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ORIGINAL ARTICLE

Corporate sustainability management accounting and multi-level links for sustainability – A systematic review

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Abstract

The societal vision of sustainable development changes both the context of businesses and expectations that management should contribute to solving sustainability problems beyond organizational boundaries. Companies are influenced by macro-level developments such as new environmental regulations and by meso-level context such as social industry standards and guidelines. At the same time, companies are expected to contribute to sustainability transformations of markets at the meso-level and to solving grand sustainability problems at the macro-level such as the greenhouse effect. These developments increase and change sustainability information needs of managers and management accounting. This paper provides a systematic literature review of how sustainability management accounting (SMA) addresses links with the organization's contexts and contributions to sustainability transformations beyond organizational boundaries. The analysis questions the conventional assumption of an internal scope for SMA. It recognises this as a problematic constricting assumption in the literature and, instead, proposes a multi-level Context, Action-formation and Transformative contributions (CAT) framework for further development of SMA.

INTRODUCTION

Involvement of the private corporate sector is vital if sustainable development is to be achieved (Atkinson, 2000). Managers need to consider sustainability in their decisions, and this requires support from accounting to raise awareness of desired and undesired environmental, social and economic impacts (Schaltegger & Burritt, 2018). Corporate sustainability management accounting (SMA) organizes the collection, analysis and communication of environmental, social and economic information for internal use by the organization's managers. Nevertheless, scepticism about corporate sustainability management, accounting and reporting has been prominent in various publications influencing the research agenda, as some authors see sustainability concerns and solutions resting more at national and global levels than with businesses (Gray, 2010). Moreover, questions arise over the extent to which SMA considers sustainability at societal and planetary boundary levels (Gray, 2010; Linnenluecke & Smith, 2019; Rockström et al., 2009; Whiteman et al., 2013).

To make progress with informed corporate sustainability management, SMA needs to support organizations in analysing and managing links with macro- and meso-level

sustainability challenges. These include, for example, clarification about how business is integrated in its environment, how it operates within the scope of planetary boundaries, and how it sources supplies without negative sustainability impacts in supply chains.

Emergence of a number of global environmental, social and economic problems, ranging through climate change, water crises, gender equality, global poverty, the COVID-19 pandemic and policies such as the EU Green Deal, has led to greater concern about the lack of sustainability (Eckert & Kovalevska, 2021). It has brought pressure encouraging development of a more comprehensive, integrated approach to corporate sustainability management, supported by accounting and reporting (e.g., Linnenluecke et al., 2015; Whiteman et al., 2013). Nonetheless, a contemporary review and analysis of contexts and outcomes and the potential role of accounting for management to contribute to sustainable development beyond the organization's boundaries is missing. In order to further develop a research agenda which supports the contribution of business to sustainable development, this review investigates how existing SMA research explicitly considers the connection with sustainability at different levels, leading to the following research question: *How does SMA literature address links with meso- and macro-level contexts and outcomes beyond organizational boundaries?*

Underpinned by a multi-level framework, this study makes the following contributions. First, it uncovers the extent to which SMA research has explicitly addressed links between the organization, macro-level (e.g., planetary ecological boundaries) and meso-level (e.g., sustainability transformation of supply chains). The review reveals a growing number of publications addressing macro- and meso-micro links. These highlight various aspects of the business environment in general, indicating that regulations, networks and ecological necessities, do or can influence the context for SMA (e.g., Qian et al., 2015; Wang et al., 2019). Second, the review indicates few publications examine *how* SMA could be further developed to better inform management about macro- and meso- level contextual factors. Third, the review findings are problematised by challenging the underlying assumption that the *scope of SMA* needs to be internal to the organization. Revealing the core idea and purpose of sustainability management and accounting in general, this article proposes that SMA needs to enlarge its scope by considering influences on and impacts of the organization beyond its boundaries. In a business setting facing increasing sustainability problems, SMA can help managers to create contributions to sustainable development of markets, society and the natural environment. It can do this if it provides information to make explicit corporate influences of and impacts on meso- and macro-levels beyond organizational boundaries. Finally, to improve its purpose of supporting management in contributing to sustainable development, reorganization of SMA is proposed through a newly created CAT framework, linking Context, Action-formation and Transformative contributions.

The paper proceeds as follows: the next section distinguishes macro- and meso-level links with SMA and introduces a multi-level framework for analysing these links. The following two sections detail the systematic literature review method adopted and examine the findings from the review within the multi-level framework. The findings are then discussed and problematised in relation to the scope assumption of SMA adopted in the existing SMA multi-level literature, leading to the proposal of a new CAT framework to reorganize SMA. Finally, a short conclusion is presented.

ANALYTICAL FRAMEWORK FOR LINKING SMA WITH MULTIPLE LEVELS

SMA interacting with multiple analytical levels of sustainable development

Sustainable development is a vision of and for society (UN, 2015). As corporations are embedded in the social and natural environment, they are influenced by and have influence beyond organizational boundaries (Benn et al., 2014). Corporations are key actors able to increase or mitigate social and environmental impacts of mankind, having an impact on this vision (Schaltegger et al., 2017). Previous corporate SMA literature has analysed ways to address sustainability from a corporate perspective. These include reviews of methods (Christ & Burritt, 2015; Dienes et al., 2016), management areas (e.g., Moreno-Camacho et al., 2019; Vitolla et al., 2019), sustainability orientation (Mathews, 1997) and themes (Marrone et al., 2020). To extend these reviews and analyze the existing organizational SMA (micro) research to meso- and macro-levels of analysis, the paper adopts Coleman's multi-level framework (1986), as refined by Hedström and Swedberg (1998).

Four reasons lie behind the choice of this conceptual framework. First, the multi-level perspective (MLP) framework (Geels, 2002, 2011) has been widely applied in the transitions literature and provides valuable oversight of system level connections and dynamics. The multi-level approach of Hedström and Swedberg (1998) has informed entrepreneurship research, with its focus on social mechanisms, to explain both enabling influences on the micro- and micro-level impacts on other levels. The framework, therefore, complements the systems view of the MLP perspective by offering a novel analytical lens to analyze the SMA literature with regard to its enabling potential

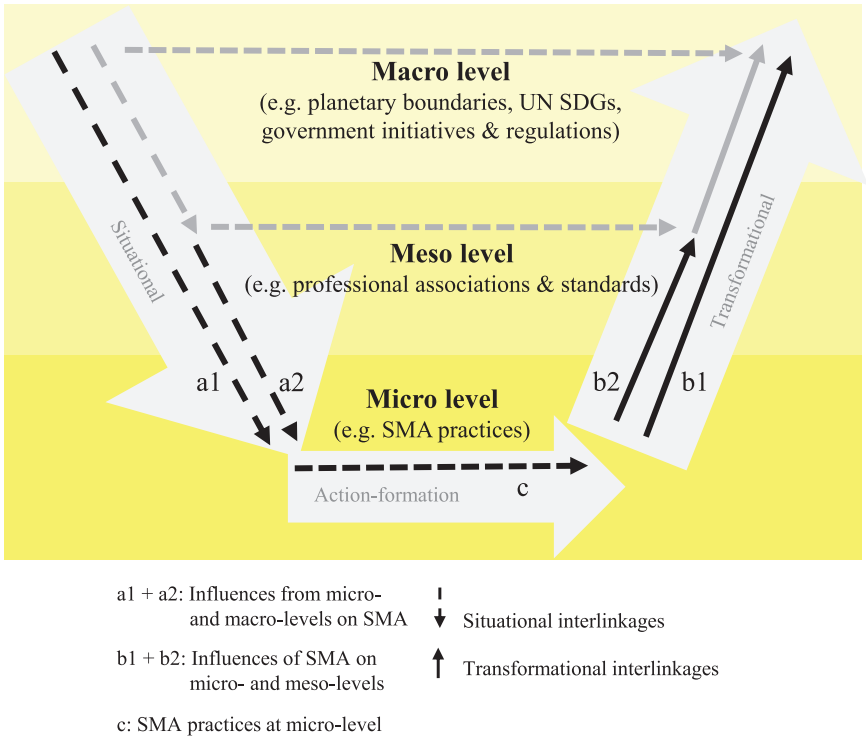

FIGURE 1 Framework for analysis of SMA links at multiple levels [Colour figure can be viewed at wileyonlinelibrary.com]

and to discuss how SMA at the micro-level is influenced by and can contribute to impacts at other levels. Second, the framework allows contributions from different research streams (i.e., accounting, management and sustainability) to be synthesised. Third, the framework requires analysis of the links between context and outcomes (Hedström & Wennberg, 2017). This complements recent dynamic analysis of SMA processes associated with the introduction and use of SMA within organizations (e.g., Burritt et al., 2019). Finally, the framework requires activities at multiple levels to be linked, which helps to provide a comprehensive understanding of SMA and its role in corporate sustainability and sustainable development at larger scales. According to Hedström and Swedberg (1998), interactions between the different levels of business and society can be analysed in terms of contextual influences, activities that occur at the micro-level, and transformational change fostered by organizations (see Figure 1). The dark arrows in Figure 1 display links connecting macro- and meso-levels with the organizational micro-level where SMA is located.

