

Sustainability Skills and Sustainable Natives: Key Competencies and Maturity Model for Sustainability Management

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Abstract

Sustainability and ESG criteria, i.e. environment, social, and governance, are essential strategic drivers, especially because of the circular economy and a new generation of 'sustainable natives' among the Generation Z. In light of firms' varying performance in managing sustainability, this conceptual paper develops a maturity model for sustainability management with five maturity levels: awareness, efficiency, transparency, ecosystem, and innovation. A further sixth level goes beyond most firms' present aspirations in managing sustainability, but it may become important in the future. Additionally, the key skills that companies and employees need at different maturity levels are discussed along with implications for sustainability trainings and assessments as well as human resources management and ethics. These skills may provide the source of sustainability-based core competencies, and they help to explain interfirm differences in managing sustainability, positainability, and digitainability. Finally, the framework highlights innovation and transformation in the context of the sustainable development goals (SDGs).

Keywords: Circular Economy; Core Competencies; Digitainability; ESG; Human Resources Management; Innovation; Sustainability Management; Sustainable Development Goals (SDGs).

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1 Introduction

Why are companies successful? For a long time, the key arguments in discussions of strategists and business people in general primarily centered around external market-based arguments and internal resource-based arguments (Porter, 1985; Wernerfelt, 1984). Only in recent years, researchers and practitioners have started to examine in detail companies' sustainability strategies and sustainability initiatives in order to understand new drivers of company performance (Cantele & Zardini, 2018; Franco, Segers, Herlaar, & Richt-Hannema, 2022). In particular, the ability to maintain firm performance and competitive advantage over time seems to depend strongly on their management of sustainability, e.g. environmental sustainability (Du, Yalcinkaya, & Bstieler, 2016; Hussain, Rigoni, & Cavezzali, 2018). Consequently, sustainability is far more than just one of several megatrends (Govindan, Rajeev, Padhi, & Pati, 2020; Gutiérrez-Martínez & Duhamel, 2019). In fact, the sustainable development goals and sustainability management dominate the strategic agendas of many corporations across a variety of sectors, for example with respect to the need for reducing carbon emissions in the face of climate change (Cohen & Munoz, 2017; Hoek, 2017; Nikolaou, Tsalis, & Evangelinos, 2019).

In a similar vein, the importance of sustainability and ESG criteria, i.e. environment, social, and governance, receives growing attention in public discussions, international regulations, and global politics (Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2016; Alberti & Varon Garrido, 2017). In the European Union, for example, the so-called European Green Deal from 2020 describes a number of policy initiatives and political decisions with the goal of turning the European Union into a climate-neutral region in 2050 (European-Commission, 2020). In addition, the European Union developed the so-called green taxonomy for sustainable activities, which describes a classification system to limit greenwashing and to clarify which investments are environmentally sustainable (European-Commission, 2022). Many similar political and governmental decisions drive companies worldwide to strengthen and to speed up their sustainability initiatives (Hull, Russell, & Kukar-Kinney, 2022; Uhrenholt, Kristensen, Rincón, Adamsen, Jensen, & Waehrens, 2022).

In particular, sustainability is now a key strategic driver in companies across nearly all industries (Sancak, 2023; Whelan & Douglas, 2021). For example, the US steel recycling company Schnitzer Steel was ranked as the most sustainable firm worldwide in Corporate Knights' 2023 global ranking (Corporate-Knights, 2023). It is the first steel company ever to lead this ranking, and this evolution shows the growing importance of sustainability across different sectors on the one hand as well as the growing relevance of further sustainability topics besides the reduction of carbon emissions, for example the circular economy (Scott, 2023). "Schnitzer Steel's rapid ascension to the top of the Global 100 highlights the growing importance of both the circular economy and low-carbon metals in the energy transition" (Scott, 2023). Thus, sustainability management goes far beyond the reduction of carbon emissions, and it also goes far beyond a relatively passive reaction to new regulatory requirements in order to meet reporting and compliance standards (Hahn & Kühnen, 2013; Mura, Longo, Micheli, & Bolzani, 2018).

