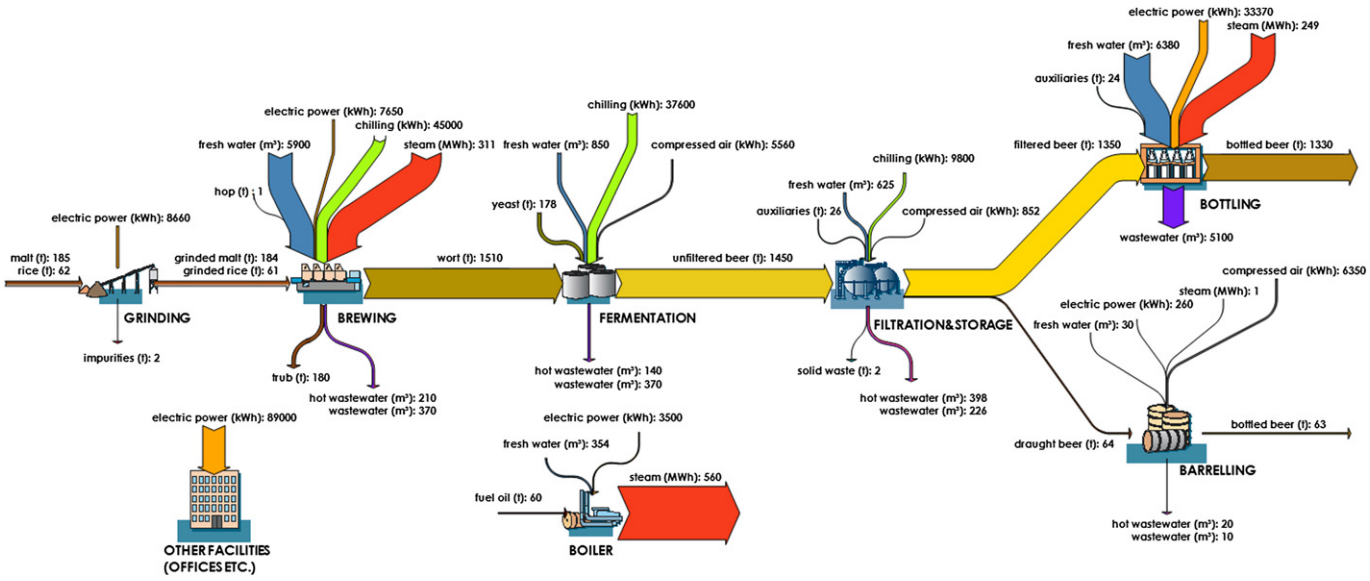

Fig. 2. Sai Gon Beer material and energy flowchart (monthly average).

mechanical treatment processes fulfil all legal requirements for wastewater treatment. The main input to the chiller and the air compressor is electric energy. The electricity demands of air compressors and chillers were allocated to the various production steps, neglecting any inefficiency within the devices as the electricity consumption of those devices was known, but not the distribution to the production steps. The distribution was estimated on the basis of the appliances' nominal power consumption.

All mass flows (in metric tonnes) are depicted proportionally, i.e. the width of a flow of two tonnes is exactly twice the width of a flow of one tonne. Accordingly, this applies for volume flows (in m^3). For energy flows an exception is made. The flows for steam (in MWh) are not proportional to all other energy flows (in kWh) because the magnitude of the steam flows would otherwise graphically dominate all other flows.

The overall relevance of steam for the energy-related environmental performance is highlighted in Figs. 3 and 4. Fig. 3 depicts the total energy demand of all production steps and other facilities while Fig. 4 shows the resulting Global Warming Contribution (GWC) for each of these steps. The GWC was calculated based on the following conversion factors:

- the GWP for electricity is 0.7 kg CO_2-equivalent per kWh. This value was computed on the basis of the Vietnamese electricity mix (roughly 50% hydro and 50% fossil fuel power, cp. EIA, 2007) using Ecoinvent data sets (SCLCI, 2010) and
- the GWP for fuel oil is 3.15 kg CO_2-eq. per kg (ibid.), i.e. 0.34 kg CO_2-eq. per kWh of steam at *Sai Gon Beer*.

Physical information assumed the main interest of *Sai Gon Beer*'s production and environmental managers, while the direct financial implications were given a slightly lower priority.

According to the information provided by the accounting department, purchasing costs were 1000 VND/kWh of electric energy, 3400 VND/kg of fuel oil and 3500 VND/m^3 of freshwater (VND 20,000 equalled about € 1 at the time the case study was conducted). Fig. 5 presents a Sankey diagram of purchasing costs and aggregated costs. The unit price for chilling and compressed air was assumed to be the same as for electric energy.

Fig. 5 depicts the total energy and water costs, summing up to roughly VND 500 million (€ 25,000) per month or VND 6 billion (€ 300,000) per year. This makes up 'mere' 4% of total sales and had therefore not been of highest importance for decision making in the past. It should be noted though that by far the largest portion of production costs cannot be affected by management action. For

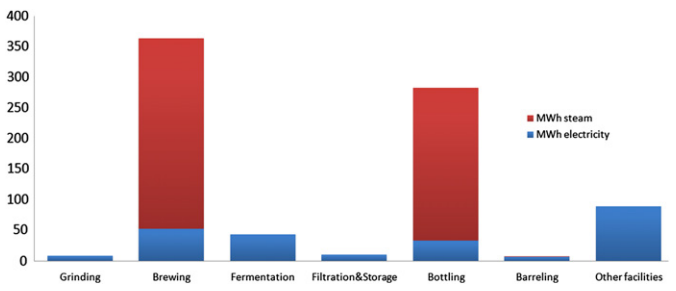

Fig. 3. Sai Gon Beer energy breakdown.

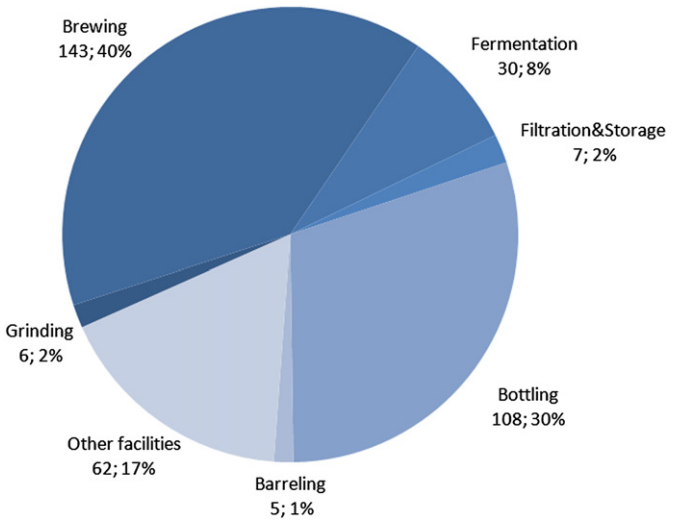

Fig. 4. Sai Gon Beer GWC breakdown (tonnes of CO_2-equivalent; % of total).

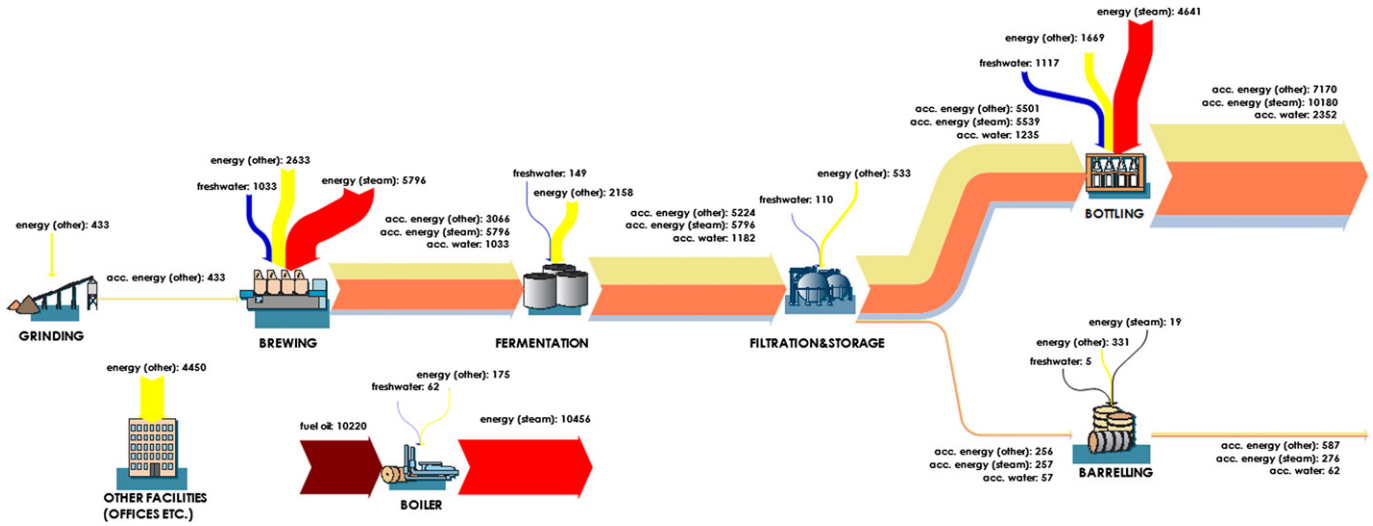

Fig. 5. Sai Gon Beer energy and water costs in € (monthly average).

instance, the options for reducing raw material purchase costs are very limited as solid waste and other by-products have already been reduced to a minimum (cp. Fig. 2).

The relevance of energy and water costs can be further highlighted by comparing them with labour costs. In rough terms, the total of monthly energy and water costs equals the monthly labour costs of 100 full time employees, half of *Sai Gon Beer*'s total work force.

4.3. Analysing CP potentials

Sai Gon Beer's production manager was alarmed by benchmark figures of other breweries. For instance, Jever, a medium-sized Germany brewery reported its relative energy and water consumption in its 2004 environmental report (Jever, 2004, p. 17). Fig. 6 compares these indicators to Sai Gon Beer's indicators derived from Fig. 2. This benchmark revealed that the demand for electric energy and water per hl of beer was about twice the demand of the German brewery. Due to the differences in climate (tropical vs. moderate) and technology this comparison with the German brewery is not necessarily a reliable benchmark, but nevertheless serves as a first orientation.