Situational mechanisms (arrow a1 and a2 in Figure 1) describe the contextual and institutional-based processes affecting beliefs, motivations and actions of managers, linking macro- and meso-level conditions to the micro-level of the company.

Transformational mechanisms (arrow b1 and b2) explain individual and collective processes of organizations influencing networks and associations at the meso-level, as well as regulations, consumption patterns, life-styles and ecological phenomena at the macro-level. Arrow 'c' (action-formation) in Figure 1 represents SMA practices that are adopted at the micro-level. Micro-level SMA activities often result from situational pressures acting on the organization leading to meso and macro transformational change.

Situational links influencing SMA

Both the macro- and the meso-levels provide a situational context in which organizational actors operate and where changes take place slowly over time (e.g., Hernes, 1998). *Macro-micro links* are characterised by situational mechanisms influencing SMA through context (arrow a1 in Figure 1). Macro-level concerns about unsustainability can, for example, be related to the United Nations Sustainable Development Goals (SDGs) (UN, 2015), planetary boundaries (Rockström et al., 2009), specific global environmental problems such as the greenhouse effect, or social and environmental government initiatives at the national or supra-national levels. *Meso-micro links* (arrow a2 in Figure 1) are characterised by situational social mechanisms that capture the influence of networks on corporate adoption of SMA. Various societal actors, such as international organizations (Greenhouse Gas Protocol developed by the World Resources Institute, the World Business Council for Sustainable Development and the Global Reporting Initiative), sustainability-oriented business networks (Carbon Disclosure Project), and professional accounting organizations (e.g., Sustainability Accounting Standards

Board) propose approaches to monitor, measure, assess and report on corporate sustainability issues at the corporate level. This shapes the accounting and reporting context at the meso-level, having a substantial influence on the sustainability issues considered in corporate SMA (Nartey, 2018).

At the *micro-level* (arrow c 'action-formation' in Figure 1), entities apply, develop or refrain from using SMA. They mobilise resources and involve partners in the adoption and adaptation of information systems for sustainability (Melville, 2010; Seidel et al., 2013). The micro-level is also a key place where innovations emerge (Geels, 2002; Kemp et al., 2001; Smith & Raven, 2012). Organizations react to situational influences beyond organizational boundaries (Geels, 2010), including niche interactions with incumbents (Geels, 2019). As SMA requires new approaches and innovations different from conventional accounting, the micro-level is crucial for SMA research, experimentation and practice (e.g., Burritt et al., 2019), development of capabilities (Albertini, 2019) and competencies (Ascui & Lovell, 2012). New SMA approaches are developed through dedicated arrangements of actors, pioneering companies, external research projects and citizen's initiatives. Where companies see sustainability as a means to obtain benefit, the situational context is important for SMA development, but not always essential if managers have a well-developed social conscience.

Analyzing situational links between the macro-, meso- and micro-levels helps with understanding why certain SMA approaches emerge and how companies react to the broader business context. The potential contribution of SMA to creating solutions to planetary environmental and social challenges requires investigation of the transformational outcomes at the meso- and macro-levels (Loorbach et al., 2010) that result from SMA activity and adoption.

Transformational links of SMA influence

Sustainability transformations involve multi-party participation at different levels, akin to a transdisciplinary approach (e.g., Lang et al., 2012) to setting strategic long-term goals (e.g., Loorbach et al., 2010), experimenting with different situations and tools, and linking the long-term aims of the different parties with pragmatic short-term actions to achieve these (Rotmans et al., 2001). If SMA is to be effective in supporting improved management decisions then processes which create impacts at the societal meso-level of markets and networks (transformational link b2) as well as at the macro-level (transformational link b1), should be initiated in the corporation at the micro-level.

Transformational mechanisms linking the micro- and meso-levels of analysis address the influence of micro-level SMA development and use on networks, industry associations and markets at the meso-level. These links capture the influence of SMA adoption on establishing industry initiatives for SMA, sustainability-oriented industry associations, professional accounting organizations issuing reports on SMA, and sustainability awards (e.g., Hansen et al., 2010). Transformational links between micro-level development of innovative methods of SMA, with disseminating organizations at the meso-level, potentially play an important role in altering unsustainable practices and creating new, more sustainable professional and industry-based standards. These, in turn, can subsequently exert situational influence on the whole industry and economy towards sustainability.

Transformational mechanisms *linking micro- and macro-levels* of analysis address the involvement of SMA effects on wider global societal and planetary ecological areas and governments, with sustainable development as the ultimate goal. This link addresses, for instance, the influence of pioneer companies on regional and government programs and regulations as well as the contribution of SMA information to macro-level sustainability accounts.

For SMA to contribute to creating sustainable development requires situational and transformational links, between the corporation and the meso- and macro-levels, be addressed. To structure analysis of how SMA literature has addressed these links, a multi-level framework is adopted.

RESEARCH METHOD

Based on Tranfield et al. (2003), a systematic literature review was conducted to identify relevant prior research (Breslin et al., 2019). The method has been applied in sustainability, management (e.g., Moreno-Camacho et al., 2019; Vitolla et al., 2019) and accounting (e.g., Hansen & Schaltegger, 2016; Lavia López & Hiebl, 2015) research. The literature is organized using the multi-level framework originally proposed by Coleman (1986) and refined by Hedström and Swedberg (1998). The analysis of existing literature problematises key assumptions SMA research has adopted from conventional management accounting. It proposes a new Context, Action, Transformation (CAT) framework for SMA research and practice and suggests a new assumption on scope be adopted in future SMA research.

Table 1 lists the agreed search strings, combining text from Groups 1 and 2, applied to the titles, abstracts and keywords of research articles focused on environmental, social and sustainability accounting. Five commonly used databases (EBSCO Host-Business Source Premier (BSP); JSTOR; ScienceDirect; Scopus and Web of Science) were selected as different databases can lead to different themes

TABLE 1 Search strings for the systematic review

Group 1: Terms referring to SMA	
Carbon accounting	Sustainable cost management
Water accounting	Environmental cost management
Material flow accounting	Social cost management
Material flow cost accounting (MFCA)	Sustainability benchmarking
Biodiversity accounting	Environmental benchmarking
Social accounting	Social benchmarking
Environmental accounting	Sustainability budgeting
Environmental management accounting	Environmental budgeting
Sustainability accounting	Social budgeting
Sustainability management accounting	Sustainability key performance indicators
Ecological accounting	Environmental key performance indicators
GHG accounting	Social key performance indicators
Greenhouse gas accounting	Sustainability performance management
Energy accounting	Environmental performance management
Environmental management control	Social performance management
Social management control	Sustainable product design indicators
Sustainability management control	Environmental product design indicators
Sustainability control	Social product design indicators
Eco control	Sustainability investment appraisal
Sustainability balanced scorecard	Environmental investment appraisal
Environmental balanced scorecard	Social investment appraisal
Social balanced scorecard	Accounting for stakeholder
Sustainable decision-making	Accounting for human right
Environmental decision-making	Accounting for modern slavery
Social decision-making	
AND	
Group 2: Terms referring to entity	
Company	Firm
Companies	Organisation
Corporate	Organization
Corporation	Enterprise
Business	

Note: Each term in Group 1 is matched in turn with each term in Group 2 to capture combinations of terms in sustainability management accounting.

