

Isensee, Carmen; Teuteberg, Frank; Griese, Kai-Michael

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CASE STUDY

How can corporate culture contribute to emission reduction in the construction sector?

An SME case study on beliefs, actions, and outcomes

Carmen Isensee^{1,2}  | Frank Teuteberg² | Kai-Michael Griese¹

¹School of Business Management and Social Sciences, University of Applied Sciences Osnabrück, Osnabrück, Germany

²Department of Accounting and Information Systems, Osnabrück University, Osnabrück, Germany

Correspondence

Carmen Isensee, School of Business Management and Social Sciences, University of Applied Sciences Osnabrück, Caprivistr. 30A, Osnabrück 49076, Germany.
Email: carmen.isensee@hs-osnabrueck.de

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Abstract

In the race against climate change, small and medium-sized enterprises (SMEs) play a fundamental role. To clarify the contribution of corporate culture to SMEs' emission reduction, three perspectives can be useful: corporate culture as driver and barrier, current and planned corporate culture development actions, and the corporate culture profile as an outcome. As the first application of the extended Belief-Action-Outcome framework, this single case study exemplifies the role of corporate culture in an SME from the steel construction and manufacturing sector in Germany. The investigated SME has achieved emission reduction while increasing its revenue and is an early adopter of sustainable and digital development. The rich insights from an employee survey, semi-structured interviews, observation, and document analysis allowed us to outline an informed approach toward corporate culture development that emphasizes vision development of the desired corporate culture and the role of information systems for promoting emission reduction.

KEYWORDS

belief-action-outcome framework, corporate culture, digitalization, emission reduction, sustainability culture, sustainable development

1 | INTRODUCTION

The global climate crisis urges businesses to reduce their emissions, especially greenhouse gas emissions (GHG). Often, it is emphasized that businesses need to measure, reduce, and report their emission reduction for processes associated with direct and high levels of GHG emissions, such as decarbonization of logistics or energy savings in production. Political agendas, such as the European Green Deal, as well as specific initiatives, such as the global small and medium-sized enterprise (SME) climate hub initiative, draw attention toward SMEs' responsibility to reduce GHG emissions.

Corporate culture underpins a company's emission reduction achievements (Baumgartner & Zielowski, 2007). It has the potential to

influence corporate members' understanding of climate change and their motivation to consider emission reduction in their decision-making and behavior (Kaesehage et al., 2014). An open-mindedness of corporate culture toward emission reduction can also support bottom-up sustainability measures (Kiesner & Baumgartner, 2019). Nonetheless, the emission reduction debate in the SME context insufficiently considers cultural meanings, such as values and beliefs (O'Brien & Wolf, 2010; Persson et al., 2015). Instead, recent works discussed SME specific policy programs (Johansson et al., 2019) and stakeholder pressure (Kowalczyk & Kucharska, 2020) as success factors of SMEs' emission reduction. At least the COVID-19 lockdowns have stimulated the debate about emission reductions for knowledge work (El Geneidy et al., 2021), drawing attention toward the environmental

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footprint of digitalization disrupting the working world. Consequently, the aim of achieving emission reduction should be institutionalized within all business functions and processes, that is, aligned with corporate culture.

The construction sector in Germany plays a vital role in the race against climate change. Germany accounts for 14 per cent of direct CO₂ emission of the EU-27 construction sector (Huang et al., 2018, p. 12). The rate of employees in construction as a share of all jobs in all industries in Germany amounts to 5.8% (Eurostat, 2021). Stricter regulations and rising CO₂ prices in Germany require businesses to rethink their business models (Dullien et al., 2021). Ideally, they would develop a culture with a long-term orientation that institutionalizes emission reduction as a basic assumption (Kucharska & Kowalczyk, 2019; Löbbecke et al., 2019). Based on these insights, a central research question arises: How does the corporate culture of SMEs in Germany contribute to emission reduction in the construction sector?

The overall aim of this study is to clarify the contribution of SMEs' corporate culture to emission reduction. For investigations of the role of corporate culture for achieving specific outcomes, single case study research is particularly useful (Pathirana et al., 2020). Consequently, a single case study research design allowed us to exemplify how beliefs and actions associated with corporate culture underpinned emission reduction as an outcome in a steel construction SME in Germany (Isensee et al., 2020; Melville, 2010). More specifically, we identify cultural success factors and barriers, hence revealing where open-mindedness of the corporate culture toward emission reduction is present and where it is not (Baumgartner, 2009, 2014). In considering the environmental and digital orientation of the corporate culture, we outline the role of information systems (IS) for an informed corporate culture development (Isensee et al., 2020).

2 | THEORETICAL BACKGROUND

Corporate culture can be defined as “a pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (Schein, 2004, p.18).

In focusing on the problem of emission reduction, this article adds to the literature on sustainability-oriented corporate culture, which has acknowledged the role of corporate culture for sustainability for more than 20 years (Caldera et al., 2019; Chen, 2011; Galpin et al., 2015; Harris & Crane, 2002; Linnenluecke & Griffiths, 2010). As a specification, Ambekar et al. (2018) developed eight categories of a carbon culture. Based on an investigation of manufacturing SMEs in Germany, Löbbecke et al. (2019) established a strong energy efficiency culture as a normative ideal and target. To illuminate how SMEs can live up to these envisioned corporate culture profiles, this study builds on theoretical propositions described in more detail in the following emphasizing that for clarifying the contribution of corporate culture to emission reduction, it is necessary to consider cultural layers and dimensions, the openness toward emission reduction, and include

perspectives of subcultures. Such an approach offers a path toward the identification of cultural success factors and barriers.

Corporate culture is multi-layered and multi-dimensional (Isensee et al., 2020; Schein, 2004). Schein (2004) differentiates three levels, namely artifacts, espoused beliefs and values, and basic underlying assumptions. Through a systematic literature review on the relationship between corporate culture and SMEs' sustainable and digital development, Isensee et al. (2020) identified eight central dimensions (attitudes, values, ethics/norms, strategic orientation, internal capabilities, management/leadership, pro-environmental behavior, collaboration).

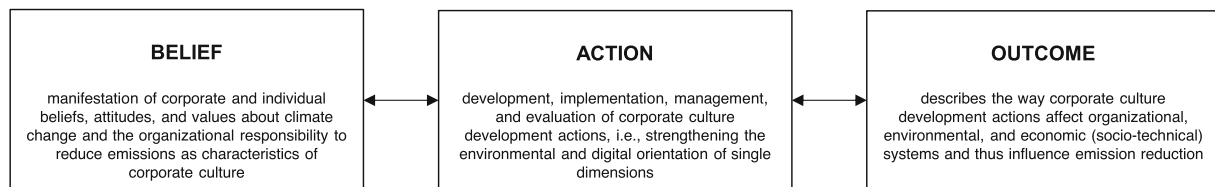
Corporate culture can be open-minded or defensive regarding sustainable development (Baumgartner, 2014). From their investigation of nine SMEs, Kiesner and Baumgartner (2019) concluded that open-mindedness toward sustainable development and top-management support are necessary for integrating sustainability on operational, strategic, and normative management levels.

Corporate culture is characterized by subcultures (Linnenluecke & Griffiths, 2010; Sugita & Takahashi, 2015). In spite of this, early works often focused on SME owner-managers, especially how their attitudes would influence the adoption of environmental practices (Battisti & Perry, 2011; Cassells & Lewis, 2011; Reyes-Rodríguez et al., 2016; Testa et al., 2016). In their qualitative investigation, Kaesehage et al. (2014) revealed the influence of climate change knowledge, personal values, and the identity with the place the company is operating in on UK business leaders' decision-making. This limited perspective represents a top-down implementation logic for emission reduction measures. In contrast to this, the framework for greening corporate culture by Harris and Crane (2002) considers whether managers perceive emission reduction as relevant (depth) and whether this belief is spread throughout the whole organization (diffusion). This focus on employees for the development of an environmental orientation within the corporate culture is manifested in Green Human resource management (Ansari et al., 2021; Chaudhary, 2020). Hence, researchers should also consider employee perceptions (Kucharska & Kowalczyk, 2019).

Previous works in the construction or manufacturing sector demonstrate the usefulness of layers and dimensions as a path toward the identification of cultural success factors and barriers (Bulińska-Stangrecka & Bagieńska, 2021; Caldera et al., 2019; Wong & Zapantis, 2013). By measuring corporate culture along seven dimensions (sense of community, strategic orientation, leadership, team collaboration, communication, team structure, informal relationships), Bulińska-Stangrecka and Bagieńska (2021) found a significant influence of corporate culture on the conservation of energy and other natural resources in the manufacturing sector. Other works identified values (Williams & Schaefer, 2013), goal clarity, rewards, innovation orientation (Wong & Zapantis, 2013), integrity (Mohter & Fernando, 2020), and acceptance resulting from awareness and interest in climate adaptation measures (Griese et al., 2021) as cultural success factors of emission reduction. In contrast to this, Kowalczyk and Kucharska (2020) could not find a significant influence of corporate culture (awareness, beliefs and values, strategy, training) in the manufacturing industry. We conclude that studying corporate culture along cultural dimensions

TABLE 1 Theoretical frameworks on the relation between corporate culture and emission reduction