The MEFA results astonished the company's manager in another respect, too. The management had not expected the bottling step to be the major consumer of freshwater (cp. Fig. 2) and the second largest consumer of energy (cp. Fig. 3). Once known, an explanation for the high energy and water demand in this step was found: bottling includes the washing of returned bottles, which takes place in several steps using different water temperatures and detergents. The heating of water for washing consumes a huge amount of thermal energy and the water demand for washing turned out to be crucial, too. The benchmark in Fig. 6, which includes indicators for *Sai Gon Beer* and excludes the bottling step, highlights the relevance of this step for the overall energy and water efficiency. Water and energy efficiency are the relevant categories of eco-efficiency for *Sai Gon Beer* (for a general introduction to accounting for eco-efficiency see e.g. Schaltegger, 2002). Calculating these KPIs supports the management in focussing on simultaneous reductions of costs as well as water and energy consumption. In terms of electric energy, *Sai Gon Beer* remains behind the benchmark even if the bottling step is excluded.

Beside bottle washing, heat losses were identified as important energy consumption drivers. Given the high ambient temperatures of a sub-tropical setting, cooling processes and storage of cooled beer require special attention. The chilling demand of brewing, fermentation, filtration and storage accounts for almost 40% of the total electricity consumption (cp. Fig. 2). Another third of the total electricity consumption is driven by office and production buildings

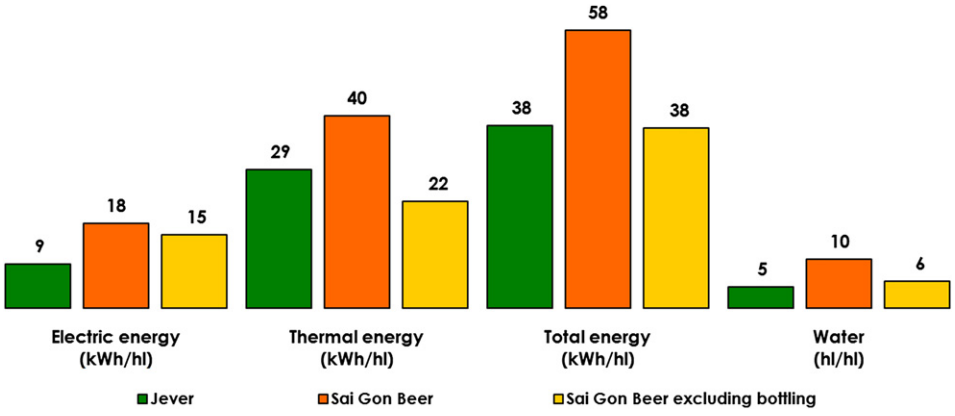

Fig. 6. Energy and water benchmark.

as well as other overhead electricity demand (Fig. 5), most of it resulting from air conditioning. Thus, as a substantial difference to the German beer brewery *Jever*, two-thirds of the total electricity consumption resulted from the provision of cooling energy.

Including energy and water costs into the EMA assessment supports the findings of the previously applied MEFA. Brewing and bottling are the most intensive production steps in terms of energy and water costs. Yet, reducing overall costs requires that the efficiency of these production steps and the steam supply is improved. Thus, as a next step, the air compressors and chilling units of *Sai Gon Beer* were analysed in detail to identify further CP improvement potentials.

The material and energy flow analysis including energy and water costs allows for comparing bottled and draught beer. Table 2 is derived from Figs. 2, 4, and 5 and highlights the environmental advantage of draught beer in comparison with bottled beer. The different energy sources explain the fact that energy and water costs of draught beer are nevertheless not much lower than those of bottled beer. Bottled beer requires comparably more thermal energy (steam) per hl while draught beer consumes greater quantities of electric energy, which is more expensive. In any case, comparison supports the conclusion of an Italian LCA study on lager beer: "From the previous analysis it turned out that the most effective actions to reduce the environmental burdens of the beer life cycles have to be promoted in the consumption phase, preferring draught beer to bottled one […]" (Cordella et al., 2008, p. 138).

4.4. Identifying CP improvement options

Based on the information obtained with the material and energy flow assessment, several CP improvement options were discussed and presented to *Sai Gon Beer*'s top management:

- The assessment revealed that a *cascade water recycling system* could be installed to reduce the water and energy consumption in bottling. For each of the four separate washing steps, freshwater had to be drawn from the tap, heated up with steam or electric energy, and discharged to the wastewater plant. A cascade system would only use freshwater for the final washing step and reuse the lightly polluted wastewater of this step as water input to the second last washing step. The wastewater from that second last washing step would serve as input for the third last step and so on. Such a cascade system would reduce freshwater, wastewater and steam demand substantially.
- A large energy saving potential was identified in the proper in*sulation of pipes and tanks*, in particular where large temperature differences exist. For instance, several large beer tanks were situated outside in the tropical atmosphere and exposed to direct sunlight, while the beer inside these tanks had to be kept at a temperature below 2 °C. Installing a sun shades over these tanks and improving the tank insulation were calculated to be profitable and energy saving.
- The bulk of the energy consumption was caused by auxiliary processes, in particular the oil-fired boiler, air compressors, and the chilling devices. As a consequence, the efficiency of these processes was examined closely, including one-off measurements. The boiler, for instance, could use *exhaust heat for preheating of water* instead of using electric energy. Furthermore, the water needed for the steam generation could be *preheated by solar power*, e.g. by simply using a black hose on the roof of the production facility.
- The aggregated EMA information showed that office buildings consumed a considerable amount of energy. Thus, the use of *heat exchangers* was evaluated for several processes in the brewing step and could also be used to reduce the loss of thermal energy of air conditioners by using the cool exhaust air leaving the office and production buildings to pre-cool the incoming air.
- The results of the EMA based analysis of CP potentials showed that the *environmental management system* could be improved by including more *ambitious and specific indicator based targets* on energy and water consumption. Targets such as the annual 0.5% reduction of energy consumption per unit of product were replaced by more ambitious ones.

Table 2
Comparison of the relative resource consumption of bottled and draught beer at *Sai Gon Beer*.

Product	CO_2-eq. (kg/hl)	Water (hl/hl)	Costs (VND/hl)	Total energy (kWh/hl)
Bottled beer	8.16	4.80	29,600	21.23
Draught beer	7.89	0.48	29,400	12.08
Ratio bottled to draught	3.4%	907.4%	0.9%	75.8%

As the top management was pleased with the recommendations it got interested in establishing EMA on a more regular basis to improve measurements. It furthermore considered including EMA as an assessment tool in the planning process of its new production plant. Based on these results, *Sai Gon Beer* commissioned a Japanese company to conduct a feasibility study for energy efficiency measures at its new plant. The commissioned company recommended the establishment of a so-called 'total energy management system' in combination with Cleaner Development Mechanism measures.

5. Towards more informed decisions for cleaner production

The take-home message of this case study on Sai Gon Beer is three-fold. Firstly, the case study provides an example that increasingly recognized voluntary corporate initiatives such as CP (Lozano, 2012) can be achieved more efficiently on the basis of relevant and robust information. EMA and the EMA framework can help to identify and create this kind of information. Secondly, the case study illustrates that EMA is understood, applicable and suitable to support CP also in a typical setting of a developing country. Thirdly and most importantly, very few case studies on EMA for CP exist for developing countries, compared to a relatively large number of case studies in industrialized countries. This imbalance might trick managers to believe that CP and EMA would be beneficial for industrialized countries only. However, as the case study illustrates, actually the opposite is true. The proportion of material and energy costs compared to labour cost as part of the total production costs is relatively much higher in developing countries than in industrialised countries (Hasanbeigi et al., 2012). The application of EMA for CP thus reveals much higher relative cost saving potentials in developing economies.

As the above case study shows, by using the EMA framework, managers were able to identify their information needs and choose the most powerful environmental information management tools in a systematic manner. More importantly, these tools not only serve to use information for various decision-making situations but also support the systematic identification and retrieval of such information.

This case study approach can be seen as a guiding example for introducing environmental data collection by firstly considering the decision situation on basis of the EMA framework. Once the most adequate EMA tools have been identified, applied and valuable information has been created, management may be motivated

to establish EMA on a more regular basis and to broaden the application of different EMA tools. For example *Sai Gon Beer* established a regular collection of environmental data (boxes 3 and 1 in Fig. 1) and applied an environmental investment appraisal and planning (boxes 14 and 16 in Fig. 1) for planning its new production plant.

The case study may be particularly revealing as for the promotion of CP in a company the most relevant research questions are 'how' and 'why' rather than requiring broad statistical analysis (cp. Eisenhardt, 1989; Yin, 2009). This is why this case study illuminates the application and implementation process of EMA as a tool for CP. The first units of analysis are the company specific management decision situations, which can vary substantially, depending on the company's physical context (e.g. tropical vs. moderate climate), the type of management activity (investment, operational production activity, *ex post* assessment of a project, etc.), the management level (top management, middle management, etc.), the department in charge (accounting, finance, production, environment, etc.), the time frame, and the risk attitude.

This case study is based on *Sai Gon Beer*'s written records, personal onsite-inspection, and oral information provided by the environmental, production and accounting departments. Data obtained was compared with figures available in several publications on brewing referenced throughout this study. Based on these publications the order of magnitude and the general direction of the results derived from the data available can be considered as reliable. However, the overall completeness and data quality of the EMA application can only be classified as medium. In particular, the breakdown of material and energy flows to production and supply processes is based on qualified estimates and computations by production managers and engineers. Actual measurements, as planned by management after they realised the CP potential, could be carried out to improve the reliability of information.