(Meho & Yang, 2007). Table 2 shows the search yielded 5456 articles to the end of 2019. The final number of articles for analysis, after data cleaning (as described) and adjustments, was 62 high quality peer-reviewed journal articles.

The goal was to include reviewed articles that address multi-level linkages with SMA. In the analysis of title and abstract, articles which only mention SMA issues at the margin, such as those dealing with broader corporate social responsibility issues, external communication, reporting and disclosure of sustainability aspects, were excluded. Furthermore, with the focus on for-profit companies, articles were excluded that examine an entire economy, local or regional areas, governments, municipalities, non-profits and public sectors. Likewise, articles dealing with sustainability accounting from an engineering perspective focusing on technical analysis or on different forms of sustainability accounting for ecosystems, forests or other natural habitats, were excluded to ensure a clear focus for the study. Intercoder agreement on the exclusion criteria was assessed using the Krippendorff α (Krippendorff, 2013; Lombard et al., 2002) based on a SPSS macro by Hayes and Krippendorff (2007). All four authors reviewed 30 randomly chosen articles and rated whether they should be included in the sample based on the exclusion criteria given above. The results were discussed to achieve agreement and then new sets of randomly chosen articles were rated until agreement by all authors was reached at the threshold of Krippendorff

TABLE 2 Derivation of publications included in the review

Database From origin to end 2019	EBSCO – BSP	JSTOR	Science Direct	Scopus	Web of Science	Total number
First scan – citations	*1687*	*37*	*543*	*2207*	*982*	*5456*
Data cleaning. Removal of duplicates and incorrect entries.	−476	−6	−397	−2	−763	−1644
Data cleaning. Adjustment to exclude non-scientific journal publications	−399	−16	−35	−544	−53	−1047
Data cleaning. Adjustment to exclude non-English articles	−111	−1	−0	−57	−44	−213
Articles after data cleaning	*701*	*14*	*111*	*1604*	*122*	*2552*
Exclusion of journals based on Australian Business Deans Committee quality criteria (English language level C peer-reviewed journal articles and above), cut off for minimum number of publications, and removal of non-accounting publications	−340	−8	−81	−951	−91	−1471
Articles after quality adjustment	*361*	*6*	*30*	*653*	*31*	*1081*
Removal of articles based on title and abstract	−320	−6	−23	−392	−22	−763
Articles subjected to full text review	*41*	*0*	*7*	*261*	*9*	*318*
Exclusion based on full text review	−38	0	−6	−207	−8	−259
Articles included after full text review	*3*	*0*	*1*	*54*	*1*	*59*
Expert recommendations						3
Total						*62*

Note: Columns show the number of publications.

α of 0.8 (Guthrie & Mathews, 1985). By applying the exclusion criteria to the titles and abstracts, a total of 763 articles was removed from the sample.

Despite a rigorous review of titles and abstracts, the full text analysis revealed that many articles did not have the desired focus on SMA. Therefore, the exclusion criteria mentioned above were also applied when reading the articles in their entirety. In the full text review, two authors searched for links to the meso level and two authors for links to the macro level while also assuring that all articles explicitly dealt with SMA. To double-check these results, the teams then reversed their focus. It was found that many articles mention a link to the macro or meso level. However, most papers address these links as a side concern, or use them to set the scene in relation to the specific accounting issue examined. Therefore, differentiation was made between articles that solely mention a link and those that deal with a link in depth. Only the latter are included in the final sample, to which three articles were added as a result of expert recommendation. In the full text review, 259 articles were excluded that did fit the exclusion criteria or had no meso or macro link. Only papers that explicitly considered situational or transformational links to and from micro- to meso- and macro-levels of analysis and deal with SMA are included in the final sample and are listed by number in the Appendix.

Finally, to conceptualise the analysis of the identified literature dealing with SMA links, a framework (see 'Discussion' below where the framework is proposed) was abductively developed in a continuous iteration between the data (the reviewed articles) and the theory that informed the analysis (multi-level perspective distinguishing social mechanisms).

FINDINGS AND ANALYSIS OF THE EXISTING LITERATURE

In total, 62 research papers were identified as thoroughly and explicitly addressing links between corporate SMA and meso- and macro-levels. Overall, more of these papers deal with situational (53 articles) than with transformational links (23 articles) and more discuss SMA links with the meso-level (55 articles) than the macro-level (36 articles) (Table 3).

Figure 2 displays each of the articles analysed mapped against the multi-level framework.

In relation to the multi-level framework in Figure 1 the set of articles addressing multiple links is analysed first for situational links and second for transformational links before a key underlying assumption behind all SMA literature is problematised.

Situational links influencing SMA practices

The systematic literature review serves first to identify situational influences linking macro- and meso-level

TABLE 3 Number of in-depth links addressed in the existing literature (some articles address several links)

Situational links (53 articles; 85%)		Transformational links (23 articles; 37%)	
Meso-micro situational	**Macro-micro situational**	**Micro-meso transformational**	**Micro-macro transformational**
(40 articles)	(25 articles)	(15 articles)	(11 articles)

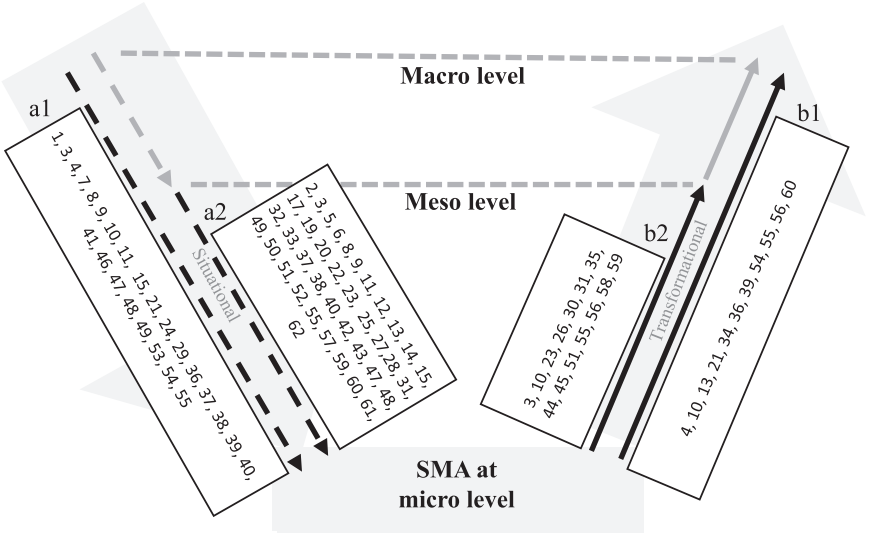

FIGURE 2 Literature mapped against the multi-level framework

contexts to SMA at the organizational level. Situational links (arrows a1 and a2 in Figure 1) describe how external issues influence whether, what and how organizations take-up and develop SMA. Table 4 provides an overview of different topics that have been specifically addressed in the accounting literature and explanations as to how they link either macro- or meso-levels with SMA at the micro-level.

Among the situational links to SMA, in the publications analyzed (Table 3), meso-level influences (40 articles) are considered more than macro-level impacts (25 articles). This reflects the importance of stakeholder relationships with industry associations, professional accounting organizations and sustainable business networks for introducing and developing SMA in organizations (e.g., Ascui & Lovell, 2012; Rodrigue et al., 2013). For example, Burritt et al. (2019), while mentioning macro topics briefly in the introduction, emphasise meso-level influences when explaining why and how a company started to engage with SMA. With few exceptions (e.g., Hörisch et al., 2015; Qian et al., 2018) the literature, while developing tools, processes and accounting systems for use by management, assumes that the application of SMA will (somehow) contribute to sustainable development (e.g., Atkinson, 2000; Hansen et al., 2010; Jalaludin et al., 2011), leaving the issue of scope to later research.