Framework/theory	Description	Adaptation in previous works	Adaptation in the present paper
Hofstede's culture dimensions (Hofstede, 1980)	Four dimensions describing national cultures (power distance, uncertainty avoidance, individualism–collectivism, masculinity–femininity)	e.g., Kucharska & Kowalczyk, 2019	–
Three levels of organizational culture (OC) (Schein, 2004)	Artifacts, espoused beliefs and values, basic underlying assumptions as three interdependent levels of OC	e.g., Baumgartner, 2009; Baumgartner & Zielowski, 2007	–
Four culture types of the competing values framework (CVF: Cameron & Quinn, 2011)	A 2 x 2 matrix based on the orientation (internal vs. external) and external influences (integration vs. differentiation). Emerging culture types: 1. Adhocracy culture 2. Clan culture 3. Hierarchy culture 4. Market culture	e.g., Sugita & Takahashi, 2015 Extension by Ambekar et al., 2018	Challenging the gap detection approach toward culture change suggested by Cameron and Quinn (2011) through introducing the envisioning of the corporate culture beyond the current corporate culture as a central element for achieving emission reduction through OC.
Belief-Action-Outcome (BAO) theory (Melville, 2010)	The influence of information systems (IS) on sustainability on micro- and macro-levels is explained through the relation between beliefs, actions, and outcomes.	Extension by Isensee et al., 2020	<ul style="list-style-type: none"> • Adaptation of BAO pillars to exemplify the role of corporate culture in the investigated company • Adaption of extended BAO logic → environmental and digital orientation of corporate culture affects emission reduction • Extension: cyclical process of informed corporate culture development actions

**FIGURE 1** Corporate culture as integral part of the three BAO pillars. Simplified BAO model with a focus on the role of corporate culture within the pillars (adapted from Isensee et al., 2020) as a relevant theoretical framework for the present case study. BAO, Belief-Action-Outcome

proposed by Isensee et al. (2020) provides a valuable contribution for promoting emission reduction in SMEs.

Furthermore, cultural dimensions and layers can inform corporate culture development. According to Baumgartner and Zielowski (2007), emission reduction should be integrated with the three levels by Schein. The model for building a culture of sustainability by Galpin et al. (2015) establishes a hierarchy between mission (top layer), values, goals, and strategy. What is missing is a path toward the derivation of company-specific actions based on single cultural dimensions.

Table 1 compiles frameworks on the relation between corporate culture and emission reduction or environmental sustainability in general. Isensee et al. (2020) established corporate culture as an integral element of all pillars in the Belief-Action-Outcome (BAO) framework (Melville, 2010) (Figure 1). The process logic of the extended BAO

framework supports our research aim. It draws attention to the relationship between beliefs, attitudes, values, actions, and outcomes in the context of sustainable, digital development. For example, within the construction sector, the belief about the causes of climate change (natural vs. man made) significantly influences the perceived need for change regarding emission-reduction measures (Morton et al., 2011). Stewart and Gapp (2014) showed that reflective and cyclical learning can support the necessary internalization of beliefs, values, and actions underpinning sustainable management practices. Furthermore, BAO theory suggests that a simultaneous consideration of sustainable and digital development is advisable. The extended BAO framework also considers that the digitalization of the working world influences corporate culture. From this, we derive two specific study aims focused on theoretical generalization (Yin, 2018):



1. apply the extended BAO framework to a best practice SME in the context of emission reduction and
2. outline an IS-supported corporate culture development approach as a specification of the action pillar.

3 | METHODOLOGY

We used an embedded single case study research design, which is appropriate for investigating exploratory questions of “how” (Yin, 2018), including the role of corporate culture for achieving specific outcomes (Pathiranage et al., 2020). Triangulation enhanced the validity of our findings (Yin, 2012, 2018). To include employee perceptions (Kucharska & Kowalczyk, 2019), we conducted a company-wide survey (ES) followed by semi-structured interviews with change agents, as investigating language use presents one approach to understanding corporate culture (Alvesson, 2013). Document analysis of physical/cultural artifacts and a site visit provided additional data sources.

3.1 | Case description

In line with our research question, the role of corporate culture in emission reduction in a best practice SME from the construction sector in Germany forms the contemporary phenomenon of interest. For our investigation of different units of analyses, we subdivide corporate culture as an object of study according to the previously described theoretical propositions. Regarding the *belief* pillar, our case covers beliefs about the environmental and digital orientation of eight cultural dimensions (Isensee et al., 2020), the company's environmental (and social) responsibility, the (future) role of corporate culture, the connection of emission reduction and digitalization, and the need for change. Regarding the *action* pillar, we cover environmental protection measures, the use of digital technologies, and corporate culture development actions (Isensee et al., 2020). Regarding the *outcome* pillar, we cover the corporate culture profile (subcultures, cultural success factors and barriers) and the company profile, especially the environmental performance (emission reduction) and changes to the organizational structure related to corporate culture development.

3.2 | Company selection

Specific characteristics of a best practice SME allowed us to gather rich data and apply the extended BAO framework. The investigated SME is a second-generation family firm operating in steel manufacturing and construction with a turnover of 67 million Euros employing around 240 employees. The core activities cover the whole hull construction, especially for industrial halls and logistics centres. This includes statics and design (including building information modeling [BIM]), manufacturing of steel trusses, steel erection and construction supervision. The variety of business functions, day-to-day routines

and working environments provides the diversity in perspectives required to identify subcultures instead of analyzing a supposedly unified corporate culture (Linnenluecke & Griffiths, 2010). Besides the owner-managers, different positions and departments are implicitly entrusted with tasks related to corporate culture development. Furthermore, various actions indicate that the company shows a long-term orientation culture, which most SMEs still need to develop to enhance sustainability (Kucharska & Kowalczyk, 2019): The preparation of the first sustainability report in 2016 without legal obligation; the aim to set emission reduction targets with a growing experience in managing climate-relevant emissions; the promotion of commute to work by bike; the participation in a research project on artificial intelligence (AI) in construction.

3.3 | Data collection and analysis

With the ES conducted in August 2021 online and in paper, we assessed beliefs about the manifestation of the environmental and digital orientation within the eight dimensions of corporate culture in SMEs (Isensee et al., 2020) on a 5-point Likert scale (Appendix A). We calculated and visualized item totals across respondents. To assess respondents' needs and wishes regarding the environmental and digital orientation of the corporate culture, we used open ended questions. $N = 33$ corporate members from different business functions and hierarchy levels completed the ES. For data analysis, we used SPSS statistics.

On November 3, 2021, the lead author and a student assistant made a site visit. It included a supervised tour through the office buildings and the production site, two group and two single semi-structured interviews. The interviews (Appendix B) allowed us to better understand culture development actions (including success factors and barriers) from the perspective of change agents for sustainable and digital development (named as such in the ES), including their relation to emission reduction. On average, the interviews lasted 42 min. All interviews were transcribed verbatim and coded using QDA miner.

To analyze the data (Table 2), we used pattern-matching (Yin, 2018). More specifically, we compared the case study evidence with the predicted relations between the BAO pillars (Isensee et al., 2020; Melville, 2010). In the report of the results, we first provide a description of each BAO pillar using narratives, diagrams, and quotes. Then, we summarize evidence underpinning the relation between the pillars, relying on interpretation where necessary.

4 | FINDINGS

4.1 | Beliefs

Apart from the weak beliefs about the need for change, most espoused beliefs appear as a cultural success factor for actions resulting in emission reduction (outcome).

TABLE 2 Overview of data sources for triangulation

Data source	Description
Employee survey (N = 33)	
ES	Assessment of personal interest in environmental protection and digitalization; confrontation with environmental management and digitalization in day-to-day work; beliefs about the environmental and digital orientation of the corporate culture; acceptance/perceived usefulness of digital technologies for promoting pro-environmental behavior; desires/wishes
Semi-structured interviews	
GI 1	Group interview (N = 3) with a focus on the environmental and digital orientation of the business and the role of corporate culture
GI 2	Group interview (N = 3) with a focus on the connection between digitalization and sustainability
I1	Single interview with a focus on the potential and role of corporate culture in organizational change processes (including sustainable, digital development)
I2	Single interview with a focus on the connection between digitalization and sustainability, digital orientation of corporate culture
Observation (supervised tour)	
F	Field notes (memos, observation protocols)
Document analysis	
W	Company website
D1	Sustainability report 18/19
D2	Application for sustainability award
S1	Award study (2011)

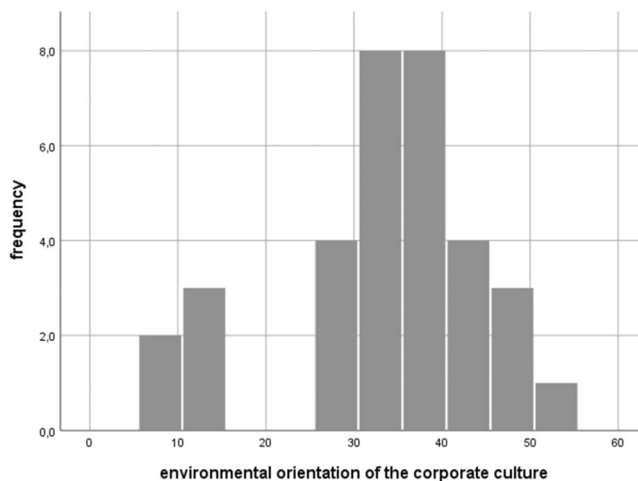


FIGURE 2 Beliefs about environmental orientation of the corporate culture (N = 33). Index of environmental orientation based on 16 items rated on a 5-point Likert scale by N = 33 participants. Medium = 33.52; SD = 11.52

criticisms about the environmental impact of the steel industry, the company wants to ensure that employees interpret their work as an activity through which they make a positive contribution (purposefulness).

4.1.1 | Beliefs about the environmental orientation of the corporate culture

As displayed in Figure 2, company members assessed the environmental orientation differently (avg. = 33.52, SD = 11.52). Hence, company members hold different beliefs about the environmental orientation of the corporate culture.

