



Driving sustainability in organizations: polymathic responsible leadership and circular economy

Andreas Wihler¹ · Ryan C. Nolan¹ · Yaxin Zheng¹ · Ilke Inceoglu¹ · Hannes Leroy² · Fiona Charnley¹

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Abstract

Issues around environmental sustainability have significantly increased in importance in both management practice and scholarship. One approach to address these is the transformative concept of the circular economy, which offers an alternative to traditional models of production and consumption. With organizations starting to adopt circular economy models and principles, the pivotal role of leaders in reshaping organizational practices from linear to circular approaches has begun to emerge. In this paper we introduce a novel perspective on responsible leadership emphasizing the need for a polymathic approach to address sustainability and apply this to the context of the circular economy. Viewing responsibility in leadership through a meta-taxonomy of effective leadership orientations, we apply our framework to a case study and illustrate its usefulness in guiding research and practice in the area of sustainability within organizations.

Keywords Circular economy · Sustainability · Responsible leadership

Environmental sustainability has gained significant traction in both management practice and scholarship over recent decades (Shrivastava and Berger 2010; Whiteman et al. 2013). This has been further stimulated by the introduction of the sustainable development goals (SDGs) outlined by the United Nations (United Nations 2015). One approach to sustainability is the transformative concept of the circular economy (CE). Aimed at resource efficiency,

designing out waste and regenerating nature, CE offers an alternative to traditional production models and consumption where resources circulate for a short time and are discarded as wastes (Ellen MacArthur Foundation 2023). Indeed, SDG 12's focus on 'sustainable consumption and production' is often linked to the CE concept at the supra-national scale (Pizzi et al. 2020).

Moving towards a CE requires organisations to change their business operations (Kirchherr et al. 2023). As formal leaders play a critical role in shaping organizational change (Battilana et al. 2010; Seo et al. 2012) and their behaviors also affect organizational sustainability performance (Pham and Kim 2019; Piwowar-Sulej and Iqbal 2023), leaders are important for enabling this change process (Walk 2023) and systematically integrating CE values in the short and long term.

To achieve the successful implementation of change, we argue that leaders need a broad set of leadership skills to be effective, which we integrate in the concept of responsible leadership (Maak and Pless 2006b, 2021a). However, the field of responsible leadership is broad and fragmented, with differences in understanding, unclear levels of analysis, and varying foci of responsible behaviors (see, for example, Maak and Pless 2021a).

We define responsible leadership as *an orientation or mindset adopted by leaders to take actions toward meeting the needs of and realizing value for an organization and*

✉ Andreas Wihler
A.Wihler@exeter.ac.uk

Ryan C. Nolan
R.C.Nolan@exeter.ac.uk

Yaxin Zheng
Y.Zheng2@exeter.ac.uk

Ilke Inceoglu
I.Inceoglu@exeter.ac.uk

Hannes Leroy
leroy@rsm.nl

Fiona Charnley
F.Charnley@exeter.ac.uk

¹ University of Exeter Business School, Rennes Drive, Exeter, EX4 4PU, UK

² Rotterdam School of Management, Burgemeester Oudlaan 50, 3062 PA Rotterdam, The Netherlands

their stakeholders through social processes of interaction with a local and global focus. We adopt a value-based view on responsible leadership (Ciulla 2021; Freeman and Auster 2021), which allows us to operationalize responsible leadership with a value-based taxonomy of leadership behaviors, the so-called Big X of leadership (Inceoglu et al. 2023).

The Big X framework integrates established taxonomies of leadership behaviors (e.g., DeRue et al. 2011; Yukl 2012). It consists of four broad orientations, which are drawn from a wealth of evidence (e.g. Gottfredson and Aguinis 2017; DeRue et al. 2011): progress, principle, performance, and people. We argue that organizational leaders who want to be effective in the transformation from a linear to a CE need to be effective in all dimensions, demonstrating a comprehensive level of knowledge and understanding in multiple domains and thereby becoming *polymathic* leaders. This term stems from the Greek term *polumathes* (“having learnt much”) and refers to individuals “of great or varied learning” (Oxford English Dictionary 2023).

In what follows, we ground the Big X leadership framework within responsible leadership and apply it retrospectively to a case study of a circular business that illustrates how organizations are transforming business models to achieve circularity. By doing so, we contribute to the literature in the following ways: First, we link research on CE and responsible leadership to highlight the central role of responsible leadership in driving change towards circularity. Thus, we present initial evidence of how polymathic leadership in organizations drives circular transformations. We provide evidence that CE transformations seem to require not only change, but also accompanying behaviors that provide a facilitating environment and stem from the other Big X orientations.