Applying EMA at *Sai Gon Beer* has helped the production, environmental and accounting departments to identify drivers of environmental performance and related costs. The management was surprised to find out that certain steps in the production process such as bottle filling and bottle washing were amongst the major drivers of water and energy consumption and thus environmentally induced costs. As the existing environmental management system did not break down the physical inputs and outputs to single production steps and supply processes, this fact had been overlooked prior to conducting the EMA analysis. A cascade water recycling system and several others environmental improvements were identified which would easily exceed the environmental goals of *Sai Gon Beer* stated in its environmental reports. Thus, the case study shows that the introduction of EMA can create benefits for environmental management systems by providing a detailed information basis for target setting, planning of improvement measures, and performance monitoring.

The application of EMA at *Sai Gon Beer* comprised basic MEFA and the breakdown of related energy and water costs. Albeit elementary, the analysis led to the identification of several improvement options and made the top management rethink its environmental targets and establish EMA on a more regular basis. This case study thus confirms the experiences of Jasch (2006, 2009) and Onishi et al. (2008) in introducing MEFA and highlights the relevance of EMA also for beer brewing in developing countries. EMA shows particular importance of the MEFA approach, which enables managers and engineers to break down relevant physical information to separate production steps and supply processes. EMA can help to meet the accounting criteria of materiality, i.e. it helps to focus on 'hot-spots' – those steps and processes with the highest potential for improvement and the greatest impact on overall (environmental) performance. This can be done in four major steps. The initial step (i) consists of inspecting material and energy flows and is followed by (ii) identifying the decision situation when investigating material and energy flows. Based on the relevant decision situation identified, (iii) a corresponding information management tool from the EMA framework can be chosen and applied to obtain the relevant information to (iv) support informed decisions when applying CP. This structured information acquisition process supports the implementation of CP in a systematic manner.

The case study highlights the importance of considering both, production processes and auxiliary processes. Most of the energy required at *Sai Gon Beer* is related to steam production, a central boiler, chilling and refrigerating units, as well as compressors.

Overall, the application of EMA at *Sai Gon Beer* supports the findings of earlier studies dealing with beer production in developed countries and the beer life cycle: "At the process level, improving the energy and material use efficiency of energy intensive equipment could enhance efficiency of production and processing. There is a clear need to expand the focus of the past and existing cleaner production efforts, which were mainly focussing on solid waste and dust control towards enhancing energy and resource use efficiency" (Narayanaswamy et al., 2005, pp. 15–16). Given the strong growth rates of the food industry and beer production in developing countries the more wide-spread application of EMA could foster CP where it is needed most.

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Accounting for sustainable organisations: where is the accountant and why it matters?

Dimitar Zvezdov[1]

Abstract

Sustainability Accounting has been observed to be gaining relevance for corporate performance. This has been reflected both by the critical and the managerial schools of sustainability accounting – both with their interpretations of the impact of the accounting profession on successful sustainability accounting. Yet, both schools appear to focus on the technical abilities of accountants and to neglect a more essential component of the accountant's function in organisations.

The following paper investigates the role of the accountant from a promotor theory viewpoint. By using recent studies on the involvement of the accountant in sustainability accounting, it investigates the reasons that explain the insufficient involvement of accounting professionals and suggests why such is necessary.

The results suggest that the involvement of the accountant is essential. However, as the paper argues, it is not his technical expertise that makes him essential for supporting sustainability accounting but his role as gatekeeper of sustainability-related information in organisations.

1. Why is the accounting professional's support needed for corporate sustainability?

In recent years, the accounting profession has seen significant development in regard to tackling sustainability issues (Schaltegger 2011). Although many calls for engaging accountants in corporate sustainability management have been made, their ability has been questioned (e.g. Gray 1990, Gray 1995).

The change in accounting systems (e.g. Gray 1990), accounting education (e.g. Bebbington 1997), accounting thinking that has been called for has not been observed to have taken place. Is this because companies are not willing to (e.g. Gray 1990), since it is not worth it (Freedman 1970) or since accountants do not think beyond their accounting pragmatism (Gray 1990)? Does the accounting profession need to support the process and is it in a position to do so?

Whereas numerous publications observe the above challenges from a system perspective (Gray 1990; Gray 1995), the following contribution focuses on the people – whether accountants or not – who can contribute to disturbing the current balance of accounting customs, rules and thinking towards more sustainable business.

In order to do this, the analysis starts with an investigation of the barriers – willingness to support change and ability to do so. In order to overcome these barriers, two types of key people are identified – those who can support the transition process with their power and those who can support it with their professional competence.

This conceptual paper thus arrives at the conclusion that accountants need to be involved in corporate sustainability accounting. The argumentation goes on to argue that this involvement is necessary due to the accountant's role as information gatekeepers and less so for their professional expertise.

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The next Section presents the research question by giving an overview of a) the discussion on the above issues and b) the current status of the discussion. Section 3 builds upon the Promotor Theory to arrive at the conclusion that the accounting profession is essential for establishing corporate sustainability management for reasons other than those that can be expected. Finally, a set of hypotheses is presented in Section 4.

2. The role of the promotor

Corporate sustainability management has been developing rapidly for the past two decades (Schaltegger/Burritt 2005). This can be observed by the number of publications – both scientific and practice-orientated. The role and the contribution of the accounting profession have been discussed widely in the context of the sustainability transition. One of the very first publications that focus on this problem – The Greening of Accountancy (Gray 1990) – raises a few concerns in regard to the extent to which accountants need to be involved. The main reason for this concern is, however, that "accountants probably [...] underrate their talents with information systems and evidence, as well as our potential communication, integrity, independence, etc." (Gray 1990, p. 2). This statement obviously rests on the presumption that accountants are especially talented in these areas and ultimately, that this talent is what makes the accountant professional particularly needed for this challenge. Several empirical studies also focus on this (obtained) talent (e.g. Gray 1995; CICA 1993; Zvezdov et al. 2011; Bennett et al. 2011) to argue in favor of the need to engage sustainability accountants in corporate sustainability management.
Another concern raised in regard to accounting and corporate sustainability is the need for environmental and social aspects of business to be given priority (e.g. Schaltegger & Sturm 1992; Gray 1990, Hyrslova 2006). Giving priority has been defined in various ways, with various arguments ranging from ethical considerations (Mathews 1995, Reynolds & Mathews 2000) to the business case for sustainability (e.g. Schaltegger & Wagner 2006, Lohmann 2009). However, giving priority is hardly sufficient – as two question marks appear:

- How is this priority to be translated into action? A way to use the accountant's expertise seems necessary, as so far accountants have not been trained to tackle sustainability issues.
- How to implement any changes, given the strong change resistance of various actors, from top management to lower management?

In order for sustainability accounting to take place, its barriers need to be identified. This has been done by several authors to date (Burritt 2004, Scavone 2006). However, related research has focused on the content of the accounting itself and are thus hardly related to the above two challenges.

3. Barriers to sustainability accounting

Rather than exploring the drivers of corporate sustainability accounting, I focus on the two barriers postulated by the Promotor Theory. I use the term barriers as opposed to challenge, obstacle or impediment to highlight the fact that they can be overcome. The Promotor Theory (Witte 1973) focuses on two sets of barriers: those related to the willingness of the actors to change and those related to their competence (or ability) to contribute to the change. In the context of accounting the two sets of barriers can be briefly analysed in detail, before proceeding with the approaches to overcoming these barriers and – ultimately – relating back to sustainability accounting.

The willingness barriers identified in regard to the adoption and implementation of sustainability accounting have not been subject to an extensive discussion. Yet, a few authors have called for a major transition. With some exceptions, the lack of willingness to support (or even lead such a transition) sustainability accounting has been attributed to accounting professionals. The reasons have been identified to be of various nature: from limited adaptability (or need to adapt) to too company-specific processes and objectives (e.g. Gray 1990). In other words, accountants are trained to deal with the same set and type of numbers independent of whether they work for a small not-for-profit organisation or a Fortune 500 company. Thus, they tend to avoid company-specific situations and focus on generic methods and tools of accountancy, although these might not be in the best interest of the company at all times.

So what is it that prevents the accountant from cooperating and collaborating on tackling sustainability issues? It can be argued that it is a two-fold reason. On the generic side of the problem is the issue that departments do not want to be told by other departments what they should do (Abraham & Reddy 2010; Chimhanzi 2004; Kahn 1996). On the specific case is the accountant's image of someone whose language is not understandable and whose activities are not related to the one of other departments and functions (Schaltegger et al. 2010).

Accountant can thus be told to be the gate keepers of sustainability information in organisation. Corporate governance depends upon "gatekeepers" to protect the interests of investors and shareholders by monitoring the behaviour of corporate "insiders" and by reporting the financial results of corporate performance in an accurate and unbiased fashion that permits objective valuation of the firm. Although a well-known theoretical model posits that the gatekeeper is a reputational intermediary who will strive diligently to preserve its credibility (Kraakman 1989, Cox 2006).

On the other hand, the ability or technology required to address sustainability challenges by accounting have been largely discussed. And whereas this point has been central to the discussion, it seems to play less of a role. Hauschildt & Gemünden (1999) argue that technology promotors' interest for a process does not need to coincide with their routine tasks – their interest can be the result of personal interest or inclination towards a certain topic. It can be argued that it is the various other positions that are the technological promoters of sustainability accounting in organisations, therefore the accountant's role as technology promotor is not required at this stage. Similarly, the sustainability report of a company has not been prepared by the financial reporting team but rather often by communications or PR departments.

4. A process towards sustainability accounting: the role of promotors

Witte (1973) borrowed the term promotor from Latin to refer to the people who actively and continually boost a given innovation process. His model was based on the assumption that overcoming barriers energy needs to be input (Knight 1967, Lewin 1961).

Considering sustainability accounting (Milne 1996; Jasch 2006) as an evolution to conventional managerial accounting practice, the process of evolution needs to be boosted by various actors. Whereas accountants have been seen in this role for their expertise, several studies have revealed a minor involvement of the accounting professional in sustainability accounting. Instead, various other people such as sustainability managers, middle managers, etc. have been observed to be doing the sustainability accounting in organisations (Bennett et al. 2011). Thus, accountants have not been considered in the position of a technology promotor, i.e. those contributing to adopting and implementing sustainability accounting by means of their expertise. Interesting this is hardly necessary.