Rather, companies actively develop new strategies and implement specific managerial measures to enhance their sustainability management and sustainability outcomes (Cantele & Zardini, 2018; Jin, Navare, & Lynch, 2019). Some of these sustainability initiatives have quickly achieved the intended goals by targeting some low-hanging fruits, often with respect to optimizing established processes, for example to increase energy efficiency (Faria, Moura, Delgado, & Almeida, 2012; Vrbsky, Galloway, Carr, Nori, & Grubic, 2013). In contrast, many other sustainability initiatives have not yet met their initial objectives (Alshehhi, Nobanee, & Khare, 2018; Lichtenthaler, 2022a). Sometimes, the managerial measures simply need some more time until their positive impact fully unfolds. However, there are also many other sustainability initiatives whose implementation has failed due to limited skills for sustainability management. More importantly, some companies seem to have achieved higher proficiency levels in managing sustainability, thus outperforming others in their industries in this regard (Claudy, Peterson, & Pagell, 2016; Lampikoski, Westerlund, Rajala, & Möller, 2014).

In light of this varying proficiency and success of companies in managing sustainability, this conceptual paper builds on prior research to develop a conceptual framework with a maturity model for managing sustainability. On this basis, the key skills that companies and employees need to have at different maturity levels of managing sustainability will be discussed. As a result, a better understanding of interfirm differences in the proficiency of managing sustainability is developed. In addition, a clearer overview of the necessary competencies and skills for managing sustainability is achieved which will help to systematically understand potential sources of implementation problems in sustainability and ESG initiatives. Taken together, the maturity model and the overview of key skills will enable a smoother transition of companies towards a sustainability-based competitive context in the future (Lichtenthaler, 2022a; Uhrenholt et al., 2022). This is particularly important

in the context of the young generation of 'sustainable natives', who expect companies to provide a positive impact, especially with regard to the challenges of climate change (Deloitte, 2023; Lichtenthaler, 2023a).

As such, this paper offers several important contributions. First, it contributes to research into sustainability and the sustainable development goals by suggesting one of the first maturity models for systematically assessing an organization's proficiency in managing sustainability (Sachs, Schmidt-Traub, Mazzucato, Messner, Nakicenovic, & Rockström, 2019; Sancak, 2023; Straub, Hartley, Dyakonov, Gupta, van Vuuren, & Kirchherr, 2023; Uhrenholt et al., 2022). Second, the paper provides new insights into human resources management and the ethics of sustainability because the overview of key skills highlights the need for preparing executives and employees for the new managerial opportunities and challenges by initiating targeted personnel development and training programs (Carroll, 1991; Hull et al., 2022; La Torre, Perez-Encinas, & Gomez-Mediavilla, 2022; Shearman, 1990). Third, it provides a contribution to strategic management by systematically illustrating key skills, which may form the basis for new and sustainability-based core competencies (Lichtenthaler, 2022a; Nikolaou et al., 2019). Fourth and finally, the paper has implications for research into innovation management, co-creation and the quintuple helix model (Brem & Bilgram, 2015; Carayannis et al., 2012; Durán-Romero, López, Beliaeva, Ferasso, Garonne, & Jones, 2020). Specifically, it highlights the need for innovation in the context of sustainability initiatives and it further deepens our understanding of firms' dynamic transformation processes along different stages of the maturity model for managing sustainability and along university-industry-government-public-environment interactions of the quintuple helix (Carayannis, Barth, & Campbell, 2012; Narayan, 2019; Sancak, 2023).

2 Sustainability Management

Over the past decades, there have been many theoretical perspectives and conceptual frameworks in strategic management for understanding major drivers of company performance. Initially, there often was a focus on market-based performance determinants, such as the five forces framework (Porter, 2008), which emphasized the relevance of external factors in shaping companies' actions and outcomes (Peteraf & Bergen, 2003). In subsequent decades, more attention was placed on internal factors, especially with the resource-based view and a growing desire to understand internal skills and core competencies (Prahalad & Hamel, 1990; Wernerfelt, 1984), which help companies to outperform others that operate in a similar competitive environment with similar external drivers of performance.

With the growing strategic relevance of sustainability and ESG, this particular dimension of corporate activities attracted growing attention from strategic management practitioners and academics (Amel-Zadeh & Serafeim, 2018; Grewal & Serafeim, 2020). Beyond established frameworks, such as the natural resource-based view (Hart, 1995), the shared value creation framework (Porter & Kramer, 2011) was developed. In recent years, a distinctly sustainability-based view of firm performance was suggested (Brockhaus, Fawcett, Knemeyer, & Fawcett, 2017; Lichtenthaler, 2022a), and it was used to examine various phenomena (Hull et al., 2022; McDougall, Wagner, & MacBryde, 2022; Polese, Carrubbo, Caputo, & Sarno, 2018). In addition, the term digitainability was created (Gupta, Motlagh, & Rhyner, 2020), and interdependencies between sustainability and digitalization were addressed in more detail (Lichtenthaler, 2021).