4.1.2 | Beliefs about the company's environmental (and social) responsibility

The materiality assessment lists regional engagement as very important issue (S1). From the interviews, we learned that change agents believed that the company has a high environmental and social responsibility, that environmental sustainability is related to digitalization, and that corporate culture plays a central role in change management, including the institutionalization of pro-environmental behavior. For example, the respondents in GI1 discussed that the new working world and environmental challenges require a new perspective on the role of the company in society and the meaning of work. In answer to

4.1.3 | Beliefs about the (future) role of corporate culture (metaphors and visions)

To refer to corporate culture, participants in GI1, I1, and I2 used the metaphor of a guardrail. The following statements reflect the belief that this guardrail would create the inter-organizational community life ensuring that employees accept changes with a positive environmental impact they might not fully agree with personally.

“That these are such firmly prescribed guardrails within which you move. And from that, a corporate culture, a communal, internal life is shaped.” (I1)

“The users who complained about having to keep running still do, but they accept it as God given because the guardrails are just that, there's only one printer left on each floor.” (I2)

The following statement stipulates that corporate culture as a guardrail is dependent on guardrails provided by the wider organizational context and would translate these guardrails into corporate behavior. As external factors, respondents mentioned the policy environment, the social debate about the environmental impact of the construction sector, and changes in the working world, including increasing HomeOffice, other forms of mobile working and the reorganization of offices (Boland et al., 2020).

“But to achieve this, certain guardrails must also be made narrower from the outside so that people can live with this. Yes, that would be my wish.” (GI1)

“The wheel is turning in the furniture industry, too. This working world is turning completely...” (G1)

Beliefs about the influence of the overall changing working world on corporate culture underpinned vision development of the future role of corporate culture for achieving emission reduction. One respondent envisioned corporate culture as an early warning mechanism enabling an agile reaction to emerging cultural barriers.

“What we really need is a barometer of the mood, which is updated on a daily basis ... And we have to shoot a different question through the company every week, along the lines of: Do you like your work? What do you think of the working atmosphere? Do you have any special requests? That you are always up-to-date and immediately sense certain tingling tensions, where you can then counteract them relatively agilely. Because doing that every two years, that is no longer contemporary.” (G1)

Another vision concerned the allocation of resources (time and money) for living the corporate culture outside the work environment. This was based on the belief that greater team coherence would improve and ensure an effective and collaborative organization of work and thus promote the institutionalization of pro-environmental behavior (outcome), including the acceptance of sustainability measures. Through the reorganization of working hours into hours determined for (a) fulfilling operational tasks and (b) living corporate culture beyond the operational context, that is, teambuilding through shared leisure time, corporate culture would stretch more into employee's private life. One participant shared the following idea:

““And the company invites us because we have worked really well this week, and that in a minimum period.’ That means that I also see it like this: The people then only work a maximum of 30 h a week, have the same amount of money, and we as a company promote the other ten hours, so to speak, which they are no longer here, but where they can also live their corporate culture very well.” (G1)

4.1.4 | Beliefs about the relation between emission reduction and digitalization

It appears that company members widely believe that digital technologies enable pro-environmental behavior. They are open to use respective tools (ES, Figure 3). Interview participants were aware of the potentials of big data use in BIM (construction planning phase) (Ding et al., 2020; Oesterreich & Teuteberg, 2016) for emission reduction in construction.

“For windows, for example, there are so-called K values, where you can then, if you really have the building here in the 3D model, (...) run a calculation

program, so to speak, and see what heating the room needs. Or, if I use a different wall construction, I may not need as much heating load and so on. So, you can now calculate all these things digitally.” (G2)

4.1.5 | Weak beliefs about the need for change

As a main barrier, the lack of openness for change among employees was mentioned in the open questions (ES) and all interviews. A potential explanation for this is that those employees not open to change either do not believe that climate change is man-made, or do not share the organizational belief on the company's (and their individual) emission reduction responsibility espoused by change agents (Morton et al., 2011).

4.2 | Actions

Assuming that actions influence beliefs, the insights on the role of environmental protection and digitalization in daily working routines supplements the analysis of corporate culture development actions.

4.2.1 | Environmental protection and use of digital technologies

The company employs different measures to increase energy efficiency of office buildings and production sites (e.g., solar panels and LED lamps) and shifted toward electric mobility. Furthermore, environmental protection and digitalization influence working routines across different business functions (Figure 4). In other words, most employees are confronted with these subjects through work tasks. While the overall relevance is lowest in production, the use of digital technologies for process optimization is rated highest in production. Two robots were introduced recently. During the time of the investigation, an enterprise resource planning (ERP) system was being implemented.

4.2.2 | Corporate culture development

In addition to corporate culture development actions assessed in the ES (Figures 6 and 7), the interviews revealed further actions planned or implemented by individuals (predominantly top-management): cultural house rules with bold comparisons of environmental impact of daily actions as a wakeup call for environmental issues (in planning) (G1); sustainable by default settings through a follow-me-print system (I2) (nudging: Byerly et al., 2018); in-house marketing (G2); employee involvement (e.g., digital scout project for trainees) (G1 + 2); employees-educating-employees program (G2); external knowledge assimilation through participation in networks (G2) and research projects.

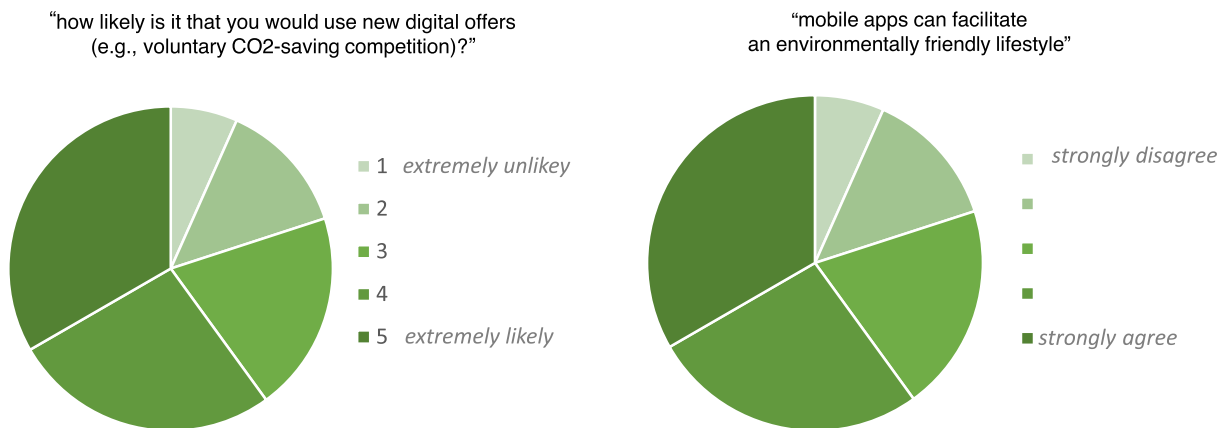
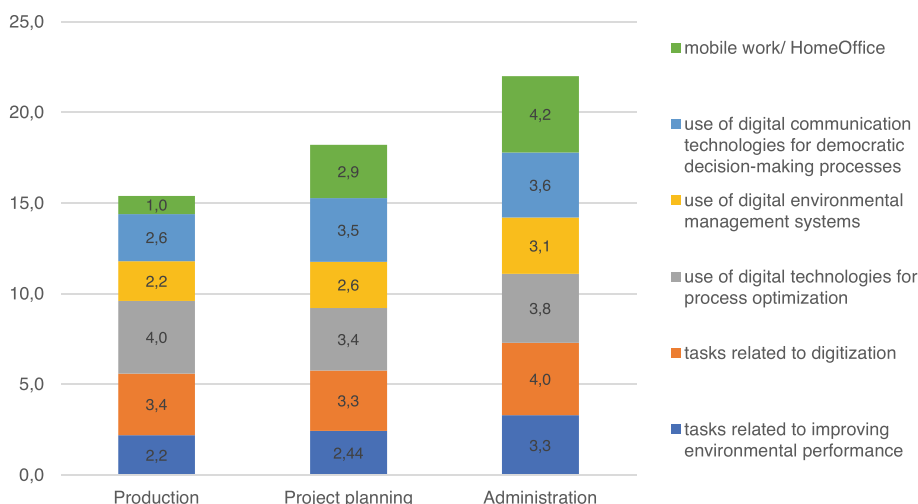


FIGURE 3 IS adoption as accepted approach to strengthening the environmental orientation (N = 33). IS, information systems [Colour figure can be viewed at wileyonlinelibrary.com]

FIGURE 4 Relevance of environmental protection and digital technologies in daily working routines. Items were assessed on a 5-point Likert scale. Values are item averages. Group sizes: n_{Production} = 5; n_{Project planning} = 18; n_{Administration} = 10 [Colour figure can be viewed at wileyonlinelibrary.com]



Actions, such as default setting or commitments (pledges), aim to nudge employees toward pro-environmental behavior without forcing or incentivizing respective behavior (green nudging: Byerly et al., 2018). This is congruent with the metaphorical understanding of corporate culture as a guardrail. Following the successful paper reduction through the follow-me-print system, the company could set more sustainable defaults or adapt other nudging principles aiming at emission reduction. For example, feedback in the form of a metaphor for a healthy natural environment realized within an app can positively affect energy saving behavior at the workplace (Oppong-Tawiah et al., 2020).