Publications at the *macro-level* informing situational mechanisms, which are discussed in the existing literature with regard to influencing SMA adoption and development in organizations, cover a *wide range of single influencing factors*, including regulations (e.g., carbon management accounting, to comply with the EU emissions trading scheme (ETS) (e.g., Ascui & Lovell, 2012), ETS related standards on how companies should monitor, collect and report carbon emissions (Stechemesser & Günther, 2012), international agreements such as the Kyoto protocol and related national and supra-national regulations shaping the introduction and design of SMA with regard to carbon accounting (Bui & Fowler, 2019), direct stakeholders of a company (e.g., Mokhtar et al., 2016), accounting standards (e.g., Zou et al., 2019), international organizations (e.g., Burritt and Christ, 2017) and business associations, media and NGO pressure (e.g., Wang et al., 2019).

Topics include the influence of global, large scale and national institutions on SMA. Most prominent are references to global ecological problems (Hartmann et al., 2013; Lee, 2012), planetary boundaries (e.g., Schaltegger, 2018), unmet societal needs (e.g., Bui & Fowler, 2019) as well as, more recently, the SDGs (Nartey, 2018). A large number of SMA publications (259) are framed adding just a few sentences on global environmental and social problems. Only 53 publications (e.g., Nartey, 2018; Scavone, 2006) analyze situational mechanisms in some depth. These papers examine whether and how scientific information about sustainability problems, national regulations (e.g., Bui & Fowler, 2019, on the link between European and New Zealand climate change policies and standards for corporate carbon accounting), supra-national agreements (like the EU ETS), SDGs, and others at the societal

TABLE 4 Situational links between macro- and meso-levels with SMA at the organisational micro-level

Macro → micro	Explanations and related concepts	Prominent authors and examples
Global ecological problems and unmet societal needs	Exceeding planetary boundaries and unfulfilled societal, non-market needs on a global, large scale regional or national scale such as contained in the SDGs, including poverty, hunger, quality education and gender inequality and concepts on planetary boundaries can influence the emergence and design of SMA approaches.	Planetary-boundary-oriented related EMA (Schaltegger, 2018). Human rights reports on the global situation encourage companies to create HR reports and HR management accounting (e.g., McPhail & Ferguson, 2016).
Global and government institutions and regulations supporting SMA	Regulations, political- and institutional-driven opportunities, including provision of educational programmes, and encouragement of SMA and reporting driving SMA.	Regulations requiring certain SMA approaches like carbon management accounting (Bui & Fowler, 2019; Hartmann et al., 2013) or preserving limited resources (Aladwan, 2018).
Meso → micro	**Explanations and related concepts**	**Prominent authors and examples**
Accounting institutions (rules, standards, etc.) facilitating conservation of the natural environment	Deals with institutions (e.g., accounting standards) enticing or forcing companies to take decisions to account for impacts on the natural environment and causing social problems.	EMA as a reaction to institutional pressures (Wang et al., 2019). Sustainability reporting guideline by the Global Reporting Initiative lists social and environmental issues and indicators, which are expected to be accounted for and continuously improved with the support of management accounting (Gibassier & Alcouffe, 2018).
Public concern provoking the introduction of certain SMA approaches	Deals with public, stakeholder and media pressure encouraging to account for environmental and social impacts.	Increasing public concern about climate change leads to proactive corporate environmental strategies to prevent pollution via development of management capabilities through new management control systems (Albertini, 2019).
Business and accounting networks disseminating and supporting SMA knowledge and applications	Deals with professional accounting organizations, industry associations and sustainability networks encouraging to account for environmental and social impacts.	The UN Division of Sustainable Development, the IFAC and ISO 14051 on MFCA promote development of resource efficiency (Zou et al., 2019). Business initiatives fostering the development of the GHG Protocol (Lee, 2012).

macro-level, influence the take-up and design of SMA. An increasing number of human rights related reporting requirements and regulations (e.g., the UK Modern Slavery Act and the US Dodd-Frank Act) has been addressed, creating the necessity for SMA to deal with social problems at the macro-level. While human rights reports on the global situation encourage companies to consider human rights aspects with SMA (e.g., Christ et al., 2019; McPhail & Ferguson, 2016) research is still challenged to develop more concrete social management accounting and encompassing SMA methods at the corporate level.

Situational mechanisms addressed in the existing literature *linking the meso- and micro-level* SMA adoption and development in organizations include the role of accounting standards facilitating conservation of the natural environment (e.g., Aladwan, 2018), professional accounting organizations promoting SMA (e.g., issuing guidelines, expert reports, opinion pieces) and business networks disseminating and supporting SMA knowledge (e.g., material flow cost accounting, Günther et al., 2015). For example, the Carbon Disclosure Project (CDP) has a framework and requests data on greenhouse gas emissions from companies, as published in CDP databases and reports (CDP, 2011). As the data is requested in a standardised format CDP influences corporate SMA at the micro-level and the way they collect, aggregate and report greenhouse gas information. CDP has a similar approach for water data influencing water management accounting at the micro-level (CDP, 2020; Christ & Burritt, 2017). Qian and Schaltegger (2017) provided empirical evidence that CDP disclosure requirements have led to improved corporate carbon management performance, and the influence of the GHG Protocol for accounting and reporting of greenhouse gases by corporations (GHG Protocol, 2004) on the adoption of

carbon accounting has been investigated empirically by various authors (e.g., Brander 2017, Bui & Fowler, 2019).

With regard to meso-micro-level mechanisms in different countries, Aladwan (2018) found that Jordanian chemical and mining companies started to work alongside governments to solve the side effects of environmental problems through adopting necessary accounting standards and legislation; Scavone (2006) considered internal reporting methods of Argentinian companies responding to the National Government Cleaner Production Policy.

A growing body of accounting literature has addressed or started to analyze what and how situational mechanisms influence the introduction and adoption of SMA. Being embedded in a societal, regulatory and natural environment, entities can and do react to situational mechanisms. However, neither managers nor companies react in a purely mechanical way to external influences. External pressure or incentives can be transformed in very different ways within the organization. To understand internal corporate processes better, the way in which situational influences are taken up and how SMA adoption and development takes place requires investigation of how SMA is applied at the corporate micro-level. While much SMA literature deals with specific SMA tools (e.g., MFCA, Nakajima et al., 2013; sustainability balanced scorecard, Hansen & Schaltegger, 2016) much less research analyzes processes of SMA development influenced by situational mechanisms or creating transformational processes. To develop recommendations for public policy and professional organizations regarding how to create effective support and framework conditions to foster corporate SMA, however, requires a better understanding of how SMA is adopted, used and understood at the micro-level. This type of SMA research is also relevant with regard to whether and how SMA development processes address transformational links to the meso- and macro-levels.

Transformational links of SMA fostering sustainable development

If companies and their SMA approaches are to foster sustainable development, then the transformational mechanisms linking the organizational micro-level of SMA with macro- and meso-level impacts must be effective. Only a small number of publications have addressed transformational links between SMA and meso- (15) and macro- (11) levels (Table 3). The development of innovative SMA methods, however, can only create recognisable sustainability contributions in industries and markets if disseminating organizations at the meso-level help change existing unsustainable practices and create new, more sustainable professional and industry standards. Whether companies can become drivers of sustainability transformations of markets and society and of standard setting, and whether SMA can be a helpful approach in this context, needs to be assessed with regard to the effects of SMA on macro-level sustainability goals such as planetary boundaries (Schaltegger, 2018) and the SDGs (Bebbington & Unerman, 2018). Table 5 provides a summary of topics about transformational links, which have been explicitly addressed in the existing SMA literature.