At the core of many of these extant works and theoretical perspectives is the observation that sustainability is positively related to firm performance, and there is now ample empirical evidence for this positive relationship according to several literature reviews and meta analyses

(Alshehhi et al., 2018; Feroz, Zo, & Chiravuri, 2021; Hallinger, 2020; Lu & Taylor, 2016). As such, many companies have set up or expanded a systematic sustainability management with specific sustainability initiatives in recent years (Cirule & Uvarova, 2022; Kalmykova, Sadagopan, & Rosado, 2018; Konietzko, Bocken, & Hultink, 2020; Suárez-Eiroa, Fernández, Méndez-Martínez, & Soto-Onate, 2019). Increasingly, these initiatives are directed towards circular business models (Rovanto & Bask, 2021; Uvarova, Atstaja, Volkova, Grasis, & Ozolina-Ozola, 2023). For example, sustainability management has been defined in the following way. “Sustainability management is a management discipline embracing corporate strategies, operational capabilities, competencies, behaviors and cultures. It focuses on products, services, the enterprise and the supply chain, and it seeks to optimally balance organizational performance and outcomes across economic, environment and social criteria over all time scales” (Gartner, 2023).

Besides a growing internal strategic emphasis on sustainability, many companies perceive a growing attention from various external stakeholders on sustainability and ESG (Garvare & Johansson, 2010; Hengst, Jarzabkowski, Hoegl, & Muethel, 2020). For example, many companies’ customers actually drive them towards increasing the sustainability activities across their supply chains (Govindan et al., 2020; Seuring, 2011). In addition, the young generation of so-called ‘sustainable natives’ has grown up with a high importance of sustainability (Lichtenthaler, 2023a). This young generation of new employees and potential customers often expects firms to positively contribute to the solution of present ecological and social problems like climate change (Lichtenthaler, 2023a).

A recent Deloitte survey of Generation Z and Millennials included feedback from over 22,000 persons in 44 countries. “Climate change is a major concern for Gen Zs and millennials, but finances are making it harder for them to prioritize sustainability” (Deloitte, 2023). Nonetheless, the ‘sustainable natives’ among the Generation Z further push companies towards strengthening their sustainability management (Hassim, 2021). “50% of Gen Zs and 46% of millennials say they and their colleagues are pressuring businesses to take action on climate change” (Deloitte, 2023). Thus, there are also important indirect performance effects of sustainability, for instance by affecting product marketing and employer branding (Claudy et al., 2016; Hallinger, 2020). Accordingly, there are more than enough reasons for enhancing sustainability, and many companies have started or extended customized sustainability initiatives in recent years.

3 Maturity Model

By setting up specific initiatives, firms attempt to strengthen their sustainability management and to enhance their sustainability levels in a focused and targeted manner. While some of these initiatives have lived up to the expectations at the beginning, many other sustainability programs have failed to reach their intended targets (Hussain et al., 2018; Martínez-Ferrero & Frías-Aceituno, 2015). As different sustainability rankings indicate, even companies from the same industry often differ significantly in their sustainability management (Corporate-Knights, 2023; Scott, 2023). As many companies have acknowledged the importance of the megatrend sustainability, these varying sustainability outcomes point to different levels of sustainability management. Specifically, these findings indicate different maturity levels in the sustainability transformation (Narayan, 2019; Sancak, 2023).

Therefore, a maturity model for sustainability management is developed in the following, and this conceptual framework distinguishes five levels of sustainability management. Furthermore, there is an additional sixth level, which may hardly be observed at present but which may become important in the context of future progress in managing sustainability. The different maturity

levels indicate distinct stages of proficiency in managing sustainability. Thus, they also indicate different stages in a firm's transformation towards a greater strategic and competitive importance of sustainability in its business. There are always some individuals in a firm that are more proficient in managing sustainability than others. Therefore, this maturity model is a conceptual framework that aims at capturing the overall strategic relevance and management maturity of a company in dealing with sustainability. The different levels of the maturity model are displayed in Table 1.