4.2.3 | Insufficient corporate culture development actions

There are different indicators for an insufficient diffusion (Harris & Crane, 2002) of the environmental and digital orientation between hierarchy levels and departments. First, there is a difference between the visionary top-management team and the lack of openness for

change among employees. Only those entrusted with environmental protection or digitization tasks were mentioned as change agents. In other words, no employee from a lower hierarchy level could distinguish oneself as a climate champion beyond required work tasks, yet. Second, while change agents adapt a low hanging fruit approach regarding sustainability measures, these often simple and therefore theoretically easily replicable measures are insufficiently communicated. Hence, employees are insufficiently engaged in the development of measures. In fact, the promotion of pro-environmental behavior at the workplace was one of the least rated items (Figure 7). Employees expressed the wish for “a detailed explanation for the whole theme of sustainability” (ES), including advice on the meaning and realization of pro-environmental behavior that could be integrated into everyday life. E4 reflected:

“That’s where I’m hoping to get a few suggestions ... on how to bring this cultural change across the board. Because it doesn’t work just ‘because the management wants it,’ that is, top down with a watering can.” (E4)

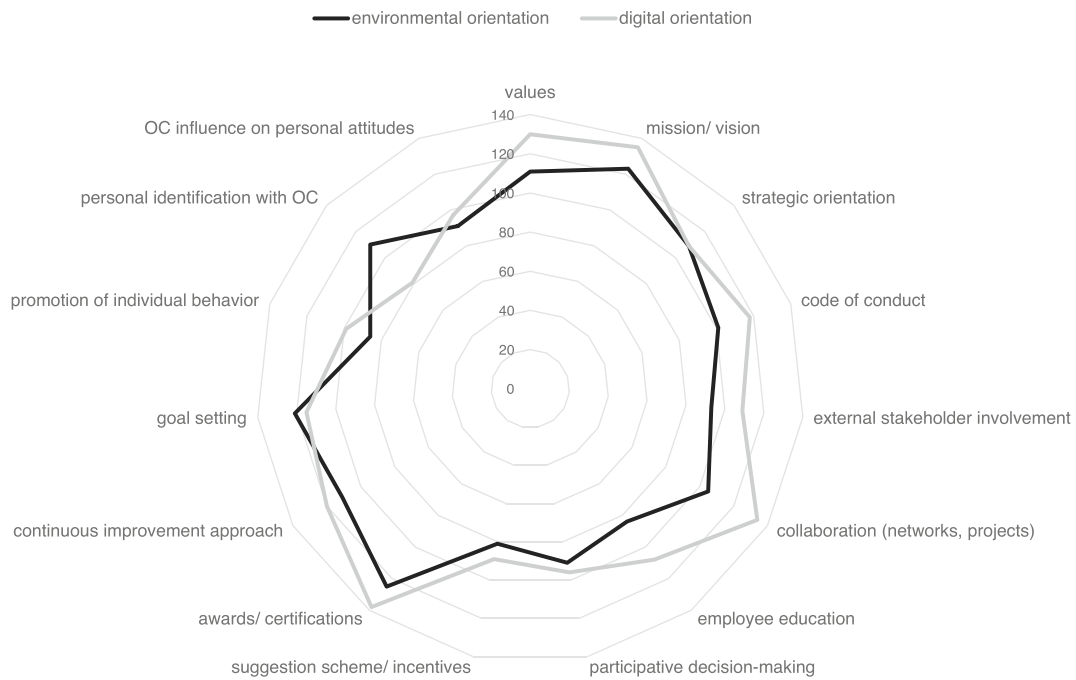


FIGURE 5 Corporate culture profile and beliefs (environmental and digital orientation). Based on employee survey (N = 33). Items were rated on a 5-point Likert scale



FIGURE 6 Top 5 (upper) organizational behaviors representing the corporate culture. Based on ES (N = 33). Bars represent item sums across all participants. Items were rated on a 5-point Likert scale [Colour figure can be viewed at wileyonlinelibrary.com]

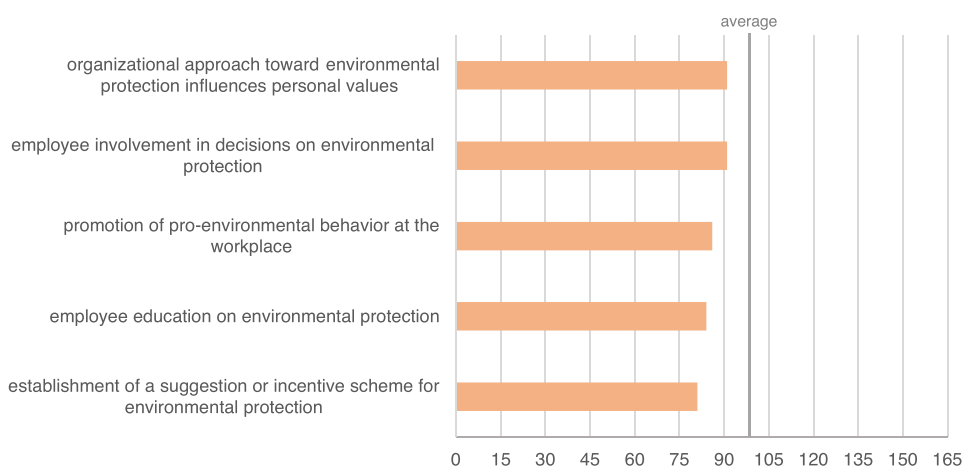


FIGURE 7 Top 5 (lower) organizational behaviors representing the corporate culture. Based on ES (N = 33). Bars represent item sums across all participants. Items were rated on a 5-point Likert scale [Colour figure can be viewed at wileyonlinelibrary.com]

The insufficient communication and knowledge management (Figure 7), including the missing integration of the numerous official and unofficial communication channels, such as an information board in the production hall, e-mail communication, or chats, was mentioned as a main barrier in the interviews and the ES (including open questions). One participant reflected:

“... we have felt ... 20 channels of communication, that are currently being used in a way, consciously and unconsciously. And if it's just the office grapevine and the rumor mill ... You have to start there and see how you can channel that.” (I1)

Similarly, the missing suggestion scheme for sustainability measures poses the risk of thoughts and ideas, for example on reducing emissions on a small-scale, petering out (I2). While the recent establishment of a project exchange with universities (I1) indicates an awareness of the need to more proactively initiating ideas, this still overlooks activating potentials from within the company.

“That gives me an idea. Tomorrow we have another Jour Fix about the management systems ... We wanted to set up the environmental protection team. ... And now I have an idea. Thank you for pointing that out. Maybe we should stick the resource savings of the week for the next year as a heading on the company, so that everyone is asked to simply make a suggestion, even if it is so small.” (GI1)

Two major challenges inform the necessity for setting up an IS-supported communication channel and suggestion scheme for emission reduction. The lack of access to computers among workers in production, the high-sound volume in the production hall (F), and different mother tongues and cultural backgrounds (where things might have different meanings or weight) hamper the spontaneous exchange of ideas. Managers are considering the employment of digital platforms such as the intranet or employee apps (I2). Initially, these seem widely accepted (Figure 3).

4.3 | Outcomes

4.3.1 | Corporate culture profile

The synthesized corporate culture profile (Figure 5) reveals that overall, corporate members perceive the environmental and digital orientation of the corporate culture as relatively strong. The digital orientation is a little stronger along all items, except for the personal identification with the digital orientation and goal setting.

The presented evidence points toward potential antecedents for the emergence of subcultures. These include diverging beliefs about the environmental orientation, work tasks, hierarchy levels, and cultural backgrounds. From the analysis of the beliefs and actions, main

cultural success factors in the investigated company include beliefs about the company's environmental responsibility and different culture development actions, such as the creation of vision statements addressing the environmental responsibility. Furthermore, the SME shows a high capability to connect visions with strategy. Lack of openness for change among employees, insufficient knowledge management and communication, and exploitation of digital technologies for these purposes, as well as insufficient diffusion of an environmental and digital orientation throughout the business (differences between subcultures) constitute main barriers. Figures 6 and 7 highlight the top 5 (lower vs. upper) company actions related to corporate culture and environmental protection (including emission reduction) based on the ES.

4.3.2 | Company profile: An early adopter of sustainable and digital development

From 2018 to 2019, the company increased its revenue by 20 per cent while maintaining a 100 per cent recycling rate and reducing CO₂ emissions by 3.4 per cent. The company assesses the ecology (e.g., energy consumption, emissions, resources, and recycling), the economy (e.g., finances), innovation (e.g., digitalization), and social aspects (e.g., compliance, demographic change, and regional engagement) with high materiality. ISO 1401 und ISO 18001 guide the environmental management. We also noted an increasing integration of environmental sustainability and digitization. For example, the BIM department investigates ways for improving the collection, storing, and processing of data to enhance the environmental performance in construction (e.g., Ding et al., 2020; Oesterreich & Teuteberg, 2016). Since 2015, the company achieved, or was nominated for, various digitization and sustainability awards.

Regarding changes to the organizational structure, it is noteworthy that a new position entrusted with the task of aligning reorganized processes with the organizational structure and the necessary digital tools (strategic IT management) in close coordination with the owner-managers was established in 2019. A trainee position with a focus on data and process analysis was created in 2021. Besides employing and maintaining software, the BIM department is also responsible for training engineering office employees as the first two BIM-coordinators.

4.4 | Relation between beliefs, actions, and outcomes

4.4.1 | Influence of beliefs on actions

The biennial strategic vision development process involving company members from different hierarchies and business functions appears as a major corporate culture development action. The following statement exemplifies the profound influence of the discursively developed belief about the purpose of a company on this process.