Second, we enrich our understanding of responsible leadership by offering a conceptualization that integrates different streams of literature and provides us with the necessary foundation to connect responsible leadership with CE. We therefore provide a more comprehensive picture of what responsible leadership is within CE frameworks and offer specific insights into the behaviors that formal leaders need to exercise to become effective agents of circular transformations.

Finally, we enhance our understanding of leadership effectiveness by introducing the novel hyper-taxonomy of leadership that aims to integrate previously documented taxonomies, which are subsumed under four categories that capture various forms of effective leadership. By doing so, we not only facilitate the understanding of responsible leadership in research, but also extend our knowledge with regard to education and training. Understanding that leaders need to be able to show all forms of leadership behaviors enables leaders to reflect on their actions and potential ar-

eas for development in the context of today’s grand societal challenges (Pless et al. 2021).

1 Theoretical background and literature review

1.1 Circular economy

There has been particular interest in better understanding how organizations can become more sustainable in the context of increasing environmental degradation, heightened societal awareness, and fast approaching policy targets aimed at lowering industrial carbon emissions, while grasping potential economic opportunities linked to ‘green growth’ (Hallegatte et al. 2012). What exactly sustainability means varies depending on context, but at its core, it emphasises the harmonious integration of environmental stewardship, social well-being, and economic prosperity in ways that ensure both current and future generations can thrive (WCED 1987).

One such transformative approach to sustainability is the CE. Guided by the principles of designing out waste and pollution, maximising resource efficiency at high value, and regenerating natural resources, the CE offers a compelling alternative to the traditional linear model of production and consumption (Ellen MacArthur Foundation 2023). In a linear model, raw materials are extracted from the Earth system or synthesised via chemical processes, refined, manufactured into products and components, consumed, and once they are considered to have reached the end of their useful life, are discarded as waste and either sent to landfill or incinerated (Stahel 2016). While this logic has been prevalent since at least the mid-twentieth century, it has expedited the release of greenhouse gases and overlooks the inherent value embedded in materials, components, and products already in circulation. By maintaining their quality, these could be retained within the economy for extended periods and repurposed as inputs for new industrial processes where technically feasible and permitted by current regulation.

Consequently, CE has been recognised as a sign of progress towards achieving sustainable development (Valverde and Avilés-Palacios 2021). The concept is underpinned by a whole systems perspective to sustainability transitions that places emphasis on the need for innovative solutions across the value chain, including infrastructural, governmental, behavioral, and organizational change (Iacovidou et al. 2021; Kirchherr et al. 2023). As such the practical implementation of CE has been developed around embedding reverse logistics frameworks within both the technical and biological cycles of the value chain (Julianelli

et al. 2020) and, by association, the introduction of circular business models (Okorie et al. 2021).

For example, an electronic device may be designed in a way that makes it easier for consumers to replace components (or have them replaced without convoluted requirements), allowing it to function as the manufacturer intended for longer and therefore extending its time in circulation at high value. Similarly, once the same device does reach end of life, rather than being sent to landfill, it may be collected by a firm who specialise in salvaging the critical minerals inside of it so they can be reused in another product.

Alternatively, we might consider the reuse of materials (that are otherwise destined for landfill) in the production of new consumer goods. There are several waste streams in circulation that have the potential to serve as inputs for new products, including niche materials such as London's decommissioned firehoses. In their mission to create a zero-waste business, Elvis & Kresse have built a successful business around the identification of such waste streams and remanufacturing the recovered materials into a range of products. We return to this case study in more detail below, in relation to our concept of responsible leadership.

However, despite advancements in circular business models, value chain frameworks, increased understanding of material flows, and the availability of high-quality practitioner tools, there is a recurrent theme in CE research that calls for its social dimension to be drawn out more prominently (Mies and Gold 2021; Monciardini et al. 2023; Padilla-Rivera et al. 2020). While the practices outlined foreground the technical implementation of CE and its potential to support environmental sustainability and economic performance, there is a need for deeper analysis of the human aspect of the transition to circularity to ensure that it is inclusive, equitable, and consistent with the expanded pillars of sustainability (United Nations 2015).

First, rethinking and reshaping organizational practices from linear to circular approaches involves fundamental changes in organizations. Change can be disruptive and requires leadership that actively supports the change and drives the changemaking process forward (Walk 2023). Leaders therefore play a pivotal role in leading and shaping this change, and in embodying the values embedded in a CE framework. Leaders themselves therefore need to start rethinking their own approach to driving these changes and realise the complexities of introducing these changes.