Table 1. Sustainability management maturity model.

Level	Name	Icon	Key competencies
+	Beyond		<ul style="list-style-type: none"> - Ensure continuous learning - Balance profit orientation
5	Innovation		<ul style="list-style-type: none"> - Capture innovation opportunities - Leverage positive sustainability
4	Ecosystem		<ul style="list-style-type: none"> - Involve all ecosystem players - Develop resilience for execution
3	Transparency		<ul style="list-style-type: none"> - Monitor reporting standards - Ensure realistic communication
2	Efficiency		<ul style="list-style-type: none"> - Optimize established procedures - Utilize resources more efficiently
1	Awareness		<ul style="list-style-type: none"> - Acknowledge business relevance - Gain fundamental knowledge

Level 1 refers to *awareness* for the relevance of sustainability, sustainability management, and sustainability ethics. Before sustainability was considered a megatrend, it was already important in many industries (Caradonna, 2014; Mebratu, 1998). However, it was not yet high on the strategic agendas of many companies. Instead, the firms focused on their traditional business activities and strategic performance determinants without paying particular attention to sustainability and the ESG dimensions environment, social, and governance. With the dramatically increasing relevance of sustainability in theory and practice in recent years, many companies and executives have acknowledged the importance of sustainability (Franco et al., 2022; Hull et al., 2022; Uvarova, Mavlutova, & Atstaja, 2021), thus achieving level 1 according to the maturity model. In many cases, present and expected future reporting standards have strongly contributed to the awareness among top management (Kolk, 2004; Whelan & Douglas, 2021). While there is now some level of awareness in many firms, the fundamental character of the necessary changes and the ethics of sustainability are often not yet clear. In addition, the awareness often concentrates on the environmental dimension in light of climate change, whereas the importance of the social dimension only slowly begins to attract the attention that it actually deserves (Eizenberg & Jabareen, 2017; Ronen & Kerret, 2020).

Level 2 is called *efficiency*, and it describes the typical strategic direction that most companies take at the beginning of implementing sustainability initiatives. Besides a focus on the environmental dimension in recent years, the massive public discussions of climate change have led to a relative emphasis on programs to reduce carbon emissions (McFarlane, 2021; Wilson, 2021). Thus, many firms' sustainability initiatives have been dominated by increasing the efficiency of using resources with particular emphasis on reducing energy consumption in order to limit carbon emissions. Generally, this has led to a focus on improving existing processes and products rather

than addressing more radical changes and innovations with a higher degree of novelty. This focus on efficiency is easy to understand because it often enabled companies to capture some low-hanging fruits by combining efficiency increases with cost savings, for example by reducing energy consumption (Lichtenthaler, 2023b; Vrbsky et al., 2013).

The next stage of the maturity model is level 3, and it refers to *transparency*. In this stage, companies often significantly improve their sustainability management with an emphasis on reporting processes and the communication of sustainability activities (Hahn & Kühnen, 2013; Pucker, 2021). As it has been described above, the importance of reporting standards often is an important trigger for starting to actively manage sustainability in the first place. Notwithstanding the relevance of reporting standards in this very early stage, many companies then focus on specific measures to increase resource efficiency in the following stage. After some initial successes with enhancing efficiency, they often try to achieve the next level in terms of a transparent management, reporting, and communication of their sustainability activities (IKEA, 2020; Kolk, 2004). This is exactly what this third level of transparency is all about.

Up to this level, most companies primarily focus on their internal sustainability-related activities. Of course, they are fully aware of the relevance of upstream and downstream activities along their supply chains for ensuring an integrated perspective on sustainability management (Govindan et al., 2020; He, Gallear, Ghobadian, & Ramanathan, 2019), for example with regard to scope 1, scope 2, and scope 3 of greenhouse gas emissions (Gaganis, Galariotis, Pasiouras, & Tasiou, 2023). Nonetheless, the major attention of the specific managerial measures that are implemented in the maturity model's first three stages, i.e. awareness, efficiency, and transparency, is usually placed on activities within the own organization. One key reason for this strategic focus is the fact that significant efficiency increases at level 2 can often already be achieved with a focus on internal processes and products, which are then communicated in a transparent manner in the following stage 3.