“Then we took half a day off ... and discussed and philosophized about what the purpose of a company is. Is it to make more and more profit ...? Or is it something else? Is it rather that the employee can go home in the afternoon and say: ‘Okay, I have now done something for ... the cause, or done something for the institution’? ... And I think this discussion was then ... sustainable, ... the vision creation, because we then suddenly had a completely different basis to find and formulate our vision sentences for 2028, 2030 accordingly. And that means that we somehow set the compass needle from northwest to northeast all at once” (G11)

Furthermore, the belief about the environmental responsibility influenced the creation of green cultural artifacts, such as vision sentences on CO₂ neutral construction solutions. One participant explained:

“So, here in the company, we have set up ... the classic business and cultural vision. And in addition, we have ... spoken out in favor of ecology with guidelines for a culture of change. The defined theses were subsequently sharpened and examined: Where is there a part where, from our point of view, the topic of sustainability and ecology can flow in today? ... And if you see our vision at the entrance..., you will also find a reference to the topic of sustainability where it fits and also belongs” (I1)

4.4.2 | Deriving required actions from beliefs

Beliefs, especially about corporate culture (metaphors and visions), provide a starting point for corporate culture development. For example, the guardrail metaphor (balancing the establishment of rules or defaults that would promote emission reduction and maintaining freedom of organizational members in structuring and organizing their work) suggests that the company should enhance employee capabilities to exploit their flexibility within the guardrails for pro-environmental behavior created by top-management.

“But to do that, we first have to define the guard rail at another level: What do we want to implement? What is feasible? Because the employee at the bottom of production always asks: ‘...When did you do it, when will you be done?’ ... So we also have to manage to prepare this for the employee in this guardrail and then transform it down to the bottom in terms of the language and the benefits. That’s how I can win the employee over for it.” (I1)

Furthermore, the early warning mechanism vision (allowing the timely detection of emerging cultural barriers of emission reduction)

and the expressed vision of more effective self-structuring of work to earn time for living corporate culture suggest that the capability building also needs to address the recognition and naming of time wasters. The following statements entitle the inefficient communication channels and lack of communication rules as such time wasters.

“And I would like to see us have, for example, a working time model where each employee only has to work six hours a day, or four to six hours, but achieves the same output, because they are able to structure themselves” (G11)

“A lot of time is also wasted, so to speak. And these time wasters are also the responsibility of management, but ... the employee also knows best: What I’m doing right now is absolute nonsense. My manager just told me to do it, but to be quite honest, I have to interrupt my work process right now.” (G11)

“But don’t put ten people on cc somewhere and think that someone will sort it out.... Those are time wasters.” (G11)

4.4.3 | Challenging beliefs through actions

The ES revealed a correlation of company members’ personal interest in environmental protection and digitalization ($p < 0.001$; $r = 0.520$). To exploit the influence of the increasingly digitalization of the working world on corporate culture (Boland et al., 2020) the company should institutionalize an integrative view on the employment of digital technologies and environmental protection (including emission reduction). The company can take different actions to achieve this. First, the potential influence of employed digital technologies, for example the use of robots in production (I2) or virtual reality glasses in distribution (G12), on environmental protection should be questioned. Second, corporate culture development along the cultural dimensions (Isensee et al., 2020 p. 2) should explicitly consider the institutionalization of the integrative view. For example, the dimensions point toward vision and strategy development and the enhancement of awareness and knowledge (internal capabilities) on the integrative view. Third, IS can help disseminate beliefs about the complementarity of digitalization and environmental protection partly acknowledged by change agents.

4.4.4 | Translating outcomes into means for strengthening beliefs and actions

To accelerate beliefs and actions underpinning emission reduction, we see potential in translating outcomes into means. In one example regarding the changes in organizational structure (company profile): The new role as a BIM-coordinator extends the task description of

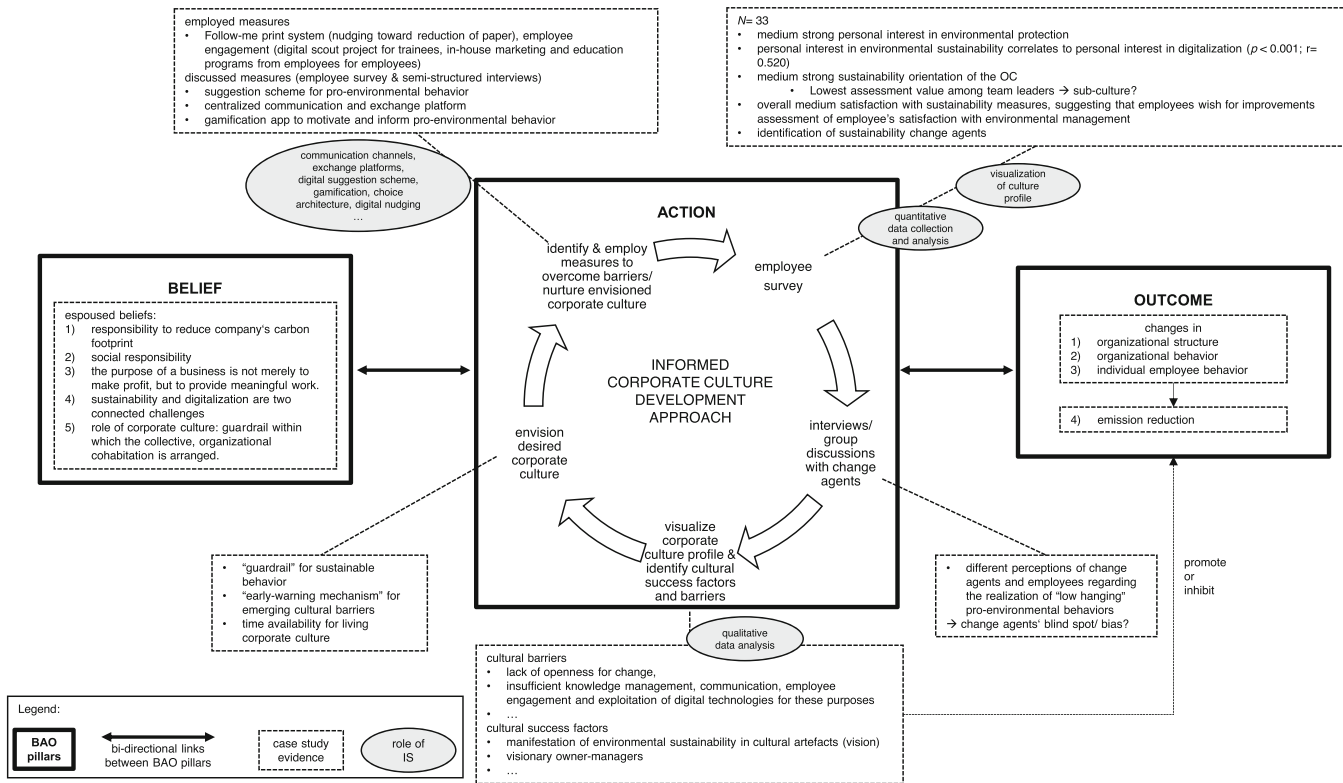


FIGURE 8 The role of corporate culture for achieving emission reduction exemplified along the BAO pillars. BAO Pillars adapted from Melville, 2010 and Isensee et al., 2020. BAO, Belief-Action-Outcome

engineering office employees. The company could now use the insights gained in this process to develop a program for institutionalizing the integrative view on the employment of digital technologies and environmental protection among all engineering office employees. In other words, the task description of the BIM-coordinators should explicitly cover corporate culture development actions underpinning emission reduction.

5 | DISCUSSION AND CONCLUDING REMARKS

5.1 | Key findings on the contribution of corporate culture to emission reduction from three perspectives

This study clarifies how corporate culture of SMEs in Germany can contribute to emission reduction in the construction sector. The value lies in the exploration of a best practice SME and the first application of the extended BAO framework (Figure 8). Hence, the results should motivate SMEs to consider corporate culture as an integral element of emission reduction (Isensee et al., 2020). To facilitate this, we differentiated three perspectives along the BAO pillars and highlighted their interactions: (beliefs about) corporate culture as success factors and barrier, corporate culture development (action), and the current and envisioned corporate culture profile (outcome).

In line with recent works (Bulińska-Stangrecka & Bagieńska, 2021; Griese et al., 2021; Mohter & Fernando, 2020), we showed that single dimensions of corporate culture would either form success factors or barriers of emission reduction. Hence, this multi-dimensional focus is necessary to understand to which degree corporate culture is defensive or open-minded regarding emission reduction (Baumgartner, 2009, 2014). The interplay of single dimensions would determine corporate members' understanding of climate change, awareness of the need for emission reduction as well as their motivation to personally promote emission reduction measures within their business function and daily working routines.

Our case study design exemplifies an IS-supported informed corporate culture development approach (action). The cyclical approach acknowledges that the urgency of the climate crises and changes in the working world, such as the reorganization of office buildings and the increasing share of mobile work, will both automatically bring about changes in corporate culture and require new approaches to corporate culture development (Boland et al., 2020; Singh, 2020) that would promote emission reduction. As a promising approach, we point toward the derivation of actions from metaphors and visions for corporate culture in the context of emission reduction and the new working world.

The envisioned role of corporate culture in emission reduction (outcome) links to wider themes, such as dissolving boundaries between professional and private life and intrapreneurship. The owner-managers indicated a willingness to offer resources (time and

money) for enhancing employees' feeling of belonging and togetherness (living corporate culture), hoping that this would facilitate the diffusion of the environmental orientation (Harris & Crane, 2002). On the one hand, this vision assigns corporate culture the role of linking corporate life with employees' private life. This addresses the increasing flexibility of working time and place, that is, the increasingly dissolving boundaries between professional and private life (Boland et al., 2020; Singh, 2020). On the other hand, this points toward corporate culture development as an entrepreneurial task (George et al., 2020). More specifically, this addresses time availability, a dimension of the intrapreneurial process, defined as "The fostering of new and innovative ideas [which] requires that individuals have time to incubate these ideas. Organizations must moderate the workload of people, avoid putting time constraints on all aspects of a person's job and allow people to work with others on long-term problem solving." (Hornsby et al., 1993, p. 33).