Transformational mechanisms connecting the micro-level of SMA involvement of organizations with the meso-level entails presenting SMA innovations with the aim of promoting SMA to create sustainability improvements for many actors (e.g., for involving stakeholders, see Hansen et al., 2010), of forming and supporting SMA networks (e.g., Rodrigue et al., 2013), of considering value-creating stakeholder partnerships in SMA (Mitchell et al., 2015), and of applying SMA with the goal of transforming markets and supply chains towards sustainable development (e.g., Koh et al., 2013; Moreno-Camacho et al., 2019; Schaltegger & Burritt, 2014; Spence & Rinaldi, 2014). The arguments examining use of SMA to help transform supply chains often reflects a relational view based on the importance of the supply chain to the social and environmental impacts of the business (e.g., Lee, 2012; Koh et al., 2013; Nakano & Hirao, 2011).

A prominent example of the influence of micro-meso transformational mechanisms is the development and introduction of the International Federation of Accountants (IFAC) guideline and the ISO 14051 standard on material flow cost accounting fostered by an increasing number of companies adopting material flow cost accounting (MFCA) (Jasch, 2008). MFCA was developed at the micro-level in transdisciplinary projects between universities, companies and consulting organizations (Herzig et al., 2012; Jasch, 2008), eventually promoted by a UN Division for Sustainable Development (DSD) project (UN DSD, 2001) in a workbook on environmental management accounting (EMA) and feeding into an IFAC guideline on EMA, particularly MFCA (IFAC, 2005). Later, driven largely by Japanese academics in collaboration with companies, the ISO 14051 MFCA standard (meso-level) was developed (Nakajima et al. 2015). In Japan, the ISO standard 14051 was at a later stage even taken up at the macro-level by the government and federal ministries (Kokubu & Kitada, 2015).

Micro-macro transformational mechanisms are notably underdeveloped in extant research. Mechanisms which are addressed in the existing accounting literature include fostering the transformation of micro institutions towards low carbon impact and sustainable development (Ascui & Lovell, 2012; Schaltegger & Csutora, 2012), supporting the creation of new regulations supporting the uptake of

TABLE 5 Transformational links between SMA at the organizational micro-level and macro- and meso-level contexts

Micro → meso	Explanations and related concepts	Prominent authors and examples
Presenting SMA innovations and transforming markets and supply chains towards sustainable development	Correcting market failures and changing market sensitivity through new accounting approaches, including what is understood by 'best accounting practice'. Companies with superior SMA methods can destroy existing conventional accounting patterns, and replace them with new ones. Examples include Puma, a company that applied a new accounting approach to assess environmental impacts in supply chains. This led to media reactions, and motivated consultancies to develop and disseminate similar methods to other companies.	Role of accounting in transforming supply chains (Burritt & Schaltegger, 2014; Spence & Rinaldi, 2014). Assessing the role of supply chains on broader stakeholder groups (Taplin et al. 2006). Applying and disseminating new accounting approaches by consultancies (Bradley et al., 2013).
Forming and supporting SMA networks and professional guidelines and norms	Creation of new SMA networks or SMA in existing networks, including professional accounting associations and support networks with new norms and guidelines. Examples include the uptake of Material Flow Cost Accounting by IFAC with a guideline. Another example is the development of the Greenhouse Gas Protocol by the WRI, WBCSD and GRI based on experiences in pilot projects at the corporate micro-level.	Roles for collaboration and boundary organizations in developing SMA for carbon (Ascui & Lovell, 2012), including the GHG Protocol (Lee, 2012). Importance of corporate community involvement in SMA (Hansen et al., 2010). Development of IFAC guideline on MFCA, initiated by academics and companies involved in pilot projects (Roy et al., 2013).
Value-creation stakeholder partnerships as a rationale for stakeholder inclusion in SMA	Value-creation stakeholder partnerships as a mechanism for the implementation of value-creation stakeholder accounting to develop and to communicate the knowledge required for decision-making. To better inform decision making accounting should create knowledge rather than just information. Knowledge considers application of information in the context of stakeholder partnerships.	Value-creation stakeholder accounting with stakeholder risk-sharing and partnerships as a rationale for stakeholder inclusion in SMA (Mitchell et al., 2015).
Micro → macro	**Explanations and related concepts**	**Prominent authors and examples**
Fostering the transformation of government institutions towards sustainable development	Company-lead promotion and diffusion of SMA on a large scale with governmental and societal implications. Also discussed as socio-economic transformations changing socio-economic conditions. Case studies aiming to encourage macro-level support for regulatory promotion of SMA.	Influences of companies sharing their SMA experiences to foster government policies (Schaltegger & Csutora, 2012). Clean Development Mechanism-related EMA contributing to the Philippines Development Plan (Burritt et al., 2009).
Creating new regulations supporting the uptake of SMA	Companies promoting and influencing governments to change existing accounting policies, norms and regulations.	Initiating the introduction of regulations on Material Flow Cost Accounting in Japan (Kokubu & Kitada, 2015).
SMA supporting to meet supra-national sustainability goals	Companies applying SMA to contribute to meeting the SDGs.	Research on linking accounting with SDGs (Schaltegger, 2018).
SMA contributing to solving large-scale sustainability problems	Companies and corporate foundations promoting and disseminating SMA to support solving global problems (such as related to planetary boundaries).	Importance of micro-level full cost accounting for macro-level sustainability improvement (Atkinson, 2000). Research encourages consideration of how SMA influences corporate externalities, particularly planetary boundaries (Gibassier & Alcouffe, 2018).

SMA (Burritt et al., 2009), the (potential) role of SMA to support companies in contributing towards the SDGs, and contributing to solving large-scale sustainability problems (Atkinson, 2000) such as developing an economy operating within planetary boundaries (e.g., Gibassier & Alcouffe, 2018).

An example of aiming to establish a micro-macro link by developing a transformational mechanism based on SMA information is the actions and advocacy of member companies of the Science Based Targets Initiative (Faria & Labutong, 2019). Each member company calculates the necessary greenhouse gas reductions to improve

corporate performance sufficiently to create an effective contribution to limiting global warming to below a 2°C increase and pursuing efforts to limit warming to 1.5°C.

Articles emphasizing the need to establish transformational links are mainly normative, argumentative and conceptual (e.g., Bebbington et al., 2020; Renaud, 2013). Few authors emphasise the need to establish a connection between SMA and planetary boundaries or the SDGs (e.g., Gibassier & Alcouffe, 2018), or provide a framework for how such an SMA approach could be structured (e.g., Schaltegger, 2018).

The literature review shows considerably more publications dealing with situational (85% of the sample) than with transformational links. This finding reveals a reactive approach of the existing sustainability accounting research. First, by focusing on how standards and guidelines at the meso-level can best be applied for internal purposes of the organization these research publications take a predominantly adoptive and internal view. Second, the small number of articles analyzing transformational links unveils that contributions to solving grand sustainability challenges are either assumed to happen automatically while focusing on internal processes, and therefore do not need to be investigated, or that they are ignored. Globally increasing sustainability problems and stakeholder pressure, however, challenge management ever more to measure and communicate whether corporate sustainability contributions are sufficient and effective. The findings reveal that SMA publications addressing situational and transformational links with the organizational micro-level have largely adopted the underlying assumptions of conventional management accounting. In particular, although the identified publications explicitly address links, the addressees and the scope of SMA are both considered to be internal. While SMA, as distinct from financial and other accounting systems, should serve different types of managers as internal addressees, in a world of increasing sustainability problems this can only be achieved if SMA considers linkages to meso- and macro-levels beyond organizational boundaries.

The next section discusses the results and problematises the assumption that the scope of SMA is internal.

DISCUSSION, PROBLEMATISATION AND FUTURE RESEARCH

Results of the systematic review of contextual and transformational aspects of SMA literature indicate a low take-up of research that considers linkages between SMA at the organizational micro-level with meso- and macro-levels (62 of 321 identified SMA publications).

This section reflects upon a main assumption in the literature about the scope of SMA. It argues for extending the scope of SMA beyond the internal, to go beyond organizational boundaries, discusses implications of such a change and proposes a new CAT (context, action, transformation) framework to organize SMA in line with the proposed extended scope.