After completing stage 3, however, many companies realize that further substantial increases in terms of their sustainability outcomes will be hard to achieve with a primarily internal orientation of their sustainability management (Gaganis et al., 2023; He et al., 2019). Instead, the leverage of addressing external activities in the upstream and downstream parts of the supply chains becomes particularly high. Consequently, level 4 refers to the *ecosystem* stage. Here, the managerial attention is further directed towards external stakeholders in a firm's business ecosystem along different stages of the value chain and beyond. Often, the managerial complexity of these activities is higher than for primarily internal activities, and the development of resilience to ensure successful implementation is even more important than in the previous stages (Konietzko et al., 2020; Tortato, Renzi, Di Nauta, & Lozano, 2022; Winnard, Adcroft, Lee, & Skipp, 2014). Nonetheless, the benefits in terms of sustainability outcomes are also higher, and this usually drives companies to advance to this next level. In addition, the expectations and activities of external stakeholders often lead companies to fully embrace the opportunities for further enhancing their sustainability management and sustainability performance across their business ecosystems.

By addressing the business ecosystem, companies often start to reconsider their business models more fundamentally (Lampikoski et al., 2014; Schaltegger, Lüdeke-Freund, & Hansen, 2016). This usually leads to more substantial changes and transformations than incremental adjustments of established business processes. Therefore, level 5 refers to *innovation*. Actually, it is surprising that firms often concentrate on efficiency enhancements and process improvements while largely neglecting more radical innovations in their sustainability initiatives (Lichtenthaler, 2022a; Sancak, 2023). At the same time, many of these more radical changes to a firm's business involve external stakeholders along the supply chains, and the benefits of these sustainability innovations

often only materialize after some time (Gaganis et al., 2023; Lichtenthaler, 2022b). Accordingly, it may be surprising but also understandable that many firms initially focus on incremental efficiency improvements in the first stages before addressing major innovations at a later stage. Often, these more substantial innovations aim at achieving a 'net positive impact' instead of targeting 'no net loss' (Lichtenthaler, 2023b). Thus, companies at this level actually aim at doing something good beyond reducing the negative effects of their business processes on society and the environment (Porter & Kramer, 2011).

Currently, this fifth level of innovation represents the final stage of the maturity model for most established companies. Beyond this level, however, there is an additional stage, which may become relevant for a broader set of companies besides some examples at present. Therefore, it is not called the sixth stage, but rather an additional level + which goes *beyond* most firms' strategic aspirations in sustainability management at present. In light of the increasingly positive relation of sustainability and financial firm performance (Alshehhi et al., 2018; Hussain et al., 2018), the activities in the five stages may involve the need to navigate decisions involving sustainability efforts, profit motives, and the ethics of sustainability (Carroll, 1991; Shearman, 1990). These activities include considering the triple bottom line of economic, environmental, and social outcomes (Alhaddi, 2015; Elkington, 2018).

In the five stages, however, sustainability management will not fundamentally question a general profit orientation of many firms, especially if a medium to long term perspective is taken. Nonetheless, if companies already have established a highly proficient sustainability management including a noteworthy volume of innovations at the fifth level with the aim to achieve a 'net positive impact', they still may further advance in their sustainability transformations. This journey to a level beyond the fifth level may call for balancing the profit orientation more fundamentally besides generally considering the triple bottom line (Lichtenthaler, 2023b). However, this is still quite far away from most firms' sustainability initiatives at present because the maturity model has been developed for a broad range of companies across all sectors rather than tailoring it to the needs of social startup companies or firms with sustainability-based business models (Pearse & Peterlin, 2019; Tiba, van Rijnsoever, & Hekkert, 2021).

4 Sustainability Skills

Independent from the particular maturity level, many companies experience implementation challenges in their sustainability initiatives (Holtström, Bjellerup, & Eriksson, 2019; Lichtenthaler, 2023b). There may be some general implementation difficulties, for example with regard to project management. Besides these general challenges, however, there are also implementation problems that may be traced back to limited competence levels in particular sustainability management skills (La Torre et al., 2022; Lampikoski et al., 2014). In fact, there are some key competencies that companies and their employees often lack at least partly when advancing to the next maturity level. Accordingly, for each maturity level, key competencies can be identified. These key competencies need to be built up to a sufficient level by executives and employees to enable a company to achieve the respective maturity level in sustainability management.