Albeit of a more scarce volume, there have also been publications on the need for managers to recognise the benefits of accounting and thus strive for integrating it into their sustainability management (Schaltegger & Burritt 2010). In a way, managers have been considered the so-called power promotors (Hauschildt & Gemünden 1999) of sustainability, i.e. the people who – by means of authority and power –

support and boost the implementation of or the transition to sustainability accounting. However, the role of accountants as power promoters seems to have been neglected to date.

As a result of the above analysis, two key hypotheses can be deduced:

H1: Accountant's involvement is essential for a successful adoption, implementation or transition to corporate sustainability management. This argument, albeit intuitive, rests on the above argumentation that the process needs to be supported by those who are traditionally in charge of accounting, i.e. accounting professionals. Whereas various studies (e.g. Bennett/Schaltegger/Zvezdov 2011; Schaltegger/Zvezdov 2011) reveal that other functions such as sustainability or middle managers are in charge of sustainability accounting, these studies do not focus on the importance of the accounting professionals. Since, they argue, the accounting professions is a set of skills that can be gained, these skills can also be learned and applied by other functions with sufficient interest in the issues dealt with. However, these studies appear to neglect the role (i.e. the power) of accountants in corporate governance. Thus, it is not necessarily accountants who develop the sustainability equivalent to the complex ROI model, as accountants lack expertise in what constitutes good sustainability performance (cf. Schaltegger & Burritt 2000)

H2: The accountant's function as gatekeeper is likely to be more important than his expertise with numbers. The few exceptions (Coffee 2001) the gatekeeping function of the accountant has hardly been attention to research. On the contrary, a few studies identify the necessity to involve management accountants in various emerging areas (such as sustainability management) precisely for their technical expertise (Wilmshurst & Frost 2001; Davey & Coombes 1996). Yet, as the above argumentation shows, it is likely that the accountant's role in corporate governance raises the more essential need to engage accountants in sustainability accountaing rather than their abilities, acquired during studies, training, etc.

5. Discussion

Whereas there seems to be no doubt that accounting expertise can provide decisive support in tackling corporate sustainability challenges, the most essential reasons for engaging accounting professionals in sustainability accounting appear to be falsely understood. Thus, the essential difference highlighted by this paper helps engage accountants in a way that effectively contributes to improving sustainability accounting practice.

Although this paper arrives at the same conclusion with regard to the importance of accounting professionals in the process of establishing corporate sustainability management, the reasons for this importance differ from those identified in previous research. This is particularly important for engaging accountants in a way that secures the effective transition to a sustainability accounting.

As opposed to previous attempts to conceptualise the role of the accounting professional in corporate sustainability accounting, the reasons identified here suggest that it is the gate-keeping function (Coffee 2006; Kraakman 1986) of accountants that is the true grounds on which their involvement needs to be considered.

The immediate implications for further research include the need to operationalize and test the above hypotheses. The question of how accountants can contribute to sustainability accounting needs to be tackled extensively in future research on both management accounting practice and sustainability management. If the above hypotheses can be supported by empirical evidence, considerable amount of corporate resources can be saved in an attempt to emphasise the technical expertise of accountants while underestimating their gatekeeping function.

The implications for practitioners are two-fold. On the one hand, sustainability accounting projects should seek to engage the sustainability accountant primarily for his gatekeeping role and less so for his technical ability. On the other hands, accountants can contribute significantly by not focusing on their ability to play with numbers but on their contacts with other departments, reputation, etc.

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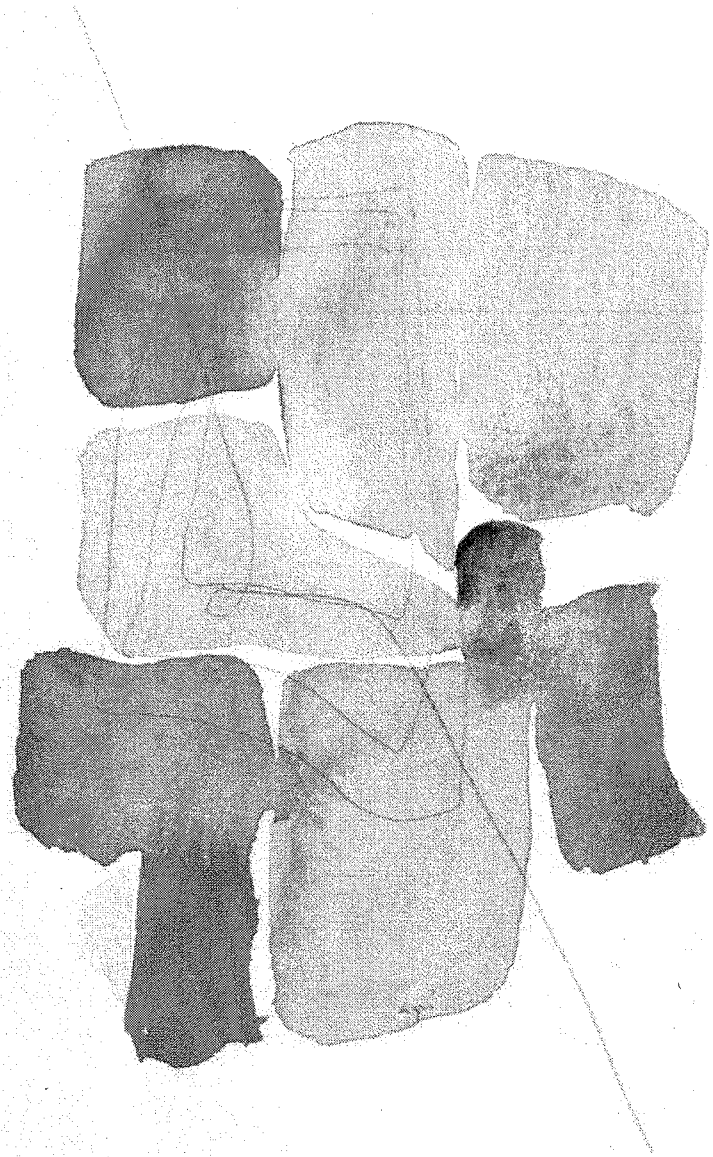
W. Pillmann, S. Schade and P. Smits (Eds.)



Part 2

USB-Stick Version

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Rolling out Corporate Sustainability Accounting: A Set of Challenges

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ABSTRACT: The benefits of improving corporate environmental and social performance have been addressed by an increasing number of companies in the past two decades. However, not all companies have been interested in the topic since it first came up. Thus, companies' attempts to quantify sustainability performance typically start with a qualitative understanding of the impacts of the environment and society on corporate economic performance and vice versa. At the forefront of corporate sustainability accounting practice, research has highlighted the attempt of various companies to expand and transform sustainability information collection practices into regular, day-to-day activities known as sustainability accounting. However, this step – referred to as roll out – is related to various obstacles that hinder its success.

The following conceptual paper identifies the obstacles in the roll-out process and suggests an approach to deal with them. Based on various studies in the field, the developed approach presents typical challenges and highlights their significance for the success of the roll out of corporate sustainability accounting. The contribution of the paper lies in the identification of decision-situations which – albeit essential for the success of the roll out – appear to be neglected by many decision makers, often with undesired consequences.

The novelty of the findings can support higher and middle management in their transition from small-scale, project-based collection, analysis and provision of decision-making information to a company-wide, self-sustaining management accounting system that integrates social and environmental impacts of and upon business. This transition can contribute to the long-term success of the enterprise and reduce its externalities on environment and society

KEYWORDS
Sustainability accounting, Information management, Decision making information, Challenge, Roll-out process

I. SUSTAINABILITY ACCOUNTING: A DRIVER FOR SUSTAINABILITY MANAGEMENT

Apart from being a topical issue in various fields of research (e.g., Schaltegger, Gibassier, and Zvezdov), corporate sustainability has been gaining importance in practice, too (e.g., Ernst & Young; BCG). Numerous recent studies reveal that companies seem to have realised the contribution of tackling sustainability issues toward their long-term success (e.g., Schaltegger and Wagner;

Schaltegger, Bennett, and Burritt). Yet, corporate sustainability management poses various challenges to decision makers, in developing an understanding of the linkages between sustainability management and financial performance (e.g., Schaltegger and Wagner). Furthermore, a successful corporate management would not only need to understand these linkages but also to be able to create new ones. This is where corporate sustainability accounting can provide decisive support.

The discipline has been maturing and enjoying a growing attention from researchers and practitioners alike (Parker; Schaltegger, Gibassier, and Zvezdov). Alongside this development several focuses of research have been observed: The oldest theme appears to have been looking into the business case for sustainability (e.g., Schaltegger and Sturm; Klassen and McLaughlin; Dyllick and Hockerts). The foundation of this research stream lies in the paradigm that striving for corporate sustainability is worth beyond pure financial performance and in the overall interest of the company. A later sub-stream of sustainability accounting publications has focused on the increasing recognition of the business case for sustainability (e.g., Porter and van der Linde; Schaltegger and Wagner). These publications give mostly empirical answers to the question of whether corporate sustainability management has been able to contribute to tangibly improving the financial performance of the company. The role of sustainability accounting in these publications has been to provide accounting tools and methods to support an accounting toward sustainability. A third theme concentrated on observing the practice of corporate sustainability accounting. The publications in this area (e.g., Bennett and James; Heydkamp et al.) look into what companies do in the field of SMA, how they do it, and why they do it. This research, although limited in volume (Schaltegger, Gibassier, and Zvezdov) has brought significant insights into the responsibilities involved in SMA, the type and regularity of the information collected, etc. Last but not least, a major body of publications in the area deals with various challenges to sustainability accounting – from "how to get the right information to the right people" to "how to measure sustainability performance *reliably*." (Burritt; Rikhardsson et al.) For example, Burritt identifies a thorough list of obstacles that need to be investigated in detail.