SMA research opportunities addressing situational links

The emphasis on situational links in the existing literature can be seen as an *indication of a reactive perspective*, the introduction and adaptation of SMA under pressure from external influences. While reactive uptake of SMA could represent business practice (see Christ, 2014; Hartmann et al., 2013; Pondeville et al., 2013), it could also reflect what researchers expect from businesses. The results also indicate that research has adopted the assumption that SMA's scope is internal to the organization. Overall, the SMA research addressing situational links discusses consequences for SMA to support internal company process improvements. With this internal focus, the existing SMA literature has not explicitly analyzed how SMA could be developed to link situational influences with contributions of the company towards solving sustainable development problems beyond the organization's boundaries.

For example, in relation to the analysis of *macro-micro links*, current research does not investigate the role of government actions and the impact of government failure (Ekins et al., 2003) on SMA development. Government failure can range from maintaining the unsustainable status quo of political and societal contexts, to institutional voids (e.g., Doh et al., 2017). It includes bureaucracy failure, the politics of power and the focus on elections instead of solving sustainability problems. For SMA, government failure leads to accounting regulations which ensure that management is under-informed about sustainability crises (Maunders & Burritt, 1991). Although some authors mention government failure as a source of sustainability problems in their SMA-related articles (e.g., Milne & Grubnic, 2011; Nartey, 2018), the topic has not been analyzed in depth in relation to situational influences on SMA. Of recent interest is that government regulations, such as policies and regulations introducing a Circular Economy (e.g., EC, 2020a, 2020b), could be analyzed in relation to how moves towards a Circular Economy could help foster SMA.

Only a few publications have started to address links between SMA, the UN SDGs (e.g., Bebbington & Unerman, 2018) and other international agreements (e.g., Kyoto and Paris GHG protocol), although the macro-level can, and

increasingly does, require certain topics to be considered in SMA (e.g., the US Dodd-Frank Act or UK Modern Slavery Act with regard to human rights issues in supply chains; e.g., Silva & Schaltegger, 2019).

Also, not addressed in depth with regard to the uptake and design of SMA is the influence of macro-level accounts on the global state and deterioration of the natural environment (e.g., the WWF living planet report; WWF, 2018) as well as reports on key global social problems of humankind (e.g., Walk Free Foundation, 2018) shaping the understanding of managers, employees and stakeholders about whether and how their company operations and products relate to large-scale sustainability problems. Likewise, the influence of EU policy aiming to foster a circular economy has not been investigated in depth in the SMA literature although it shapes the macro business environment of companies operating in the EU in relation to material flows, waste streams, reuse and recycling (EC, 2020a, 2020b), and explicitly requires monitoring, tracking and tracing of material flows at the corporate micro-level.

In relation to *meso-micro links* market failure could also be investigated with regard to meso-micro link consequences for SMA. While international and national accounting institutions mostly neglect market failure and developing markets for renewable energy, new regulations such as emissions trading and carbon compensation, are creating additional needs and incentives for companies to consider SMA. Existing research mentions market developments such as a growing demand for carbon neutral products (Milne & Grubnic, 2011), but does not analyse how these situational influences could inform SMA to account for transformational sustainability contributions of products.

With the exception of Ascui and Lovell (2012), also not addressed is the influence of voluntary accounting standard setters on SMA. These include the International Accounting Standards Board (IASB), Financial Accounting Standards Board (FASB), Sustainability Accounting Standards Board (SASB) and accountancy professional bodies such as the International Federation of Accountants (IFAC), the Chartered Institute of Management Accountants (CIMA) and the Association of Chartered Certified Accountants (ACCA). In addition, research on links between the UN reports directly addressing SMA (UN DSD, 2001, 2002) as well as GRI and IR voluntary standards for external reporting and SMA have yet to be closely examined.

Another underexamined *situational mechanism*, linking meso- with micro-levels of SMA, is expectations and influences of societal stakeholders (Silva et al., 2019) and *social movements* as 'purposive and collective attempts of a number of people to change societal institutions and structures' (Sine & Lee, 2009, p. 123). Apart from recent social movements, such as the 'Fridays for Future' movement, various environmental and social networks have addressed partial aspects of SMA, like the Earth Day movement (www.earthday.org), the International Women's Day and call to action (www.internationalwomensday.com), and the Ecological Footprint Network (www.footprintnetwork.org; Dao et al., 2018). As there is no in-depth discussion of such movements with regard to their influence on SMA future research could investigate how they constrain, enable and shape measures and themes used in corporate SMA practices.

SMA research opportunities addressing transformational links

While the small amount of SMA multi-level research focuses on contextual regulations and guidelines, it is apparent that few studies require SMA to account for transformational sustainability contributions of companies.

At the *micro-macro level*, few publications address links between SMA and the impact on specific environmental outcomes beyond the organizational boundaries (e.g., Hörisch et al., 2015; Qian et al., 2018), and none of the identified SMA publications deal with *how effective the application of SMA methods is in meeting social goals*. For example, while the Science Based Target Initiative aims to establish direct links between corporate greenhouse gas emissions and global warming goals, with one exception (Faria & Labutong, 2019), the link between different SMA approaches and contributions to combatting global warming has not been analysed. Instead, the scope of SMA research is restricted to specific internal issues, such as energy and material flows (Dunuwila et al., 2018), health and safety (Jasch & Lavicka, 2006), water (Christ & Burritt, 2017), biodiversity (Siddiqui, 2013), waste (Fakoya & van der Poll, 2013) and their measurement to support different types of managers. While reducing material flows, saving water and avoiding waste are all seen in the analysed literature to make important contributions to reducing the environmental burden of corporations and their products, there is no guarantee that these activities necessarily or inevitably lead to sufficient improvement at the societal or ecosystem level.

At the *micro-meso level*, with regard to transformation, the small number of publications touching upon mechanisms linking SMA and the meso-level of analysis includes the connection of SMA with supply chains (e.g., Moreno-Camacho et al., 2019; Schaltegger & Burritt, 2014; Spence & Rinaldi, 2014). Arguments reflect a relational view based on importance of the supply chain to the social and environmental impacts of the business (e.g., Nakano & Hirao, 2011; Lee, 2012; Koh et al., 2013). Measuring sustainability

impacts of the supply chain is a key area in which SMA could create transformational impacts (e.g., Beske-Janssen et al., 2015; Moreno-Camacho et al., 2019), yet, research is still needed to develop effective SMA approaches for doing so.

SMA and *stakeholder engagement* (Burritt & Schaltegger, 2010) has commenced through publications on accounting for stakeholders and shared-value creation (e.g., Harrison & van der Laan Smith, 2015; Mitchell et al., 2015, Hörisch et al., 2020). These articles could provide a basis for exploring the importance of SMA for stakeholders in transformational processes. The research would need to find SMA approaches that aim at creating sustainability improvements for many stakeholders. Apart from the challenge to create value for both companies and society, developing SMA would also have to discuss how creating improvements of two or more sustainability aspects could be achieved (e.g., combined biodiversity and poverty improvements pursued by different stakeholders).

SMA and *micro-macro links* are hardly touched upon in the existing sample of publications, again presenting opportunities for future research, for example, SMA and gender equality and global poverty. As most of the research literature has focused on specific internal issues in the organization (e.g., material flows) other important impacts of the company or its products with regard to the grand picture of sustainable develop as expressed in the UN SDGs or the planetary boundary concept may be missed.

Finally, only three articles address both, the meso- and macro- situational and transformational levels of analysis. Nevertheless, detailed analysis of these articles reveals that the levels are addressed separately and that the interaction between transformative influences of SMA on the meso-level with possible subsequent influences on the macro-level has not been investigated.