In this regard, the key competencies need to be developed by those persons in an organization that are essential for the new sustainability-related activities that are started in the transition to a particular maturity level. For instance, the efficiency gains at level 2 may usually not be realized by dedicated sustainability managers alone who work full-time on sustainability topics. Instead, other persons in different business and functional units beyond the dedicated sustainability managers need to develop sufficient competencies. Even if a company is still at level 2, there may well

be a relatively small group of sustainability professionals whose sustainability management skills already include those competencies that are required at level 4. However, a firm's sustainability transformation will usually not succeed if it only involves a small team of full-time sustainability professionals. Therefore, the key competencies refer to all those employees that are essential for the activities at a specific level of the maturity model.

At level 1 of the maturity model, awareness is important. In this respect, the key persons in an organization need to fully *acknowledge the business relevance* of sustainability and ESG. In particular, this awareness includes the understanding that sustainability needs to be at the core of a firm's business activities and that it is not an additional side activity that can be managed in a somewhat isolated way (Eccles, Johnstone-Louis, Mayer, & Stroehle, 2020; Whelan & Douglas, 2021). Furthermore, acknowledging the business relevance involves understanding the long-term impact of sustainability rather than viewing it as a hype or trend that will be over relatively quickly. In addition, level 1 means that the key persons in an organization need to *gain fundamental knowledge* about sustainability in their industries and also about how to manage sustainability (Hallinger, 2020; La Torre et al., 2022). This knowledge may be acquired in trainings that include some basic knowledge and further involve the transfer and application of this basic knowledge to the context and to the persons' specific tasks.

For achieving level 2 of the maturity model, efficiency is at the center of managerial attention. Firms need to have sufficient competencies about how to *optimize established procedures* and processes. This managerial competence usually does not involve any radical innovations, but rather an incremental improvement of extant business activities and measures (Franco et al., 2022; Lichtenthaler, 2023b). Another key competence at this level is to *utilize resources more efficiently*. The focus here is on optimization and efficiency gains, which may often also lead to cost savings. For instance, a higher resource efficiency in energy consumption will lead to lower costs for energy (Gaganis et al., 2023; Vrbsky et al., 2013). Therefore, implementation challenges and barriers to change are usually comparatively limited at this stage. The main emphasis is on reducing the negative effects of a firm's business activities on society and the environment in order to achieve 'no net loss' (Lichtenthaler, 2023b).

When companies advance to level 3, the transparency of their sustainability and ESG activities is critical. Therefore, it is key that the relevant persons *monitor reporting standards*. Often, regulation and reporting directives are among the prime drivers of setting up dedicated sustainability initiatives at level 1. After achieving some progress in sustainability management, reporting is often further professionalized (Hahn & Kühnen, 2013; Kolk, 2004). In particular, this involves the monitoring of the evolution of reporting standards. Even if a new environmental regulation is set in place this year, there may already be signals for higher standards that will be required in a few years. In addition, this step often goes along with receiving particular certifications for sustainability management. Besides reporting and certifications, firms need to *ensure realistic communication*. Above all, this competence involves an objective and transparent communication of a firm's sustainability activities to avoid potentially excessive claims and accusations of greenwashing. Such public discussions about potential or actual greenwashing are typical for sustainability and ESG initiatives, and they require specific communication competencies to ensure transparency and proficiency in sustainability management as well as in sustainability communication and all related marketing activities (Clausen, Göll, & Tappeser, 2017; O'Connor & Gronewold, 2013).

Level 4 refers to the ecosystem, and this broader perspective exceeding the own organization often requires some competencies that are not readily available among a firm's sustainability management. In particular, it requires the competence to *involve all ecosystem players*. As such, this stage calls for more interaction, negotiation and boundary-spanning competencies among

the key persons than most sustainability management activities at the previous maturity levels (Polese et al., 2018; Tiba et al., 2021). Often, this leads companies to bring in new persons to their dedicated sustainability management team beyond involving persons from all other business and functional units. In addition, the complexity level with multiple stakeholders tends to increase at this level, and firms need to *develop resilience for execution* because of implementation barriers (Min & Choi, 2019; Wong, 2013). Of course, implementation challenges are also relevant at the other levels, but they are often more pronounced at level 4. At lower levels, top management commitment to the sustainability measures can significantly help to reduce implementation barriers in the internal organization (Eccles et al., 2020; Whelan & Douglas, 2021), but the impact of executive support is less strong in ecosystems with multiple stakeholders along the supply chains.