Thus, the discussion has developed beyond attempts to recognize the benefits of engaging with sustainability accounting with a trend toward establishing elaborate systems to provide support to decision makers as called for by Schaltegger and Burritt. Based on the development of sustainability accounting in leading sustainability companies (e.g., Burritt, Schaltegger, and Zvezdov), the paper draws the attention to the next challenge: the roll out of corporate sustainability accounting. The implications provide support in identifying the needs of the various people involved in sustainability accounting and its implementation in day-to-day business processes – referred to as "roll out" throughout this paper. A significant contribution toward understanding specific decision situations is made. From a more general viewpoint, the considerations made in this paper can be translated to other corporate functions engaged in sustainability management.

The argumentation builds upon literature in change management theory (Cooke) and in practice-oriented accounting theory as understood by Malmi and Granlund. The analysis is strictly qualitative, using only secondary data sources. The analysis of challenges in Section 2 is based on a literature review conducted for this research. The core of the paper is a conceptual development that identifies, groups and elaborates on the challenges identifies in Section 3. A summary of the most important findings is provided in Section 4, together with implications for practitioners and researchers.

II. STATUS OF CORPORATE SUSTAINABILITY ACCOUNTING PRACTICE AND FUTURE CHALLENGES

A few years ago, Schaltegger and Burritt provided an account of what sustainability accounting is. In their paper, the authors provide an insight into the status of corporate sustainability accounting and interpret its meaning. The interpretations range from "an empty voguish buzzword blurring debate" through "a broad umbrella term bringing together existing accounting methods dealing with environmental and social issues" and "a specific unitary measurement and information management tool" to "a pragmatic, goal driven, stakeholder engagement process, which attempts to develop a company specific and differentiated set of tools for measuring and managing environmental, social and economic issues as well as the links between them." Precisely the latter – this pragmatic, goal driven approach – has been the subject of many decision-makers's attention who have realised the importance of sustainability information provision and management. For this reason, a number of companies have been engaged in designing accounting systems that provide the right information to the right people in the right moment (Bennett, Schaltegger, and Zvezdov).

However, there are hardly examples of companies that have been able to implement an overarching sustainability accounting system. For example Adidas have just published a statement on their efforts towards developing an accounting system that considers various externalities and serves as a base for short and long-term decision making. DHL is another example that highlights the challenge of an integrated information management system – so far only carbon accounting has been claimed to be integrated in business activities (Hufschlag), little is mentioned on other sustainability aspects. On the other hand, a large number of companies report on their sustainability performance: some 1400 reported on their sustainability performance in accordance with the GRI guidelines (GRI). This reveals a discrepancy between the signals of company in regard to the relevance of society and environment to business and the actual attempts to manage these aspects.

Whereas explanations of the above discrepancy such as mimicry and stakeholder pressure have been developed, the difficulty of moving from a project-based information generation and management to a company-wide sustainability accounting system has not been approached (e.g., Burritt). Yet, approaching the particular set of challenges to sustainability accounting – hereafter henceforth referred to as roll out – can provide several decisive advantages in managing corporate sustainability performance. One of the main considerations is that tackling these issues can help secure a smooth transition from project-based information collection and use to routine operations. "Project-based" refers here to the isolated nature of many sustainability activities. Projects for reducing energy consumption by educating staff are one example of such activities that can be embedded in business to improve their efficacy. Such an efficacy increase can be expected as energy consumption in this case is no longer tracked within certain boundaries (e.g., department, unit, or site) but is company-wide and not limited to a certain time frame. Furthermore, responsibilities that may contribute to improving energy efficiency are no longer excluded from the project team (e.g., Hobday).

Paying attention to SMA roll-out challenges also is likely to reduce the cost of the transition explained above through managing quality and efficiency. Last but not least, bridging management challenges with content challenges can contribute to the flow of knowledge and thus have a positive effect on SMA practice.

III. SPECIFICS OF THE SUSTAINABILITY ACCOUNTING ROLL OUT

Publications on change management often identify organisational aspects of processes and activities that need to be considered in certain situations and/or for achieving certain goals (e.g., Aladwani; Nah, Lau, and Kuang). Knowledge from this field can contribute to developing an understanding for processes and thus enable decision makers to modify such processes to achieve strategic and operational targets. On the one hand, the linkages between the various aspects need to be identified and explored. On the other hand, these linkages between the various aspects need to be put together and observed how one affects the other aspects. In the case of the roll out of sustainability accounting, it needs to be identified how approaching without losing sight of the targets. For example, a small sustainability team in a company may be motivated and capable of uncovering potentials for improving social, environmental and economic performance. However, expanding the information system without instructing the newly engaged people on the targets may result in very high costs with little additional benefits, thus rendering social and environmental opportunities unattractive for decision makers.

On the other hand, diverse accounting studies have been working towards identifying the contingencies (e.g., Chapman; Gordon and Miller; Cadez and Guilding) of accounting practice. Researchers have been identifying and investigating the aspects of information that matter, so that decision making is supported. In the context of sustainability accounting, Schaltegger and Burritt produced one of the first publications that describes in detail the actors in sustainability accounting, their information needs, and the types of information generated and provided. Furthermore, Burritt, Hahn, and Schaltegger developed an "Environmental Management Accounting Framework" that identifies various situations in which different types of information are needed.

This section focuses on the issues and challenges of the the roll-out phase of sustainability management accounting. It identifies and considers organizational as well as content-specific challenges in the roll-out phase of corporate sustainability accounting. As presented above, these two types of considerations play a significant role in the roll out of corporate sustainability accounting to support an efficient and effective transition of the latter toward day-to-day business activities.

Organizational aspects

The generic roll-out process has been tackled from various perspectives (Balogun and Jenkins), including in accounting context (Burns and Scapens; Sulaiman and Mitchell). For the purpose of this paper, the analysis of the organisational aspects of the sustainability accounting roll out are listed and systematically tackled, based on a recent publication by Homma and Bauschke. The latter is considered a good source to build upon as it provides an overview of the basics of the roll-out process by summarizing relevant literature and presenting generic steps in the process. The considerations in this section thus rest on this concept. Furthermore, the largely underestimated importance of formal transition (toward integrating sustainability accounting in core business) management (Bennett, Schaltegger, and Zvezdov) is interwoven in the following analysis.
The model for the roll-out process described by Homma and Bauschke rests on three decisive steps: (i) preparation of the roll out project, (ii) involving senior management, and (iii) subsequently involving employees. This preparation is particularly critical in terms of available resources, as the operational aspects of the roll out have been documented as very demanding (Burns and Scapens; Anderson and

Young). This calls for a clear understanding of the needs of the roll-out process.

The first consideration to be made is that as the involvement of various departments is needed, this involvement needs to be provided the necessary support, and the business needs to make sure that available capacities for the required tasks are available within these departments. As recent research (e.g., Bennett, Schaltegger, and Zvezdov) reveals, in practice this is often not the case, thus hampering the advancement of the roll-out process.

The involvement of senior management also has been identified to be crucial for the success of the roll-out process. Due to the often conflicting nature of sustainability management with short-term financial performance (e.g., Rappaport), the support of the senior management is often granted only partly (Epstein and Roy). In other words, by the nature of their functions, managers support processes and measures that can be legitimized in front of stakeholders – mainly shareholders, but also customers, wider public, etc. Thus a clear and tangible cost-benefit analysis needs to produce information (e.g., Bennett, Schaltegger, and Zvezdov; Schaltegger and Burritt) that draws the attention of senior management and stimulates its involvement. Therefore, one crucial task of roll-out management is the identification of a list of (expected) benefits of a transition to an encompassing sustainability accounting, ideally including short-term benefits as well as those expressible in monetary units. For example, a company-wide sustainability accounting can uncover further business cases for the company and additionally result in a reputation improvement.

As observed by Bennett, Schaltegger, and Zvezdov, senior management is rarely engaged in the sustainability management of the company, although it does not seem to obstruct related activities. Yet, further involvement of senior management may have positive effects on sustainability accounting, e.g., by granting additional resources, motivating employees, and even reconsidering core business activities. Last but not least, senior management can contribute to improving sustainability accounting practice by putting less pressure on middle management to justify expenses on each and every sustainability-related activity with too high an accuracy. Thereby sustainability accounting can focus on accounting rather than accountability and reporting. Similarly, marketing managers are not expected to provide a detailed and accurate account of the exact number of items sold due to a forthcoming image campaign, are they?

The involvement of employees also has been identified as a critical factor in developing a company-wide sustainability accounting. For example Schaltegger and Burritt identify a lengthy list of providers and recipients of sustainability-related information. Also, Zvezdov, Schaltegger, and Bennett arrive at the conclusion that the employees involved in sustainability accounting play a significant role for the success of these activities for various reasons. First, their support is indispensable, as they are often the only providers of related information and, therefore, they need to be involved rather than having other functions generate the same information. For instance, specific, detailed information on raw material consumption may not be available in purchasing or bookkeeping but can have a major contribution toward saving resources. Second, employee involvement is essential as they are familiar with the content behind the information they provide, i.e. before information consolidation takes place. In other words, the original providers of information may be in the position to provide further related information, as the roll-out team may not be aware of the existence and/or relevance of this information. An example for such a situation is the provision of information on major water-consuming activities in production (Bennett, Schaltegger, and Zvezdov), with major savings potential being neglected as the workers operating the machines

have not been involved in the water-saving project.

Employee involvement is often a very important aspect as sustainability accounting requires cross-departmental cooperation. A main problem appears to be the lack of resources in supporting (i.e., other than the sustainability) departments to provide the required information in the required form and, on the other hand, the unwillingness of other departments to be subordinate to the sustainability department, for example, by formally agreeing to produce certain information (Bennett, Schaltegger, and Zvezdov). In this case it is necessary that all of the involved people be informed about what the information they provide is used for. This information sharing should go beyond "ticking check boxes" by engaging employees in contributing with their specific expertise.

Content-specific aspects

The second group of aspects that require consideration for a successful sustainability accounting roll out are the so-called content-specific aspects. These, as opposed to organizational aspects, describe what the accounting practice needs to look like, such as what information is needed and which functions and departments need to be involved. Yet, the following paragraphs should not be understood as suggesting that certain actions be taken; instead they point out and describe decision-situations that are likely to be neglected or ignored during (the planning phase of) a roll out.