5.2 | Theoretical contributions

A main theoretical contribution is the illustration that the extended BAO framework motivates and supports holistic investigations of the contribution of corporate culture to emission reduction in the context of an increasing digitized work environment. The BAO framework covers the influence of such social dynamics and external guardrails on corporate members' beliefs about climate change as well as the long-term process of corporate culture development (action). Previous works on the relationship between corporate culture and emission reduction did not explicitly consider the role of digitalization. Furthermore, we specified the action pillar, especially the relation between the use of IS and culture development (Isensee et al., 2020; Melville, 2010).

Along the BAO pillars, we exemplified mechanisms that underscore the role of corporate culture as an integral element of emission reduction (Figure 8) (Isensee et al., 2020), including:

- a. how beliefs about the need for change can inform emission reduction measures (actions) (Morton et al., 2011),
- b. how the employment of IS for strengthening the environmental orientation (actions) could manifest beliefs about the complementarity of emission reduction and digitalization, and
- c. how the current corporate culture profile (outcome) can be translated into means for strengthening beliefs and actions.

This challenges the findings of Kowalczyk and Kucharska (2020) stipulating that stakeholder pressure matters for sustainability of manufacturing SMEs, while corporate culture does not. Instead, our findings connect to previous works establishing corporate culture as a mediator of the relation between stakeholder pressure and sustainability practices (Kim & Lee, 2012; Yu & Choi, 2016). On the one hand, respondents addressed that external guardrails and developments concerning emission reduction excerpt an influence on corporate culture of construction and manufacturing SMEs. Compared to the

debate on stakeholder pressure, discussions on external guardrails also include developments, such as an increasing digitized working world and the reorganization of offices (Boland et al., 2020). On the other hand, a proactive, long-term oriented corporate culture appears as a means of steering the debate about emission reduction (and environmental orientation) in the construction sector into a direction that could anticipate future stakeholder pressure.

Our understanding of vision development on the role of corporate culture challenges the gap detection approach by Cameron and Quinn (2011), which relies on the same baseline for the current and desired corporate culture profiles. Similarly, the model for building a culture of sustainability by Galpin et al. (2015) also leaves out the vision development process on the role of corporate culture in answer to anticipated developments with an effect on corporate culture.

5.3 | Practical implications

Our main practical implication is that if SMEs from the construction sector and other industries want to ensure that their corporate culture promotes emission reduction, they need to become aware of these interactions and engage in an informed approach toward corporate culture development (Figure 8). Beyond that, it might allow them to position themselves as early adopters of sustainable, digital development. More specifically, we can derive five central implications to promote a positive contribution of SMEs' corporate culture to emission reduction.

For assessing corporate members' beliefs about the environmental orientation within the single corporate culture dimensions, SMEs can follow the herein exemplified approach that would ensure a consideration of different perspectives (Implication 1). The proposed ES can offer insights into personal beliefs about the environmental and digital orientation of the corporate culture and the acceptance of corporate culture development actions. Thus, it supports the identification of subcultures and change agents (Kiesner & Baumgartner, 2019; Linnenluecke & Griffiths, 2010). In depth-interviews or group discussions following the proposed guiding questions can reveal understandings and metaphors of corporate culture or emission reduction. Beyond this, they can stimulate the vision development on the desired corporate culture and its role in the new working world.

To identify blind spots of change agents regarding necessary corporate culture development actions, SMEs should compare insights gained from employee surveys and in-depth interviews or group discussions (Implication 2). More specifically, there are various starting points for deriving required actions that would help nurture a corporate culture promoting emission reduction: the identification of barriers; a confrontation of thematically related success factors and barriers, an assessment of the diffusion of the environmental and digital orientation, the metaphors for corporate culture (beliefs); the adaptation of (green) nudging principles.

Envisioning the role of corporate culture for promoting emission reduction beyond current perspectives and understandings of corporate culture remains an important challenge for SMEs (Implication 3).

An aspect to consider is how much time availability for nurturing corporate culture SME owner-managers want to offer employees beyond operational tasks (Implication 4). In depth-interviews or group discussions can be useful, as they allow for an investigation of the language used, that is, terms and metaphors for referring to corporate culture or emission reduction. Metaphors and visions can then be merged to express a normative ideal SMEs can communicate within the company, discuss with other companies in the sector, and work toward. For example, the guardrail metaphor resembles the common compass metaphor (Alvesson, 2013). In line with the principle of green nudging (Byerly et al., 2018), such metaphors suggest that corporate culture would push employees into green behavior and thinking without forcing this behavior on them. Through this focus on people, corporate culture could function as an early warning system ensuring the timely detection of unsustainable behaviors and emerging cultural barriers inhibiting emission reduction.

Challenging and strengthening the beliefs about the synergy effects between the environmental and digital orientation is necessary to sufficiently consider current and future developments, especially the digitization of the working world (Implication 5). This includes a reflection on how SMEs want to use IS for nurturing corporate culture. In the corporate culture assessment, SMEs can use IS for data collection, data analysis, and visualization of corporate culture profiles.

5.4 | Limitations

The main limitation of the single case study research design is the limited generalizability. We could neither validate a direct influence of corporate culture on emission reduction, nor uncover all potentially relevant aspects of corporate culture. For the corporate culture profile, the research team had to rely on preliminary understandings of corporate culture, observable aspects, and subjective third-party reports without being part of the corporate culture. The investigation of cultural attributes did not consider interdependencies between single dimensions or levels of corporate culture (Schein, 2004). Furthermore, the limited number of interviews only included the perspective of change agents. Nonetheless, our triangulation of different data sources, the focus on reoccurring themes, and the participant feedback that the employee survey findings are congruent with required actions the company had identified before the research intervention enhance the validity of our findings.

5.5 | Future research

To explore the identified role of corporate culture for emission reduction in more depth, longitudinal studies considering more cases are needed. Future research could expand our findings by combining corporate culture assessment approaches (e.g., measurement of single dimensions, CVF culture types, Hofstede's dimension) in one study. This would enable a comparison of the effectiveness for identifying success factors, barriers, and required actions for achieving emission

reduction. Furthermore, the proposed IS-supported culture development approach could be refined, for example for specific sectors or organizations. For this, deeper investigations are needed into common barriers and tailored solutions. We also hope to motivate future research on vision development regarding the contribution of corporate culture to emission reduction. This includes the identification and comparison of visions that can become a guiding principle, new and effective approaches to developing and expressing these visions (e.g., visually, as narratives, or new culture models), and the required reorganization of corporate structures to ensure that business would live and nurture such an envisioned corporate culture. Similarly, future research should explore the proposed relationship between green nudging, IS, corporate culture, and emission reduction. It would be of interest to better understand the role of IS for realizing green nudging principles, such as providing corporate members with feedback (nudging principle) on the environmental impact of the current environmental orientation, and the influence of this on corporate culture and the associated emission reductions.

5.6 | Conclusion

To clarify how corporate culture of SMEs in Germany contributes to emission reduction in the construction sector, this single case study applied the BAO framework. This allowed us to cover three perspectives: corporate culture as success factor and barrier, corporate culture development (action), and the current and envisioned corporate culture profile (outcome). We outlined that corporate culture can act as driver and barrier at the same time through the manifestation of the environmental orientation within eight cultural dimensions. The envisioned role of corporate culture as a guardrail for emission reduction measures or early warning mechanism for emerging cultural barriers urges businesses to envision the role of corporate culture for achieving emission reduction and implement actions to nurture this envisioned corporate culture. We proposed an IS-supported cyclical corporate culture development process which specifies the action pillar and offers guidance for SMEs.

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ORCID

Carmen Isensee  <https://orcid.org/0000-0001-7160-6577>

REFERENCES

- Alvesson, M. (2013). *Understanding organizational culture*. SAGE.
- Ambekar, S., Prakash, A., & Patyal, V. S. (2018). Role of culture in low carbon supply chain capabilities. *Journal of Manufacturing Technology Management*, 30(1), 146–179. <https://doi.org/10.1108/JMTM-01-2018-0024>
- Ansari, N. Y., Farrukh, M., & Raza, A. (2021). Green human resource management and employees pro-environmental behaviours: Examining the underlying mechanism. *Corporate Social Responsibility and Environmental Management*, 28(1), 229–238. <https://doi.org/10.1002/csr.2044>
- Battisti, M., & Perry, M. (2011). Walking the talk? Environmental responsibility from the perspective of small-business owners. *Corporate Social Responsibility and Environmental Management*, 18(3), 172–185. <https://doi.org/10.1002/csr.266>