Problematizing the internal scope assumption of SMA

Management accounting by definition has internal organizational addressees. Furthermore, it has been based on the assumption that the purpose of management is to increase profits by optimizing organizational processes (e.g., innovation, production, logistics) and therefore has an *internal scope* (Horngren, 2004). Likewise, the review of SMA literature reveals an internal scope with an *implicit separation of the recognition of external context from the development of internal SMA methods*. It may appear paradoxical that publications mentioning links to meso- and macro-levels beyond the organizational boundaries imply that the scope of SMA should be on issues internal to the organization. Such an internal focus of SMA, however, can be explained by the adoption of the internal scope assumption of conventional management accounting. As a result, only a few of the publications addressing multi-level issues (e.g., Gibassier & Alcouffe, 2018; Schaltegger, 2018) have explicitly considered that SMA should extend the accounting scope beyond organizational boundaries. With the shortage of research which looks beyond the assumed internal scope of SMA the issue needs to be problematised (Alvesson & Sandberg, 2011). Results from the SMA literature contrast with strategic, sustainability-oriented management literature. This literature emphasises that companies are embedded in a business environment and should consider stakeholders, regulations and guidelines in their decisions, including internal management decisions (e.g., Antolín-López et al., 2016; Baumgartner & Rauter, 2017; Hörisch et al., 2014).

The existing SMA literature has so far invisibly adopted the assumption of an internal scope by focusing on optimizing company production processes, material and energy flows and investments. This implies the SMA focus is on helping to develop the organization towards its own sustainable development. However, as sustainable development is a normative societal vision, to help towards achieving this vision, SMA needs an enlarged scope that considers influences from and on the outside as well as impacts of the organization within its boundary (Schaltegger & Burritt, 2017; Schaltegger, 2018). Such an extension of the scope of SMA is also in line with the transformation necessities identified in the sustainability transition literature (Loorbach & Wijsman, 2013; Williams & Robinson, 2020).

As long as SMA continues to adopt the conventional management accounting assumption of an internal scope it reinforces the view that internal optimisations will suffice to meet external expectations about contributions towards sustainability. SMA based on the internal scope assumption of management accounting results in managers being ill-informed about sustainability relevant issues, with the effect that SMA does not support broader transformational change. If SMA is to contribute to the societal vision of sustainable development it should be designed with the purpose of supporting managers in creating external contributions of organizations to sustainable development of markets, society and the natural environment. The question of whether planned and achieved sustainability improvements are sufficient to achieve effective contributions to sustainable development at the global macro-level, therefore, needs to be brought into the focus of SMA.

The next section proposes a new assumption and goal for SMA that addresses the identified multi-level links between SMA and sustainable development for which the literature review has been a catalyst.

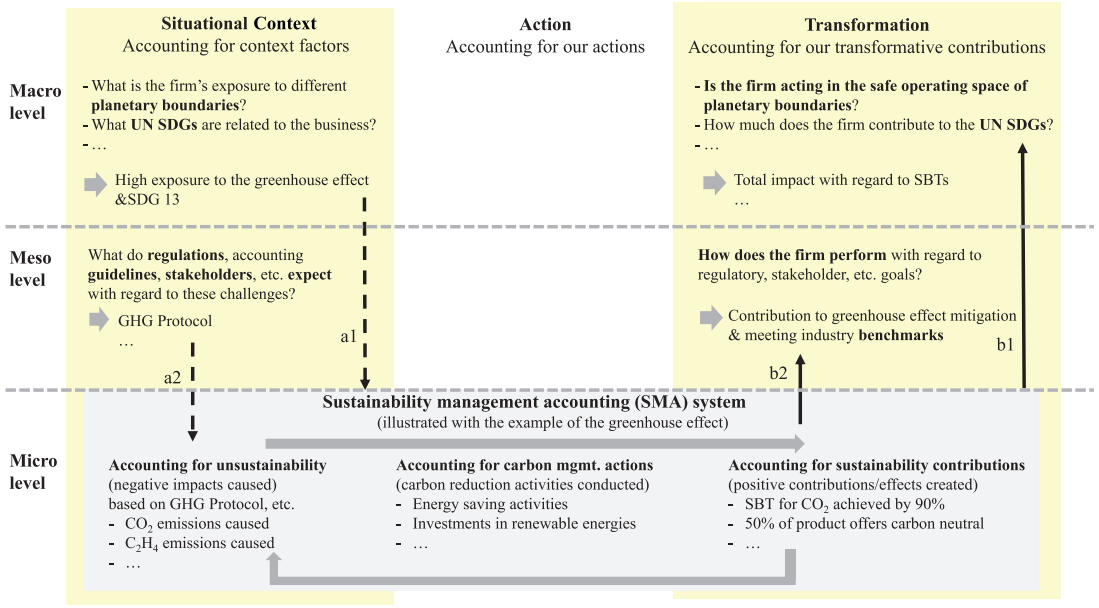

FIGURE 3 CAT framework for SMA [Colour figure can be viewed at wileyonlinelibrary.com]

CAT framework to organize SMA

The embeddedness of organizations in meso- and macro-level contexts as well as the inevitable influence of organizations on these levels requires management to be better informed with SMA about how situational topics and mechanisms can intrigue sustainability management of the business, and how the effectiveness of the organization's contributions to sustainability transformations can be measured and communicated.

To conceptualise the analysis, a framework was abductively developed in a continuous iteration between the data (the reviewed articles) and the theory that informed the analysis from a multilevel perspective. Based on analysis of the existing literature, and by referring to the social mechanisms framework that distinguishes situational (context), action-formation and transformational mechanisms, a CAT (context, action, transformation) framework to reorganize SMA is proposed as follows (see Figure 3):

a. *Context*: Performance is achievement in relation to certain expectations or goals. Managing performance therefore requires being informed about external requirements and expectations. To contribute to sustainable development first requires an understanding of scientific and societal requirements from the macro-level of analysis (e.g., planetary boundaries) as well as stakeholder expectations expressed in regulations, guidelines and standards at the meso-level (left side of Figure 3). As sustainability is a complex, multifaceted vision with many different goals a structured account of what is expected is needed. Knowledge about stakeholder expectations is a prerequisite to perform according to expectations as well as to create legitimacy (Deegan, 2002). SMA is therefore challenged to provide answers to the *key context question, what is the organization's exposure to macro-level requirements and expectations such as planetary boundaries or the UN SDGs (link a1 in Figure 3)?* If, for example, a company is particularly exposed to climate change, the subsequent key question for SMA is whether it sufficiently takes the respective context factors into account. SMA can create related meso-level information (link a2) about societal expectations, regulatory requirements, guidelines and standards (e.g., GHG Protocol) as well as heat wave or water scarcity (forecasts) faced by the company. At the micro-level of the organization, the proposed purpose of SMA accounting for context factors is to take account of potential unsustainability of the company with regard to these contextual expectations. SMA could, for example, account according to the GHG Protocol standard for the current negative impacts of the business (e.g., CO_2 and C_2H_4 emissions caused).
b. *Action*: SMA for the company's actions is what current research literature has mostly focused on. *The key question to be answered by SMA for management actions includes what social and environmental activities are conducted with what immediate economic (e.g., costs of investment in energy saving devices), social (e.g., safety improvement at working place) and environmental implications (e.g., energy savings achieved and carbon emissions reduced)?* Research and practice offer

multiple SMA methods, such as material flow cost accounting, safety and environmental investment appraisals. While internal actions in the organization have been the main focus of most SMA methods so far, the existing approaches have considered context with regard to the expectations of the own actions only partially. Implementation of material flow cost accounting in line with the ISO 14051 standard (Kokubu & Kitada, 2015), or developing carbon accounting with regard to regulatory requirements of the EU Emissions Trading Scheme, have been investigated (Ascui & Lovell, 2012). Explicit links to whether planetary boundary conditions or UN SDGs are considered (e.g., in MFCA) and what consequences need to be drawn for benchmarking, goal setting, etc. has only more recently been addressed as a requirement and needs further development of SMA with regard to creating contributions to sustainability transformations beyond organizational boundaries.

c. *Transformation*: The assumption that internal improvements in an organization will invariably lead to sustainability, has been questioned in the existing literature (Gray, 2010), but it has not informed research into how SMA could be further developed to ensure effective sustainability contributions beyond the organization. Whether and to what extent the company contributes to societal and scientifically developed environmental goals is, however, crucial information managers need to develop a sustainable business (Hörisch et al., 2014). SMA is therefore challenged to create information to answer the *key transformational question, how does the company contribute to sustainable development beyond its organizational boundaries; that is, a sustainable development of supply chains, markets, society and the natural environment?* Sustainable entrepreneurship literature suggests that organizations can contribute to sustainable development (Sheperd and Patzelt, 2011) and further sustainability research has frequently called managers to think about such effects of their activities on the macro- and meso- levels (Johnson & Schaltegger, 2020). SMA needs to be linked as explicitly as possible to key sustainability concepts such as planetary boundaries and the SDGs which relate to social, economic and ecological conditions beyond the confines of the organization. To assess whether the business contributes sufficiently to sustainable development therefore requires measurement and disclosure of the negative and positive sustainability impacts and contributions of the organization to networks (guideline development, standards development), markets (sustainability change of markets and consumption patterns), society (change of life styles) and the natural environment.