There are several content-related aspects of the sustainability accounting roll-out process that need to be considered. On the one hand, (accounting) information flows need to be designed in view of potential providers, managers (administrators, gatekeepers), and users of sustainability information. This design requirement means that involving departments not only in the provision of information but also making the information available to them can be an incentive for their involvement and thus contribute to their supportiveness (Bennett, Schaltegger, and Zvezdov). As previously identified, the involvement of various departments generating information is particularly important; for the reasons outlined above, their involvement in making use of such information is crucial, too.

Based on an environmental management accounting framework developed by Burritt, Hahn, and Schaltegger, a few additional recommendations in regard to the necessary information can be provided. On the one hand, more attention needs to be paid to future-orientated sustainability information. For the roll-out process this means providing the possibility of relating the potential impacts for each department so that an overall integrity is achieved – a main objective of an overarching sustainability management accounting system. This also has strategic implications as changes made to corporate strategy require decision making based on long-term, future-oriented information. Also management control (Schaltegger 2011) depends widely on future-oriented information supplied by accounting. Another particularly important function of such a system is linking monetary and physical data, which appears to be the case in only a few companies (Burritt, Schaltegger, and Zvezdov). Whereas the authors report that monetary information is widely considered in current practice of sustainability leaders, they stress on the difference between collecting physical information strictly for deriving monetary information and the possibility to derive monetary information from physical one. For example, a re-calculation of sale prices due to changing cost structure requires that information on related carbon emissions is collected that is in turn converted to monetary units based on current or expected carbon market prices. At the same time, however, information strictly collected for monetary purposed may be unable to provide sufficient decision-making information. For example, in the

above case, if the management realised that too high costs are attributed to poor carbon performance, they may not be in a position to improve this performance as no detailed information in the various value-creation steps is available.

The frequency of sustainability data and information generation is another important aspect to consider. On the one hand, regular data generation, collection, and use are likely to increase the efficiency of the process. On the other hand, however, limiting the scope of the system to such information renders it unable to take into consideration rare decision situations as identified in (Burritt, Hahn, and Schaltegger).

IV. CONCLUSIONS

With the increasing number of companies demonstrating sustainability engagement and the possible contribution of the sustainability manager (Zvezdov, Schaltegger, and Bennett), sustainability leaders appear to have reached a stage at which the roll out of sustainability accounting is the next step to take. Furthermore, companies that are less advanced in regard to their sustainability accounting practice are also likely to face the same challenges at a later point. Yet this process presents a serious challenge for businesses for the reasons outlined in Section 2 of this paper by means of a literature review. Against this background, an approach to tackling this challenge is developed and presented. The approach identifies and discusses crucial decision situations.

Depending on how advanced a company's sustainability accounting activities and system(s) are, these activities can present a different set of challenges for management. Some companies are expectedly more advanced in their sustainability accounting practices than others. As the above literature review reveals, different focuses of efforts toward sustainability accounting can be expected depending on what stage the company is at; a company that has just started (consciously) looking into sustainability accounting is more likely to be focused on identifying relevant performance indicators, figuring out (efficient) ways to produce the required information, and/or looking for the informational value of existing sustainability information. More advanced in this regard companies, on the other hand, are more likely to be refining existing practice e.g., by increasing the departments and people involved in producing and using sustainability information, increasing the number of aspects and linkages they look for, etc.

Thus, resting on the comprehensible presumption that different companies struggle with different challenges, the assumption could be made that eventually the challenges of the most advanced company are likely to be faced by the other companies as they advance, too. Therefore, the focus is placed on the type of challenges that seem to be at the forefront from today's viewpoint and experiences. So what is the set of challenges today?

The main message of the argument is that in practice the roll out of sustainability accounting is a complex, multi-facetted process, often overlooked or underestimated that requires professional project management as well as the full support of senior management and employees. The paper deducts a typology of sustainability-accounting-related roll-out challenges grouped in two categories: organisational challenges and content-related ones. The former category points out what non-accounting specific issues need to be considered for a successful roll out. Albeit trivial, issues such as employee involvement and support have been paid little attention in literature or – even worse – have been neglected in practice. Thus, the article not only identifies such important issues but also gives an account of why they need to be considered.

The latter category – content-specific challenges – provides a list of accounting-specific challenges in the roll-out process. These are

differentiated from the previous group since the list of challenges identified in Section 2 cannot be overcome without specific accounting considerations. That is, accounting techniques that have not been used in previous stages of accounting are essential for a successful roll out. For instance, linking physical to monetary information or assigning a wide range of information providers is not essential for identifying sustainability performance improvement potentials but is absolutely necessary for a robust, future-proof information generation and provision system to support informed decisions.

These conclusions provide a **basis** for managers to consider in their next steps or even earlier in their sustainability accounting practice, cf. Figure 1. The emphasis is on basis as both sustainability management and management accounting develop and research uncovers contingencies that have previously been ignored. Yet, the list does not provide advice as to the specific actions to be taken, e.g., how employees can be motivated or what information needs to be collected. These are company-specific decisions that are subject to other field of research and are thus not part of this paper.

Also, additional research is required to identify further specific properties that need to be considered in the roll out. For this, the here developed typology can be either extended to include further relevant decision situations that need to be considered. Also case studies or surveys examining these challenges will contribute to testing the validity of the above arguments in practice.

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Stages of engaging with corporate sustainability accounting

Abstract

As an approach to the systematic generation and use of sustainability information, sustainability accounting has the objective of delivering a comprehensive basis for decision-making and performance control in the light of corporate sustainability opportunities and threats. While engaging with sustainability accounting to tackle company-specific issues, companies may face similar challenges in adopting sustainability accounting practices.

This paper analyses the progress of adoption of corporate sustainability accounting and narrates the experience collected in 16 UK and German companies. This is done by categorising the progress of each company's sustainability accounting practice in a set of five stages. Doing so enables to depict this progress in sufficient detail to provide guidance to companies while retaining its analytical strength.

By outlining the path and specific challenges at each stage, the paper contributes towards accelerating sustainability accounting practice. By focusing on the experience of sustainability pioneers, the paper identifies future challenges for late adopters – an important prerequisite for a broader adoption of sustainability accounting.

Keywords: accounting development, sustainability accounting, change, progress

1. Sustainability accounting: supporting corporate sustainability management

In addition to being a topical issue in various fields of research, corporate sustainability has gained importance in practice, too (Schaltegger et al. 2011). A few recent studies provide evidence that tackling sustainability issues can contribute towards the long term success of companies (e.g. Wang et al. 2008). Yet, tackling these issues poses various challenges to managers, who struggle to develop an understanding of the linkages between sustainability management and financial performance (e.g. Schaltegger & Wagner 2006). Furthermore, successful corporate management not only needs to understand existing linkages but also how to create new ones. This is where sustainability information can play a decisive role. Corporate sustainability accounting has been identified as one approach to generating, providing, and using such information (Schaltegger & Burritt 2010).

Corporate sustainability accounting, although a much more recent 'invention', has been widely discussed in a growing body of literature (Burritt & Schaltegger 2010; McGrath & Mathews 2008; Parker 2005; Schaltegger et al. 2011). Two streams of (environmental and later on) sustainability accounting literature can be distinguished (Schaltegger & Burritt 2010). The critical social accounting perspective has questioned the contribution of management accounting to sustainable development (e.g. Gray 2010). The management approach to sustainability accounting, on the other hand, has been developing the discipline to support corporate sustainability management (Burritt & Schaltegger 2010). In its latter interpretation, sustainability accounting has been attributed numerous functions – from being an empty buzz word, through an umbrella term, to a holistic approach towards measuring and managing sustainability performance (Schaltegger & Burritt 2010, p. 379).

Engaging with sustainability accounting poses numerous challenges beyond the "technical" aspects of accounting, such as understanding how such activities can contribute to improving performance and overcoming resistance. Thus, to facilitate the adoption of sustainability accounting practices, a broader understanding of the adoption process and related challenges is required.

Based on an analysis of the data collected in 16 companies with good sustainability reputation, the following paper depicts the adoption of sustainability accounting practice, thereby pointing out current and upcoming challenges that management has to consider for the successful adoption of such activities.

The paper is structured as follows. The following section outlines the status of dissemination of corporate sustainability accounting and highlights the need for better understanding of the challenges in adopting sustainability accounting practices. Section 3 gives an overview of the research approach adopted in investigating the above research question. Section 4 presents the results and discusses the findings. The concluding section points out the importance of the findings with regard to the transfer of knowledge in the field and highlights the herein recognised need for further research.

2. Adoption of sustainability accounting in the context of change

2.1 Perpetual change in management accounting thinking

Change has been recognised as the normal condition of business (Hopwood 1990). Perpetual change in management accounting has been documented throughout more than a century of modern management accounting history (e.g. Burns & Scapens 2000; Burns & Vaivio 2001; Parker & Ritson 2011). The dynamics of accounting change in terms of new practices, routines, institutions, power and politics have been investigated (e.g. Burns 2000). One conclusion drawn by this through research is that within – as well as beyond – the accounting context, change has been used as synonym for progress (Siti-Nabiha & Scapens 2005). Therefore, investigating the progress in accounting in the light of corporate sustainability is of increasing relevance for supporting informed decision-making.

2.2 Sustainability accounting as innovation

Initially popularised by Rogers (1962, 2003) diffusion of innovations has been a topical field in explaining how, why, and at what rate new ideas and technology spread through cultures. Roger proposes five innovation adoption categories: innovators, early adopters, early majority, late majority, laggards. This model has been further developed in the business context in identifying innovation success (Abrahamson 1991, 1996).

Several authors have described the diffusion of (sustainability) accounting practice based on this notion (e.g. Firth 1996; Schaltegger & Burritt 2010). Numerous case studies on the implementation of environmental accounting have been produced (e.g. Burritt et al. 2009; Larrinaga-Gonzalez & Bebbington 2001; Schaltegger et al. 2012). These serve as an indication that sustainability accounting practice has been experiencing diffusion. In fact, case studies have been the most wide-spread approach in investigating the corporate practice of sustainability accounting (Schaltegger et al. 2011). And although research in the field has been on the agenda for over two decades, the field can still be considered to have emerged relatively recently. By comparison, Kaplan (1983) examined the measurement of manufacturing performance as a new challenge, although the practice had been documented to occupy manager's minds "for most of this century" (Banker et al. 1993).