While a growing literature acknowledges the complexities and tensions that leaders face today (see, for example, Volk et al. 2023), current research streams seem to have developed in parallel, with frameworks focusing on CE models and those developing approaches for responsible leaders that also address grand challenges in the sustainability area, having developed in parallel. We bridge this gap by focusing on a conceptualization of responsible leadership

that underscores both the central role organizations of all kinds play in addressing grand societal challenges such as sustainable development and the importance of developing informed and capable leaders who can deal with the complexity of the challenge. The latter is increasingly vital for scaling CE in practice, given its emphasis on whole system innovation. It requires a conscious shift away from operational business-as-usual. Therefore, it necessitates leaders who possess a deeper understanding of embedding sustainability strategies across all functions of an organization and a commitment to ethical decision-making beyond.

1.2 Responsible leadership

Responsible leadership as a concept has been discussed in the literature for quite some time. Waldman et al. (2020, p. 5) view responsible leadership as “an orientation or mindset taken by people in executive-level positions toward meeting the needs of a firm's stakeholder(s).” In contrast, Maak and Pless (2006a, p. 112) introduced the element of morality and good character and defined responsible leadership as “a social-relational and ethical phenomenon that occurs in interaction between a leader and a broader group of followers, inside and outside the organization.” The variety of definitions and views on the topic has led to a proliferation of conceptualizations, with research studying both outcome- (e.g., corporate governance, Filatotchev and Nakajima 2014; CSR, Siegel 2014) and content-based conceptualizations (e.g., relationships, Maak and Pless 2021b; globalised leadership, Voegtlin et al. 2012). In consequence, the contents and foci of responsible leadership appear elusive in the extant literature (Waldman et al. 2020) as different outcomes and contents are studied in isolation while still being referred to collectively as responsible leadership. This also affects the definitional elements of responsible leadership, since the types of responsible leader behaviors vary depending on the researchers' positions (e.g., stakeholders, Waldman et al. 2020; relationships, Maak and Pless 2021b; or a global focus, Voegtlin et al. 2012).

Given these variations in understanding how responsible leadership is understood, we suggest a more comprehensive definition of responsible leadership. Integrating the different viewpoints on responsible leadership allows us to grasp the commonalities of different approaches. Thus, we define responsible leadership as *an orientation or mindset adopted by leaders to take actions toward meeting the needs of and realizing value for an organization and their stakeholders through social processes of interaction with a local and global focus*. This definition illustrates that, due to the complexities of our world and the wicked nature of grand challenges, responsible leaders cannot confine their focus solely to specific aspects of sustainability (James and

Priyadarshini 2021) or other outcomes; responsible leaders rather need a comprehensive, holistic perspective to fulfil the multifaceted responsibilities intrinsic to leadership roles.

Since responsible leadership focuses on a value set that guides leadership behaviors (Maak and Pless 2021a), ethical conduct and values are at the core of responsible leadership (Ciulla 2021). Thus, responsible leadership should serve as a meta-leadership concept that encompasses different types of behaviors, aimed at different goals, for example relationships (Maak and Pless 2021b), corporate governance (Filatotchev and Nakajima 2014), or CSR (Siegel 2014). In that way, it is different from more specific leadership behaviors like ethical leadership (Den Hartog 2015), which focusses on “the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making” (Brown et al. 2005, p. 120). Here, the emphasis is on enforcing and promoting ethical conduct, that promotes honesty, integrity, and fairness. In contrast, responsible leadership is broader in its goals taking not only ethical decision making and values that (can) drive responsible leadership actions into account, but also extends this view by considering the long-term well-being of stakeholders and the organisational impact on society and environment (Mirvis et al. 2021).

Similarly, responsible leadership shares some communalities with sustainability leadership, but fundamentally it is a different, higher-order construct. Sustainability leadership encompasses “any ethical behaviour that has the intention and effect of helping groups of people achieve environmental or social outcomes” (Bendell and Little 2015, p. 16). While sustainability leadership also includes ethical conduct, the main goal here is the facilitation and creation of a positive environmental impact. In contrast, responsible leadership is broader in its conceptualization, and while it emphasizes responsiveness to environmental concerns, it also goes beyond them to consider other stakeholders like customers and employees (Waldman and Galvin 2008). Additionally, it aims for the long-term success of the organization in harmony with society and the environment (Han et al. 2019).