- Baumgartner, R. J. (2009). Organizational culture and leadership: Preconditions for the development of a sustainable corporation. *Sustainable Development*, 17(2), 102–113. <https://doi.org/10.1002/sd.405>
- Baumgartner, R. J. (2014). Managing corporate sustainability and CSR: A conceptual framework combining values, strategies and instruments contributing to sustainable development. *Corporate Social Responsibility and Environmental Management*, 21(5), 258–271. <https://doi.org/10.1002/csr.1336>
- Baumgartner, R. J., & Zielowski, C. (2007). Analyzing zero emission strategies regarding impact on organizational culture and contribution to sustainable development. *Journal of Cleaner Production*, 15(13), 1321–1327. <https://doi.org/10.1016/j.jclepro.2006.07.016>
- Boland, B., Smet, A. D., Palter, R., & Sanghvi, A. (2020). *Reimagining the office and work life after COVID-19*. McKinsey & Company.
- Bulińska-Stangrecka, H., & Bagieńska, A. (2021). Culture-based green workplace practices as a means of conserving energy and other natural resources in the manufacturing sector. *Energies*, 14(19), 6305. <https://doi.org/10.3390/en14196305>
- Byerly, H., Balmford, A., Ferraro, P. J., Hammond Wagner, C., Palchak, E., Polasky, S., Ricketts, T. H., Schwartz, A. J., & Fisher, B. (2018). Nudging pro-environmental behavior: Evidence and opportunities. *Frontiers in Ecology and the Environment*, 16(3), 159–168. <https://doi.org/10.1002/fee.1777>
- Caldera, H. T. S., Desha, C., & Dawes, L. (2019). Evaluating the enablers and barriers for successful implementation of sustainable business practice in 'lean' SMEs. *Journal of Cleaner Production*, 218, 575–590. <https://doi.org/10.1016/j.jclepro.2019.01.239>
- Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and changing organizational culture: Based on the competing values framework*. John Wiley & Sons.
- Cassells, S., & Lewis, K. (2011). SMEs and environmental responsibility: Do actions reflect attitudes? *Corporate Social Responsibility and Environmental Management*, 18(3), 186–199. <https://doi.org/10.1002/csr.269>
- Chaudhary, R. (2020). Green human resource management and employee green behavior: An empirical analysis. *Corporate Social Responsibility and Environmental Management*, 27(2), 630–641. <https://doi.org/10.1002/csr.1827>
- Chen, Y. (2011). Green organizational identity: Sources and consequence. *Management Decision*, 49(3), 384–404. <https://doi.org/10.1108/00251741111120761>
- Ding, Z., Liu, S., Luo, L., & Liao, L. (2020). A building information modeling-based carbon emission measurement system for prefabricated residential buildings during the materialization phase. *Journal of Cleaner Production*, 264, 121728. <https://doi.org/10.1016/j.jclepro.2020.121728>
- Dullien, S., Rietzler, K., & Tober, S. (2021). Ein Transformationsfonds für Deutschland. Hans-Böckler-Stiftung, Institut für Makroökonomie und Konjunkturforschung (IMK). <http://hdl.handle.net/10419/237911>.
- El Geneidy, S., Baumeister, S., Govigli, V. M., Orfanidou, T., & Wallius, V. (2021). The carbon footprint of a knowledge organization and emission scenarios for a post-COVID-19 world. *Environmental Impact Assessment Review*, 91, 106645. <https://doi.org/10.1016/j.eiar.2021.106645>
- Eurostat (2021). Construction share of total employment in Europe 2021, by country. https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a10_e&lang=en.
- Galpin, T., Whittington, J. L., & Bell, G. (2015). Is your sustainability strategy sustainable? Creating a culture of sustainability. *Corporate Governance*, 15(1), 1–17. <https://doi.org/10.1108/CG-01-2013-0004>
- George, G., Merrill, R. K., & Schillebeeckx, S. J. D. (2020). Digital sustainability and entrepreneurship: How digital innovations are helping tackle climate change and sustainable development. *Entrepreneurship Theory and Practice*, 45(5), 999–1027. <https://doi.org/10.1177/1042258719899425>
- Griese, K.-M., Franz, M., Busch, J. N., & Isensee, C. (2021). Acceptance of climate adaptation measures for transport operations: Conceptual and empirical overview. *Transportation Research Part D: Transport and Environment*, 101, 103068. <https://doi.org/10.1016/j.trd.2021.103068>
- Harris, L. C., & Crane, A. (2002). The greening of organizational culture: Management views on the depth, degree and diffusion of change. *Journal of Organizational Change Management*, 15(3), 214–234. <https://doi.org/10.1108/09534810210429273>
- Hofstede, G. (1980). Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics*, 9(1), 42–63. [https://doi.org/10.1016/0090-2616\(80\)90013-3](https://doi.org/10.1016/0090-2616(80)90013-3)
- Hornsby, J. S., Naffziger, D. W., Kuratko, D. F., & Montagno, R. V. (1993). An interactive model of the corporate entrepreneurship process. *Entrepreneurship Theory and Practice*, 17(2), 29–37. <https://doi.org/10.1177/104225879301700203>
- Huang, L., Krigsvoll, G., Johansen, F., Liu, Y., & Zhang, X. (2018). Carbon emission of global construction sector. *Renewable and Sustainable Energy Reviews*, 81, 1906–1916. <https://doi.org/10.1016/j.rser.2017.06.001>
- Isensee, C., Teuteberg, F., Griese, K.-M., & Topi, C. (2020). The relationship between organizational culture, sustainability, and digitalization in SMEs: A systematic review. *Journal of Cleaner Production*, 275, 122944. <https://doi.org/10.1016/j.jclepro.2020.122944>
- Johansson, I., Mardan, N., Cornelis, E., Kimura, O., & Thollander, P. (2019). Designing policies and programmes for improved energy efficiency in industrial SMEs. *Energies*, 12(7), 1338. <https://doi.org/10.3390/en12071338>
- Kaesehage, K., Leyshon, M., & Caseldine, C. (2014). Communicating climate change – Learning from business: Challenging values, changing economic thinking, innovating the low carbon economy. *Fennia - International Journal of Geography*, 192(2), 81–99. <https://doi.org/10.11143/40867>
- Kiesner, A. L., & Baumgartner, R. J. (2019). Sustainability management in practice: Organizational change for sustainability in smaller large-sized companies in Austria. *Sustainability*, 11(3), 572. <https://doi.org/10.3390/su11030572>
- Kim, S., & Lee, S. (2012). Stakeholder pressure and the adoption of environmental logistics practices: Is eco-oriented culture a missing link? *The International Journal of Logistics Management*, 23(2), 238–258. <https://doi.org/10.1108/09574091211265378>
- Kowalczyk, R., & Kucharska, W. (2020). Corporate social responsibility practices incomes and outcomes: Stakeholders' pressure, culture, employee commitment, corporate reputation, and brand performance. A Polish-German cross-country study. *Corporate Social Responsibility and Environmental Management*, 27(2), 595–615. <https://doi.org/10.1002/csr.1823>
- Kucharska, W., & Kowalczyk, R. (2019). How to achieve sustainability?—Employee's point of view on company's culture and CSR practice. *Corporate Social Responsibility and Environmental Management*, 26(2), 453–467. <https://doi.org/10.1002/csr.1696>
- Linnenluecke, M. K., & Griffiths, A. (2010). Corporate sustainability and organizational culture. *Journal of World Business*, 45(4), 357–366. <https://doi.org/10.1016/j.jwb.2009.08.006>
- Löbke, S., König, W., Büttner, S., & Schneider, C. (2019). Entscheidung für Energieeffizienz: Auswirkungen von Kultur, Verhalten und Technikdiffusion in produzierenden KMU in Baden-Württemberg. Hochschule Reutlingen (p. 2579). <https://doi.org/10.34645/OPUS-2093>
- Melville, N. P. (2010). Information systems innovation for environmental sustainability. *MIS Quarterly*, 34(1), 1–21. <https://doi.org/10.2307/20721412>
- Mohter, N., & Fernando, Y. (2020). Corporate governance and low carbon supply chains: Why integrity matters? *Journal of Governance and Integrity*, 3(2), Article 2. <https://doi.org/10.15282/jgi.3.2.2020.5308>
- Morton, T. A., Bretschneider, P., Coley, D., & Kershaw, T. (2011). Building a better future: An exploration of beliefs about climate change and perceived need for adaptation within the building industry. *Building and Environment*, 46(5), 1151–1158. <https://doi.org/10.1016/j.buildenv.2010.12.007>
- O'Brien, K. L., & Wolf, J. (2010). A values-based approach to vulnerability and adaptation to climate change. *WIREs Climate Change*, 1(2), 232–242. <https://doi.org/10.1002/wcc.30>