Being such a recently emerged area, few studies have captured and analysed the practice of sustainability accounting (exception Bennett et al. 2012); the adoption of sustainability accounting in particular has not been subject to research. This paper focuses on the progress of sustainability accounting adoption in companies leading sustainability accounting innovation, i.e. innovators and early adopters, as differentiated by Rogers.

2.3 Mapping out progress in sustainability accounting

Numerous theoretical approaches have been applied to observe and describe change in organisational and accounting practice. Kezar (2001) proposes six main categories of theories of change assist in understanding, describing, and developing insights about the organisational change process: (a) evolutionary, (b) teleological, (c) life cycle, (d) dialectical, (e) social cognition, and (f) cultural. This contribution observes corporate practice from the life-cycle perspective of Lewin's change model (Lewin 1947), whereby a three-staged model of unfreezing, moving and refreezing is proposed. Although over 60 years have passed, his model is still discussed (e.g. Fernandez & Rainey 2006; Ong & Wang 2011; Schein 1996) and applied widely (e.g. Andrews & Chompusri 2005; Bargal 2006; Goodman & Truss 2006; Ho 2000; Kotter & Schlessinger 2008; Sauser & Sauser 2002), also in the field of management information (e.g. Cooper & Zmund 1990; Grover et al. 1995; Ginzberg 1978). In addition to its popularity, this framework also provides a neat and simple measure of progress. Particularly the latter aspect allows a relatively straightforward categorisation of available data and thus suits the needs of this research adequately.

In order to support the analysis of the stages of the sustainability accounting adoption in companies with good sustainability reputation, progress was measured against the framework developed by Lewin. In describing change, Lewin identifies three stages: unfreezing, moving and refreezing. These were expanded into sub-stages and translated to the adoption of sustainability accounting practice as described in Table 1.

Stage	**Sub-stage**	**Definition in sustainability accounting context**
Unfreeze	Diagnose	Understand how and what sustainability information can contribute to managing sustainability performance
	Prepare people	Identify how various professionals can be involved in sustainability information collection, provision and use
Move	Implement changes	Reorganise information flows, include sustainability KPIs in performance measurement, etc.
	Overcome resistance	Overcome resistance resulting from new evaluating performance schemes, additional tasks, etc.
Refreeze	Institutionalise	Integrate sustainability accounting in business as usual

Table 1: Stages in corporate sustainability accounting (based on Fernandez & Rainey 2006; Kotter & Schlessinger 2008; Lewin 1947)

The three stages of the original model can be broken down into further steps to be used as a proxy of whether the step has been realised and/or approached yet. Several authors have approached this challenge (e.g. Fernandez & Rainey 2006; Kotter & Schlessinger 2008), proposing the above five intermediary steps.

Diagnosing the situation not only requires to realise that the status quo of practice is no longer a suitable approach to managing corporate performance but also that it is understood how and

what sustainability information can contribute to managing sustainability performance (e.g. Schaltegger & Burritt 2000). This arises from the fact that sustainability information can vary greatly (Burritt et al. 2002), depending on the needs of its users (Schaltegger & Burritt 2000). Diagnosing also requires that examples are produced to point out the linkages between sustainability management and corporate (financial) performance (e.g. Klassen & McLaughlin 1996; Schaltegger & Wagner 2006).

The challenges of *preparing people* arise from several perspectives. On the one hand, it needs to be identified how various professionals can be involved in sustainability information collection, provision and use. The collection, provision and use of sustainability information have, however, not been subject to extensive research so far (e.g. Burritt et al. 2011). Thus companies are forced to approach the issue on a trial-and-error basis.

Implementing change in sustainability information management is related to numerous operational challenges. Among these are reorganising information flows (Schaltegger & Burritt 2000), designing and implementing sustainability KPIs for performance measurement (Adams & Frost 2008; Schaltegger 2011), and assigning responsibilities (Bennett et al. 2012). Particularly in times of information overload (Edmunds & Morris 2000; Eppler & Mengis 2010), it is necessary that the benefit of this information for performance evaluation and decision-making is higher than the resources invested in adopting sustainability accounting practices.

Overcoming resistance has been subject to management research within (Hoffman & Bazerman 2007; Kemp et al. 2007) and outside (Hong & Kim 2002; Poon & Wagner 2001) the sustainability discussion. In the management accounting context, resistance has been observed to result from new evaluating performance schemes, additional tasks, etc. (Scapens & Roberts 1993) and to become more apparent after the first wave of enthusiasm has been left behind. Furthermore, resistance can also emerge from higher-level management, when their performance is re-evaluated based on the achievement of sustainability KPIs (Woodburn 2004).

Institutionalising corporate sustainability accounting falls into the third stage of Lewin's model and can thus be seen as the most advanced stage of development. It can be characterised with the integration of sustainability accounting in business as usual. From a practitioner's perspective that could mean that no separated team in charge of sustainability information is needed. Instead, such a team is leaner and focuses its efforts on supporting the activity rather than being in complete charge of it.

3. Research background and data

3.1 Overarching project objectives and scope

This project sought to fill a gap in extant literature by exploring developments in the practice of sustainability accounting in the UK and Germany – the two largest economies in Europe. Companies with good sustainability reputation were approached as the research focuses on the collection, management and use of (sustainability) information to support management. At the same time it was recognised that companies generate information not only for this purpose but also to report externally; and that in practice this can often be a significant determinant of the information that is generated, which can then be available for internal use, too.

Given the novelty of corporate sustainability accounting the project did not aim at identifying established, generally accepted good practice, but instead at identifying companies which might be expected to be in the lead in this area and to ascertain emerging trends in these

companies, and discernible factors which may influence corporate sustainability accounting practice.

3.2 Data collection

In order to explore the corporate practice of sustainability accounting, a research project was set up and conducted in 2009 and 2010, whereby 58 respondents in 16 British and German-based companies were interviewed in person. One of the objectives of the project was to explore the role of the current stage of development in corporate sustainability accounting in leading companies. The focus on companies with tradition in sustainability reporting was expected to be revealing as to critical aspects in development and adoption of sustainability accounting practices.

The lack of research on the practice of sustainability accounting motivated an explorative research approach to generate indicative findings that could both inform practice elsewhere and indicate potential areas for further research. Sustainability accounting practice was thus examined without former development of hypotheses. Thus, the focus was on identifying aspects that had been neglected to this moment. For example the type of information, the methods of data collection and preparation and the involved actors were the topics that were raised during the interviews. Subsequent topics emerged such as the development of corporate practice, as described in this paper.

The data was collected in semi-structured interviews. Initial interviews were held in each company with the sustainability manager, whereby subsequent interviewees – providers or users of sustainability information – were identified. For the purpose of data triangulation, corporate data and publicly available information such as reports were used. Further data triangulation was achieved by using the interviewee's own perception of their role, the other interviewee's perception of this person's role and factual information such as internal documents describing internal responsibilities, etc.

Attempting to analyse at once the large amount of data collected is considered impractical and may actually lead to overlooking essential findings. For this reason, data was extracted for the purposes of each aspect that was identified as novel and worth pursuing. For analysing the stages of development of sustainability accounting, data related to the five stages of change (Table 1) was retrieved.

3.3 Data analysis

To analyse the stage of development, the data collected was analysed. In doing so, it was necessary to distinguish between four groups of stages of progress with regard to sustainability accounting activities.

Based on the data obtained during the interviews and triangulated with other available information, each of the five stages in Table 1 was analysed based on whether (a) an issue has been recognised as such, (b) recognised but not deal with yet, (c) deal with, or (d) a solution has been developed and applied successfully. Although the five steps can constitute an iterative process, i.e. once a certain step is concluded, it may need to be revised in future, the unit of analysis was the whole process of sustainability. For example, some of the companies reported that they had initially implemented changes in their information management system to provide information only on (at that time) cost-relevant information. However, with the development of the sustainability discussion, the importance of further aspects became

apparent, which required that related information be collected too. This, in turn required re-diagnosing the situation and going through the phase of planning change in order to involve further people in the process of information provision and use. This issue is explicitly dealt with at the end of Section 4.

4. Results and interpretation

4.1 How far apart are sustainability pioneers?

Given the fact that the examined companies were chosen in such a way that they represent the innovators and early adopters of sustainability accounting practice, it was expected that each of them would be able to demonstrate good practice. This was the case, as the interviews revealed numerous challenges that had been faced and – in many cases – resolved. By applying the method of constant comparison, however, differences in the stage of progress became apparent. Table 2 presents these differences against the modified Lewin framework.

Depending on the stage of adopting sustainability accounting, each stage presents a different set of challenges for the management. Some companies are expected to be more advanced in their sustainability accounting practices than others. In turn, different focus of efforts can be expected depending on what stage the company is at: a company that has just started looking into sustainability accounting is more likely to be focused on identifying relevant performance indicators, figuring out efficient ways of producing the required information and/or looking for ways to make sense of existing sustainability information. More advanced companies, on the other hand, are more likely to be tackling challenges such as trying to move from project-based activities to systematic approach to sustainability accounting, in an attempt to secure long-term resources.

	Unfreeze		Change		Refreeze
Company	Diagnose	Prepare people / plan change	Implement changes	Overcome resistance	Institutionalise
Company A	✔	●	○		
Company B	✔	✔	✔	✔	●
Company C	✔	●	○		
Company D	✔	●	○		
Company E	✔	✔	✔	●	●
Company F	✔	✔	●	●	
Company G	✔	✔	●		
Company H	✔	✔	●		
Company I	✔	✔	✔	✔	●
Company J	✔	●	○		
Company K	✔	✔	✔	●	○
Company L	✔	✔	●		
Company M	✔	●	○		
Company N	●	●			
Company O	✔	✔	✔	●	
Company P	✔	✔	✔		

Table 2: Results based on 60 interviews in 16 leading UK and German-based companies. (no sign): the issue has not been recognised as such yet; ○ (an empty circle): issue has been realised but not dealt with yet; ● (a filled circle): issue has been deal with; ✔ (a check mark): a solution has been found and applied successfully.