Level 5 involves a higher emphasis on innovation beyond minor improvements that are typical for efficiency-related activities at the previous levels. Consequently, firms need the ability to *capture innovation opportunities* which result from advanced sustainability management. Sustainability and ESG initiatives may bring new opportunities for sustainability-based business beyond limiting potential negative effects of the firm's own business operations (Bergset & Fichter, 2015; Lampikoski et al., 2014). Often, these business opportunities call for the need to *leverage positive sustainability*. Thus, companies target a 'net positive impact' by doing something good for society and the environment which may also result in new business development (Porter & Kramer, 2011; Silva, Regan, Pollard, & Addison, 2019). Besides knowledge about innovation, this stage therefore requires a detailed understanding of the opportunities for positainability, i.e. positive sustainability, in terms of targeting a 'net positive impact' (Lichtenthaler, 2023b). Efficiency-based sustainability strategies have also been termed 'Blue Sky Strategy' in practice because resource efficiency in the environmental dimensions reduces emissions and therefore leads to blue skies. In contrast, innovation-related sustainability initiatives have been termed 'Green Grass Strategy' in practice because these positive sustainability initiatives lead to sustainability innovation and new business, which grows and flourishes like green grass (Lichtenthaler, 2022b).

If established firms aim at moving beyond the innovation level of the maturity model in the future, they need to *ensure continuous learning* and adaptation to regularly enhance their sustainability management over time (Franco et al., 2022; He et al., 2019). Thus, the key persons in the firms have most of the relevant competencies available, but they need to dynamically reconfigure their sustainability management in alignment with changes in their internal organization and in the external environment. In addition, progressing in sustainability management may require at least some openness to *balance profit orientation*. While some discussions about the implementation of sustainability measures and their profit impact – especially on short-term results – is typical for many sustainability initiatives, this level may call for a more fundamental rethinking of a company's strategic direction, priorities, and purpose (Alberti & Varon Garrido, 2017; Alshehhi et al., 2018). Overall, the key competencies at different levels of the maturity model underscore the need for regularly adapting a firm's sustainability management across the organization, for example by means of additional trainings for the relevant persons as well as potentially bringing in new experts with a different skill set for a particular maturity level.

5 Discussion

The maturity model and the key competencies for the different maturity levels have a number of implications for theory and practice. First, the conceptual framework has major implications for research into sustainability and the sustainable development goals because it presents one of the first maturity models for sustainability management (del Río Castro, González-Fernández, &

Uruburu-Colsa, 2020; Sancak, 2023; Straub et al., 2023; Uhrenholt et al., 2022). This framework enables researchers and practitioners to systematically assess the proficiency of an organization in managing sustainability. On this basis, next steps towards a more mature sustainability management can be identified. At times, it may be difficult to exactly determine a firm's maturity degree because the company may already implement some activities that belong to higher levels, whereas it is still lacking behind in the proficiency of some key competencies from lower levels. Nonetheless, companies or individual business units can usually be categorized well in one of the different maturity stages. For instance, several companies are currently advancing from the second level of efficiency to the third level of transparency, and they now tend to focus on systematizing their reporting procedures, receiving well-known sustainability certifications, and developing realistic communication (Lichtenthaler, 2023b; Pucker, 2021). The maturity model with key competencies offers them immediate starting points for how to advance towards the next maturity level in managing sustainability and ESG.

Second, the key competencies for the different maturity stages deepen our insights into human resources management and the ethics of sustainability (Carroll, 1991; Hull et al., 2022; La Torre et al., 2022; Shearman, 1990). In particular, the overview of key skills emphasizes the need for preparing all relevant persons in an organization for the new managerial challenges and opportunities in a competitive context that is increasingly dominated by sustainability. In this regard, it is very important to avoid focusing exclusively on the sustainability management professionals who work full-time on a firm's sustainability initiative. Instead, human resources management needs to closely collaborate with the full-time sustainability managers to determine which persons from different business units and functional units across the entire organization are needed and best suited for conducting certain tasks that are related to sustainability management. Firms may organize targeted recruiting, personnel development and training programs that are well aligned with the maturity level and that may also address different target groups because each new maturity level may call for bringing in new experts and persons from across the organization. Thus, a solid overview of the key persons and tasks in sustainability management beyond the dedicated sustainability professionals is essential from a human resources management perspective. If companies primarily build on a small team of dedicated sustainability experts for some time, their sustainability initiatives will usually not succeed in terms of advancing towards higher levels of the maturity model.