- Oesterreich, T. D., & Teuteberg, F. (2016). Understanding the implications of digitisation and automation in the context of industry 4.0: A triangulation approach and elements of a research agenda for the construction industry. *Computers in Industry*, 83, 121–139. <https://doi.org/10.1016/j.compind.2016.09.006>
- Oppong-Tawiah, D., Webster, J., Staples, S., Cameron, A.-F., Ortiz de Guinea, A., & Hung, T. Y. (2020). Developing a gamified mobile application to encourage sustainable energy use in the office. *Journal of Business Research*, 106, 388–405. <https://doi.org/10.1016/j.jbusres.2018.10.051>
- Pathirana, Y. L., Jayatilake, L. V. K., & Abeysekera, R. (2020). Case study research design for exploration of organizational culture towards. *Corporate Performance*, 21(3), 12.
- Persson, J., Sahlin, N.-E., & Wallin, A. (2015). Climate change, values, and the cultural cognition thesis. *Environmental Science & Policy*, 52, 1–5. <https://doi.org/10.1016/j.envsci.2015.05.001>
- Reyes-Rodríguez, J. F., Uhløi, J. P., & Madsen, H. (2016). Corporate environmental sustainability in Danish SMEs: A longitudinal study of motivators, initiatives, and strategic effects. *Corporate Social Responsibility and Environmental Management*, 23(4), 193–212. <https://doi.org/10.1002/csr.1359>
- Schein, E. H. (2004). *Organizational culture and leadership* (3rd ed.). Jossey-Bass.
- Singh, M. K. (2020). Impact of Covid-19 pandemic on working culture: An exploratory research among information technology (IT) professionals in Bengaluru, Karnataka (India). *Journal of Xi'an University of Architecture & Technology*, 12(5), 3176–3184.
- Stewart, H., & Gapp, R. (2014). Achieving effective sustainable management: A small-medium enterprise case study. *Corporate Social Responsibility & Environmental Management*, 21(1), 52–64. <https://doi.org/10.1002/csr.1305>
- Sugita, M., & Takahashi, T. (2015). Influence of corporate culture on environmental management performance: An empirical study of Japanese firms. *Corporate Social Responsibility and Environmental Management*, 22(3), 182–192. <https://doi.org/10.1002/csr.1346>
- Testa, F., Gusmerottia, N. M., Corsini, F., Passetti, E., & Iraldo, F. (2016). Factors affecting environmental management by small and micro firms: The importance of entrepreneurs' attitudes and environmental investment. *Corporate Social Responsibility & Environmental Management*, 23(6), 373–385. <https://doi.org/10.1002/csr.1382>
- Williams, S., & Schaefer, A. (2013). Small and medium-sized enterprises and sustainability: managers' values and engagement with environmental and climate change issues: SMEs and sustainability – managers' values and engagement. *Business Strategy and the Environment*, 22(3), 173–186. <https://doi.org/10.1002/bse.1740>
- Wong, P. S. P., & Zapantis, J. (2013). Driving carbon reduction strategies adoption in the Australian construction sector – The moderating role of organizational culture. *Building and Environment*, 66, 120–130. <https://doi.org/10.1016/j.buildenv.2013.04.022>
- Yin, R. K. (2012). Case study methods. In Cooper, H., Camic, P. M., Long, D. L., Panter, A. T., Rindskopf, D., & Sher, K. J. (Eds.), *APA handbook of research methods in psychology, Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological* (pp. 141–155). American Psychological Association. <https://doi.org/10.1037/13620-009>
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE.
- Yu, Y., & Choi, Y. (2016). Stakeholder pressure and CSR adoption: The mediating role of organizational culture for Chinese companies. *The Social Science Journal*, 53(2), 226–235. <https://doi.org/10.1016/j.soscij.2014.07.006>

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APPENDIX A: EMPLOYEE SURVEY

Confrontation with environmental management and digitalization in day-to-day work (5-point Likert scale)

Taking on tasks to improve environmental performance

Taking on digitization tasks

Use of digital technologies for process optimization

Use of digital environmental management systems

Use of digital communication technologies for participative and representative decision-making processes

Mobile working/home office

Environmental orientation (5-point Likert scale)

Environmental protection is a core corporate value

Environmental protection is integrated in my company's mission/vision

My company has a well-developed environmental protection strategy

My company has a code of conduct on the subject of environmental protection

My company participates in networks/projects on the subject of environmental protection

My company trains its employees on the subject of environmental protection

My company involves its employees in decisions on environmental protection

My company has established a suggestion scheme and incentive system to promote environmental protection

My company regularly and openly discusses environmental protection with external stakeholders

My company regularly applies for environmental protection certifications or awards

My company has established a continuous improvement process (CIP) for environmental protection

My company has formulated binding environmental protection targets

My company promotes voluntary environmentally friendly behavior in the workplace

My company communicates helpful instructions on environmentally friendly behavior in the workplace.

With regard to environmental orientation, I can identify with the corporate culture (e.g., uniform environmental attitudes)

My company's handling of environmental protection influences my personal attitudes toward environmental protection

Digital orientation (5-point Likert scale)

Digitization is a core corporate value

Digitization is integrated in my company's mission/vision

My company has a well-developed digitization strategy

My company formulated a code of conduct for the use of digital technologies

My company participates in networks/projects on digitization

My company trains its employees in the use of digital technologies

My company involves its employees in digitization decisions

My company has established a company suggestion scheme and incentive system for digitization

My company regularly and openly discusses digitization topics with external stakeholders

My company regularly applies for certifications or awards for the use of digital technologies

My company has established a continuous improvement process for digitization

My company has formulated binding digitization targets

My company promotes the use of digital technologies in the workplace

My company communicates helpful instructions on the use of digital technologies in the workplace

The topic of digitization is reflected in the corporate culture (e.g., uniform understanding of digitization)

With regard to the digitization orientation, I can identify with the corporate culture (e.g., uniform understanding of digitization)

My company's handling of digitization influences my personal attitudes toward digital technologies

My company uses digital technologies to promote personal engagement with environmental issues (e.g., apps with a game or competition character)

Digital orientation (5-point Likert scale)

My company uses digital applications to visualize environmental information

How likely is it that you would use new digital offerings (e.g., voluntary CO2 savings competition via app)?

Overall assessment

How satisfied are you with your company's approaches to environmental protection?

How satisfied are you with the digital development of your company?

Desires/wishes (open-ended questions)

Which developments and support options would you like to see regarding the integration of environmental protection in your everyday work?

Which developments and support options would you like to see regarding the integration of digital technologies in your everyday work?

What do you consider the greatest internal challenge with regard to the strategic topics of environmental protection and digitalization?

If you could change the corporate culture in a certain way, where would you start?

APPENDIX B: SEMI-STRUCTURED INTERVIEWS

Guiding questions GI 1.

1. Please introduce yourself briefly by name and state very briefly one of the focal points of your area of responsibility.
2. How did the idea of implementing environmental protection, especially with regard to resource efficiency, into the corporate philosophy and strategy come about?
3. In your estimation, to what extent has the topic of environmental protection, in particular emission reduction, been successfully anchored in the company to such an extent that it influences daily actions and decisions?
4. What is your vision regarding the integration of the topics of environmental protection and digitization, especially from a corporate culture perspective?
5. What is the motivation behind this effort?
 - a. To what extent do you see the way things are done at your company as a driver of sustainable digital orientation and emission reductions?
 - b. To what extent do you see the way things are handled in your company as a hurdle or barrier to sustainable digital orientation and emission reductions?
 - c. Where are the biggest uncertainties?
6. To what extent have your relationships with external stakeholders changed as a result of your sustainable and digital corporate development?

Guiding questions GI 2

1. To what extent do you think there is an understanding across the company about the benefits and how this approach works (diffusion)?
2. What internal factors do you see as driving this development?
3. To what extent does the combination of the topics of environmental protection and digitization play a role in BIM?
 - a. To what extent is environmental protection taken into account as a guideline for the use of digital technologies?
 - b. To what extent does the digitization strategy take into account the use of digital technologies for environmental protection?

c. Do you use certain guidelines, concepts, or similar to guide the connection of these issues?

4. What is your understanding of the concept of "sustainable digitization"?
 - a. In your view, to what extent is it necessary to anchor this understanding within the entire company?
 - b. In terms of corporate cultural factors, where do you see the biggest hurdles and barriers to embedding the principles of sustainable digitalization in order to achieve emissions savings?
 - c. How could this anchoring succeed?
 - d. To what extent could digital tools support the development of a digitization orientation?

Guiding questions I1

1. What is your position of "organizational transformation" (OT) about and how is the OT embedded in the organization?
 - a. How, when, and why was the OT established?
 - b. What does this structure influence?
 - c. Are there specific guidelines or concepts that guide your activities?
 - d. To what extent are there interfaces with other departments/positions?
 - e. To what extent is this a common approach in your industry?
 - f. To what extent does this structure influence other companies?
2. To what extent do you think there is acceptance of this structure across the company (diffusion)?
3. To what extent do you see it relating to how things are done in your company in general?
4. What is your understanding of a corporate culture?
5. How would you describe the corporate culture of your company?
 - a. To what extent do you see environmental protection being embedded, especially with regard to emissions reductions?
 - b. To what extent has environmental protection been written down or visibly anchored in other forms (artifacts)?
 - c. In your opinion, is this understanding lived out evenly throughout the company?
6. In your opinion, to what extent is there an awareness of the corporate culture among members of your company?

7. To what extent does the connection between the topics of environmental protection and digitalization play a role in the OT?
 - a. To what extent is environmental protection taken into account as a guideline for the use of digital technologies?
 - b. To what extent does the digitization strategy take into account the use of digital technologies for environmental protection?
 - c. Do you use specific guidelines or concepts to guide the connection of these issues?
8. In your view, to what extent is it necessary to anchor this understanding within the entire company?
 - a. In your opinion, what potential does the way things are generally handled in your company have for achieving greater resource efficiency, including through digital technologies?
 - b. In terms of corporate cultural factors, where do you see the greatest hurdles and barriers to embedding the principles of sustainable digitalization in order to achieve emissions savings?
 - c. How could this anchoring succeed?
 - d. To what extent could digital tools support the development of a stronger focus on environmental protection, in particular emissions savings (including through digital technologies)?
4. What internal factors do you see as drivers for this proactive development?
 - a. Do you see a connection to the corporate culture?
 - b. To what extent would you say members of the company are ready and open to digital developments?
5. Are there any digitization champions outside the IT department with whom you are in exchange?
6. To what extent does the topic of environmental protection play a role in the digitization strategy?
 - a. To what extent is environmental protection taken into account as a guideline for the use of digital technologies?
 - b. To what extent does the digitization strategy take into account the use of digital technologies for environmental protection?
 - c. Do you use certain guidelines, concepts, or similar to guide the connection of these issues?
7. What is your understanding of the concept of “sustainable digitization”?
 - a. In your view, to what extent is it necessary to anchor this understanding within the entire company?
 - b. In terms of cultural factors, where do you see the biggest hurdles and barriers to embedding the principles of sustainable digitalization to achieve emissions savings?
 - c. How could this anchoring succeed?
 - d. To what extent could digital tools support the development of a digitalization orientation?
 - e. Have you already dealt with the topic of employee apps for culture development?

Guiding questions I2

1. How is the IT department embedded in the company?
2. How was the digitization strategy developed, or how is it currently being developed?
3. Which technologies would you highlight as innovative and forward-looking?