The above presentation of the results allows several interesting observations. Probably the most straightforward one is the fact that a measurable variance in sustainability accounting practice development could be captured, despite the fact that a fairly homogeneous population (sustainability leaders) was investigated. Nevertheless, the results show that even among this group, major dissimilarities can be observed.

Second, the collected evidence suggests that the unfreezing stage has been approached and largely tackled in this group. This observation is hardly surprising, given the good sustainability reputation of the sample companies, based on which they were chosen to be involved in the project. It can in turn be expected that the vast majority of companies will be approaching challenges related to this stage, as they are behind the leaders in terms of adoption of sustainability accounting practices.

Third, the movement phase appears to have been successfully approached by only few companies, although almost the complete sample appears to have recognised the need to

tackle related issues. This suggests that major effort has now been concentrated on that stage, which is in fact of rather technical nature, as the following section argues.

Last but not least, the process of institutionalising sustainability accounting could not be observed to have taken place yet. In fact, evidence of approaching related issues was collected in only three of the 16 companies. This can be supported by the previous observation, that the majority of the researched companies appear to be dealing with the 'moving' phase, therefore effort can be expected to be concentrated there.

Resting on the above observation that different companies are at different stages and thus focus on different challenges, two key points can be made. First, support needs to be provided in tackling each of the above stages. Second, the challenges faced by the most advanced companies are likely to be eventually faced by the other companies as they advance, too. Therefore, effort on providing support in that final stage – institutionalising sustainability accounting – is likely to grow as corporate adoption within each company advances. The rest of this section presents examples of the challenges faced in the researched companies and discusses them in accordance with Lewin's change management model.

4.2 Challenges in unfreezing

In the unfreezing phase, the importance of a clear understanding of the needs of the sustainability accounting was highlighted. Several interviewees shared their experience of having difficulty engaging with sustainability accounting as the purpose of the activities was not clear outside the sustainability department. Many other professionals – who were to be involved later on such as information providers – could not see the benefit of such activities to business and considered them competitive to their formally agreed objectives.

The involvement of senior management in particular was also identified as crucial in the stage of planning sustainability accounting adoption. Partly due to the perception of the often conflicting nature of sustainability management with short-term financial performance, senior management support was in numerous cases reported to be only partially granted. The involvement of senior management was described as essential in allocating sufficient resources, motivating people and even reconsidering core business activities.

Also reported was the need for effective communication that informs various internal stakeholders of the reasons for the change (e.g. for what purpose information needs to be collected), the benefits of successful implementation (what is in it for the company and for that particular person who needs to be involved). Interviews expressed their positive experience with making clear the details of the change so they can be clearly communicated to answer questions such as 'When?' 'Where?' 'Who is in charge?' 'Who is involved?' 'How much will it cost?'

Securing resources revealed to be another challenge at this stage. For example, as the involvement of various departments is needed, it needs to be made sure that capacities for the required tasks are available within these departments. In the researched companies this was not always the case, thus hampering the advancement of sustainability accounting. Expressed was also the concern that people were less eager to get engaged if they did not see the long term establishment of such activities.

Also important for the planning change appears developing the process in a way that benefits management. This challenge was reported to have been tackled by defining measurable stakeholder aims, creating a business case for their achievement (and continuously updating

it), and monitoring assumptions, risks, dependencies, costs, return on investment, and cultural issues affecting the progress of the associated work. Providing personal counselling to alleviate any change-related fears was also mentioned as an important factor to consider in while planning change to existing management accounting systems.

Preparing employees to be involved in sustainability information flows was identified as a critical factor for several reasons. First, employees' support was considered indispensable, as they are often the only providers of certain information. For instance, specific detailed information on material consumption was not available in purchasing or bookkeeping, but had a major contribution towards saving resources, once it was provided by a production manager who was aware of the existence and/or relevance of such information. Furthermore, employee involvement was also reported to be essential as employees are familiar with the content behind the information they provide. An example for such a situation from the researched companies was the provision of information on major water consuming activities in the production, with major saving potentials being neglected as the workers operating the machines had not initially been involved in the water-saving project. Last but not least, it was considered important that all of the involved people be informed of what the information they are going to provide will be used for. This was observed to have the positive effect of people being actively involved and contributing with their specific expertise rather than 'merely ticking check boxes'.

On the positive side, engaging people in sustainability information provision seems less challenging compared to other tasks. Interviewees in higher management positions expressed their feeling that it was in fact easier to motivate people to engage in sustainability accounting than in other projects. This was explained with sustainability issues not being considered in the sole interest of the company, but also as a contribution to society, future generations and the natural environment.

4.3 Challenges in moving

The next stage of Lewin's model – moving –was also observed to present a set of issues to be tackled. To start off, devising effective education, training and/or skill-upgrading schemes for the organisation were reported to have worked in the companies where it was applied. People who were more familiar with the objectives of a company-wide sustainability accounting were reportedly less likely to exercise resistance by not engaging or engaging only as much as required, thereby not effectively using up improvement potentials.

The implementation of changes was also observed to be particularly critical in terms of securing available resources as the operational aspects of development have been documented to be very demanding. As an example of this challenge, two of the companies reported they were experiencing difficulties in computational power, once the volume of sustainability information had grown substantially. However, given today's availability of computational power, this event can be considered a misallocation of resources, rather than unavailability of technology.

The frequency of data and information generation was mentioned as a further important aspect to consider. On the one hand, regular data generation, collection and use were expected and/or reported to increase the efficiency of the process. On the other hand, limiting the scope of the system to such information was observed to render it unable to take into consideration other decision situations, as identified by Burritt et al. (2002).

The implementation of changes also revealed that information flows need to be designed in view of potential providers, managers, and users of the thus generated information. In several of the researched companies, involving departments not only in the provision of information but also in its use was reported to foster improvement. The explanation for this observation was that these professionals also recognisably benefitted from the innovation, e.g. by meeting other (non-sustainability related) goals.

Aligning sustainability accounting objectives with the overall strategic direction of the organisation was also observed to facilitate countering employee resistance. For example, monitoring the implementation and fine-tuning plans and activities to fit the specific requirements of the project was recognised as an effective method of dealing with sustainability accounting related change, whenever discrepancies between the objectives of sustainability accounting and other (already established) activities and objectives occurred.

4.4 Challenges in refreezing

At the end of the change process model, the final stage of 'refreezing' aims at putting down roots again and establishing the new stability. In practice, refreezing may be a slow process as transitions seldom stop cleanly. The measures in this stage aim at taking people and systems from a state of being in transition and moving them to a stable and productive state. Due to the fact that not many companies have faced the challenges of this stage, only few considerations for approaching these challenges in the context of sustainability accounting in the researched companies were collected.

As the process of engaging with sustainability accounting involves numerous and various stakeholders, on several occasions this stage was compared to the 'tug-of-war' game, an exercise of power. Building change into the formal systems and structures was seen as one way of exercising power. By formalising related activities and integrating them in regular top management agenda, one manager reported that his transition had been successful.

Ensuring there is no way back revealed to be another technique of institutionalising sustainability accounting change. Hiring staff, rather than delegating tasks to existing people, was one argument to keep activities going. This was explained with the fact that when human resources are already available and specially trained for the job the resistance and costs of cutting down sustainability activities are higher. However, as described in Section 2.3, such positions need to be spread throughout the company departments rather than being concentrated in a centralised structure. Formal long-term commitments – e.g. to reduce emissions – were another good justification to plan long term sustainability accounting activities and thus formalise them.

To the interviewees' perception, showing people that the change is real did seem to signal that sustainability accounting is not a mere fashion. For example, communicating performance improvement obtained by using sustainability information was reported to motivate people to get engaged with related activities.

Last but not least, building sustainability accounting practice into the social fabric was reported to facilitate the institutionalisation of change. Delivering regular internal and external reports, acting as a connection between departments, and having titles such as 'head of carbon accounting' did seem to convey the need of these activities.

4.5 A consideration on perpetual change in sustainability accounting practice

It needs to be considered, however, that as of present day, the stage of refreezing may often be rather tentative for most companies and situations, as the next change is already in sight before the current one is finalised. As a result, refreezing does not necessarily need to be achieved, thereby facilitating the next unfreezing.

This consideration fits the observation that although the progress in engaging with sustainability activities is broken into the three-step model, it can in fact be interpreted as an iterative process for each of the components of sustainability accounting. That is, as awareness of environmental issues and their impact on corporate performance grew, companies established systems to capture, manage, and use related information. Later on, as social issues – such as child and forced labour – posed a threat to the organisation, systems to report such information externally were developed. Thus, some of the researched companies have been through all stages of change in developing and implementing systems to deal with these issues.

This paper, by comparison, focuses on the holistic approach of sustainability accounting as understood by Schaltegger and Burritt (2010, p. 381) as a "pragmatic goal driven set of tools which attempts to develop measurement tools for different integration levels and methods of environmental, social and economic accounting and reporting expressed in physical and monetary terms". Particularly the measurement and management of information about all linkages and aspects of corporate sustainability is seen as the main challenge in adopting sustainability accounting, and is thus subject to examination in this contribution.

5. Conclusion

With the increasing number of companies demonstrating sustainability engagement, sustainability leaders and followers exhibit different stages of progress with regard to adoption of sustainability accounting practices. Accordingly, each company may face different challenges for businesses in the next step to take in engaging with sustainability accounting for the aforementioned reasons. Against this background, important considerations in tackling this challenge are presented.

Further research is needed to systematically identify additional obstacles, and more importantly, to identify which of these obstacles play an important role in corporate practice. Based on the above results, subsequent research in the strategies and approaches to overcoming these challenges is needed. Also, subsequent research can identify further specific aspects that need to be considered in the change process as well as examples of good practice.

The results focus on sustainability leaders. This can help later adopters to overcome related problems and challenges. These conclusions provide a basis for managers to consider in adopting sustainability accounting practices.

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