The CAT framework has various intended methodological implications for SMA, including: the necessity for backcasting from macro-level sustainability problems for benchmarking purposes in SMA; a focus on management guidance, integrating different sustainability issues to ensure comprehensive contributions to sustainable development; and moving from ex post-tracking to future-oriented action and transformation:

Backcasting to develop benchmarks. Backcasting rather than forecasting has been proposed in the sustainability science literature (Holmberg & Robèrt, 2000) to create a database and goals with regard to achieving sustainable development. Backcasting aims to calculate the necessary reductions at a global scale to stay in the limits of a 2-degree Celsius increase to global climate, and it can be broken down for industries and individual companies (e.g., Schaltegger et al., 2017). This shows the amount of greenhouse gas emissions an individual company must reduce to be in line with an economy operating within planetary boundaries. Such alignment of sustainability accounting and benchmarking with macro-level planetary boundary targets serves to establish micro-macro-level transformational mechanisms, which may help managers to set and achieve the goal to transform the own company to be in line with planetary boundaries. With regard to planetary boundaries, the Science Based Target Initiative (https://sciencebasedtargets.org/) provides a novel approach providing macro-level benchmarks establishing a link between SMA and the 1.5-degree Celsius goals of the Paris agreement to combat climate and to create meaningful informational value for manager.

Management guidance in addition to transparency. Creating transparency has been highlighted in the existing literature as a key goal for social, environmental and sustainability accounting (e.g., Gray 1992). Much of the literature has also addressed reporting as an important aspect of sustainability accounting (e.g., Adams, 2008; Antonini & Larrinaga, 2017; de Villiers & Sharma, 2020). However, while transparency certainly has its value to inform management and stakeholders, to create awareness about problems, challenges and changes (whether improvements or deteriorations), transparency alone does not lead to management actions and sustainability transformations. As the Volkswagen 'diesel gate' case has shown, excellent reporting practices (e.g., Isenmann et al., 2007) are neither sufficient to motivate nor to guide managers to create excellent environmental and social performance with regard to the grand sustainability challenges relating to planetary boundaries and the SDGs. In spite of that, empirical research shows that, on average, improved disclosure quality leads to improved environmental performance of large companies (Qian & Schaltegger, 2017). Sustainability accounting that supports management to

make better decisions with regard to sustainability needs to provide guidance with regard to macro-level sustainability challenges. This research suggests to investigate whether a new type of report – a *'Corporate Sustainability Transformation Statement'* could provide more guidance to managers to bridge the gap from SMA at the organizational micro-level to meso- and macro-levels. Recent global warming literature has touched on such an approach at the facilities level for companies operating in Australia (Australian Government, 2020), but such an approach has not been proposed for the corporate level, so far. Such a sustainability transformation statement could foster SMA projections with regard to meso- and macro-level action and transformational aims, and would also involve audit and assurance for such a new statement.

Integrating different sustainability issues to develop comprehensive contributions to sustainable development. Integrating social, environmental and economic perspectives remains somewhat abstract and insufficiently tangible for most managers in corporate practice. Furthermore, material flow management and accounting still does not provide information about whether the improvements achieved create trade-offs between different global sustainability goals. For example, the reduction of greenhouse gases by means of planting trees (Bastin et al., 2019) may contribute to combatting climate change and may be achieved in a socially and economically beneficial way. However, the means chosen to achieve this climate-related goal could potentially impact another planetary boundary: biodiversity (Veldman et al., 2019). From an overarching sustainability perspective, integration thus has a new meaning beyond the 'environmental-social-economic'. Sustainability accounting research and practice is challenged to develop approaches to measure and assess crossing and side-effects between different SDGs as well as between different planetary boundaries.

Moving from ex post-tracking to future-oriented action and transformation. Social and environmental accounting and reporting largely focus on the provision of past data to external parties, but communication in this way does not lead to action per se. While SMA, as with all management accounting, has so far focused on accounting using past and contemporary data to assist managers with decision making, taking actions leading to transformations towards sustainability would necessarily be concerned with data about the future.

This analysis of the existing SMA literature also has implications for research beyond the accounting discipline. Analyses on how well SMA supports managers and organizations to create effective sustainability contributions also becomes important for *research on sustainable entrepreneurship* (which assumes that social and green entrepreneurs can contribute to sustainability transformations of markets and sustainable development of society; e.g., Hockerts & Wüstenhagen, 2010). Only if entrepreneurs contribute effectively to meso- and macro-level transformations the promises of sustainable entrepreneurship hold true.

For *innovation management*, questions of fostering SMA dissemination in organizations to translate context changes into organizational processes and structures and to understand how situational mechanisms and related management actions help transforming organizations may be of particular interest. Silva et al. (2019) suggest to involve stakeholders in the assessment of sustainability performance to overcome the situation that most practitioners find the sustainability assessment and measurement approaches proposed in the research literature of little practical value and therefore do not apply them in practice. This raises the question how SMA could be further developed as an approach that involves stakeholders in assessing context factors and in contributing to sustainability transformations.

Policy and governance research could examine the effectiveness of different macro- and meso-level contexts and situational mechanisms on SMA introduction and adoption. For the last decade, various publications in the general corporate sustainability and corporate social responsibility domain have addressed the political role of companies and how companies can try to motivate business associations, influence regulations (Marques, 2017). The purpose of corporate political activities is to influence or create the future situational context through legislation for other companies to adopt a certain sustainability approach or issue as well. The accounting literature, however, has not dealt in depth with how SMA could contribute to the political role of companies in fostering sustainability transformations of professional accounting and business associations, markets or regulations.

CONCLUSION

SMA research has large development potential, both with regard to methods as well as dissemination. Analysis of the existing research literature on SMA suggests that innovation potential could be unleashed by reframing the role of *SMA based on an extended scope that* explicitly addresses context and transformational contributions, and links them with the organization's activities as proposed with the CAT framework.

Most social, environmental and sustainability accounting publications are focused only on the organizational level. While this focus is understandable, it has been criticised for many years as being too narrow (Marland et al., 2015; Milne, 1996; Stechemesser & Günther, 2012). In

corporate practice, reference points to assess an organization's sustainability performance are either past emission levels, own reduction goals, the industry average or best practices (Bradley et al., 2013). Such information, however, does not tell us anything about whether the respective reductions are sufficient to achieve SDGs or be in line with an economy operating in the safe space of planetary boundaries. Corporate sustainability includes contributing to sustainability transformations not just of the organization but also of markets at the meso-level and sustainability transformations of society at the macro-level (Patterson et al., 2017). Until now, practically no methods have been proposed as to how to broaden the management accounting scope including linkages to the meso- and macro-level in an effective way, which would be meaningful for company managers with regard to their job duties at the organizational level and create effective contributions to sustainability transitions beyond organizational boundaries. Accounting research is therefore challenged to develop innovations that enable SMA to translate situational influences on the organization and its management accounting to transformational contributions that support sustainable development.

The intended implications of the CAT framework for SMA include the necessity for backcasting from macro-level sustainability problems for benchmarking purposes in the organization with SMA to explicitly consider the organization's embedding in society and the natural environment. In addition, the implications include the need to integrate different sustainability issues to ensure comprehensive contributions to sustainable development, and moving from ex post-tracking to future-oriented action with the framework's focus on management guidance towards creating effective contributions to sustainability transformations.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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