Third, the conceptual framework has major implications for strategic management research because it systematically presents key skills, which may become the foundation of sustainability-based core competencies in the future (Hull et al., 2022; Lichtenthaler, 2022a). Sustainability and ESG topics are usually too complex to merely assign them to a small group of experts that would work in relative isolation from the remaining organization. Instead, it is key to strongly rely on the business and functional experts, who are supported by the sustainability professionals with their expert knowledge. Based on this organizational nature of advanced sustainability management involving experts from different parts of an organization, specific measures of sustainability management and the key skills that are required for proficient implementation may evolve towards new core competencies (Hull et al., 2022), which often will be related to a firm's existing core competencies in traditional processes and business models. As such, these sustainability-based core competencies may provide the basis for a sustainable competitive advantage in industries and ecosystems which are increasingly dominated by sustainability and ESG as key drivers of competitiveness (Cunha-Alegre & Parente, 2022; Nikolaou et al., 2019).

Fourth, the maturity model of sustainability management has implications for innovation research by underscoring the importance of dynamically transforming sustainability management

over time. As such, the conceptual framework offers new insights into the dynamic transformation processes along different maturity stages. Setting up a sustainability initiative and sustainability management is an important first step, but the sustainability management needs to be regularly adapted in order to enable an organization to advance towards the next proficiency level (Maier, Maier, Aschilean, Anastasiu, & Gavris, 2020; Sancak, 2023). In addition, the maturity model has highlighted the role of innovation in sustainability initiatives (Metz, Burek, Hultgren, Kogan, & Schwartz, 2016; Narayan, 2019). Even many of those companies that are considered pioneers in sustainability management have not yet fully reached level 5 because their sustainability-related innovation activities are still quite limited and primarily directed at efficiency-based incremental improvements (Lichtenthaler, 2023b). Therefore, innovation portfolios with more radical innovations involving completely new solutions and business models for a 'net positive impact' in a circular economy are an important next step in most organizations that are regarded as sustainability leaders (Coulon, Ernst, Lichtenthaler, & Vollmoeller, 2009; Lichtenthaler, 2023b). In this regard, innovation and co-creation along the quintuple helix model of university-industry-government-public-environment interactions will be essential (Brem & Bilgram, 2015; Carayannis et al., 2012; Durán-Romero, López, Beliaeva, Ferasso, Garonne, & Jones, 2020).

6 Conclusion and Outlook

To conclude, this conceptual paper has suggested a maturity model with five proficiency levels in sustainability management and one additional level which goes beyond the present aspirations of most firms in managing sustainability. In the future, however, this additional level may become relevant for a broader group of companies beyond social startups and firms with a sustainability-based business model (Pearse & Peterlin, 2019; Tiba et al., 2021). Besides a systematic understanding of different maturity stages, the key competencies for the maturity levels offer immediate starting points for researchers and practitioners with respect to enhancing organizations' sustainability management. In light of a growing strategic importance of sustainability and ESG across different sectors, a systematic management and assessment of sustainability initiatives and resilience in implementation will continue to gain relevance in the future. The conceptual framework in this article may serve as a first step in this regard, and it also highlights the need for further understanding the expectations of the 'sustainable natives'.

While offering a first step, the conceptual arguments need to be further developed with future empirical research. Qualitative methods, such as in-depth case studies and exploratory expert interviews (Mention, Pinto-Ferreira, & Torkkeli, 2019; Reichel & Seeberg, 2011), may offer a deeper understanding of the maturity levels and of firms' journey in advancing from one level to another. In addition, quantitative empirical studies with primary or secondary data may allow for a representative overview of managerial approaches to sustainability management according to the maturity model (Montiel & Delgado-Ceballos, 2014; Mura et al., 2018). Longitudinal studies can further inform us about the impact of changes in sustainability management on subsequent changes in the performance along the triple bottom line (Elkington, 2018; He et al., 2019). In addition, the ethics of sustainability, innovation along the quintuple helix as well as the organizational structures and processes for sustainability management deserve more attention (Carayannis et al., 2012; Sancak, 2023; Shearman, 1990), for example the interface of dedicated full-time sustainability professionals with employees from different business units and functional units who are actively involved in managing a firm's sustainability-related activities. Relative to the expected future importance of sustainability management, research is still at the beginning, and very important insights are still to be gained.

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