Finally, responsible leadership also shares some commonalities, but also differences with the functional leadership approach (McGrath 1962). The functional leadership approach argues that leadership effectiveness stems from the interaction between the leader and the situational context. Thus, certain behaviors are more effective than others in specific situations. While the core focus of this approach is improved organizational effectiveness and performance (Homan et al. 2020), responsible leadership is motivated by the underlying value-system to do good (Stahl and Sully

de Luque 2014). Thus, responsible leadership might be, but is not exclusively, targeted at organizational performance. More specifically, responsible leadership strives to create long-term positive effects not only for the organization (e.g., organizational performance) but also the environment and society.

Like the functional leadership approach, which looks for the “right behaviors in the right situation”, there is a question regarding which behaviors should be recognized as manifestations of responsible leadership. While others have taken narrower views on responsible leadership (see above), we draw from an integrative model of leadership that serves as a hyper-taxonomy aimed at consolidating the diversity of leadership behaviors in research and practice while using values as a guiding principle: The Big X model of leadership.

1.3 The Big X model of leadership

The Big X model of leadership is a multi-layered matrix that aims to help navigate the complexity of approaches to effective leadership. While Yukl (2012) introduced a taxonomy of leadership effectiveness, others have joined this discussion suggesting a different taxonomy of what effective leadership entails (e.g., Anderson and Sun 2017; DeRue et al. 2011; Morgeson et al. 2010). These scholars have not only used different labels, but also included varying aspects of leadership. Yukl’s (2012) initial model only focused on task-, relation-, and change-oriented behavior. In contrast, Anderson and Sun (2017) considered ethical leadership but left out change-oriented leadership, while DeRue et al. (2011) excluded ethical leadership.

Whereas these prior reviews (Fischer and Sitkin 2023; Morgeson et al. 2010) are typically limited in the focus of singular value-driven leadership styles such as transformational or charismatic leadership, our Big X of model of leadership goes beyond a singular value-based model towards the ability to address and embrace the tension among the values. Such an approach highlights the potential conflict among values. For example, leaders might need to balance between safety and rules (principle) and motivation (progress) or between performance and people. Bridging seemingly opposite values is necessary to tackle the grand challenges that our world currently faces, as research on the paradoxical lens (Smith and Lewis 2011; Zhang et al. 2015) and integrative complexity (Tetlock 1986) suggests. By integrating a plurality of perspectives, we therefore argue that the values we proposed are not opposing but complementary, where overreliance on one requires a shift towards the other to maintain balance. The ‘Big X of leadership’ aims at bringing structure and coherence to the leadership field akin to what was achieved by personality researchers with the Big 5 of personality (Goldberg 1993). Therefore,

guided by theory, the ‘Big X of leadership’ research seeks to synthesize the variety of leadership constructs available. To achieve this goal, the research looks to build upon previous hyper-taxonomies of leadership, where four overarching dimensions have emerged repeatedly namely task-, relation-, change-, and ethics-oriented leadership (Yukl 2012). Whether it is through meta-analytical reduction (DeRue et al. 2011) or competency modelling (Bartram 2005), a key strength of these approaches is their strong empirical basis. However, ideally strong data should be complemented by strong theory (Astley 1985), which further explains the different ways of leadership rather than simply categorizes different types of leaders (Meuser et al. 2016). This is where Inceoglu et al. (2023) suggested that prior work can be reconsidered from a value perspective and showed, using various studies, how values help to capture the diversity of leadership perspectives.

Thus, the Big X framework highlights that there are four value-based key dimensions that leaders can work towards (see also Fig. 1). The four P’s of leadership are: *Performance*, *People*, *Progress*, and *Principle*, which can be divided into additional sub-categories for each dimension. *Performance*-oriented leadership is associated with leaders who structure and organize for effectiveness (e.g., initiating structure; Fleishman 1953). Performance-oriented leadership is sometimes seen as “just management” or “only transactional” (Anderson and Sun 2017), but leadership in organizations cannot be effective without good organizational talent (Morgeson et al. 2010). Furthermore, this orientation can be differentiated into achievement and power. Exemplary behaviors for achievement would be transac-

tional or goal-focused behavior, while power consists of behaviors like authoritative and instrumental leadership behaviors.

People-oriented leadership focuses primarily on support (or consideration, Fleishman 1953). The ability to connect with or relate well to others is a key determinant of leadership effectiveness (Yukl 2012). People-oriented leaders cultivate their perceptions of warmth and benevolence (DeRue et al. 2011). This orientation can be differentiated into equality, which encompasses behaviors like authentic and inclusive leadership behaviors, as well as benevolence, which includes behaviors like servant and supportive leadership.

Progress-oriented leadership is best captured through the concept of change. Some leaders can cope with the changes and are even instigating change for others (Yukl 2012). These leaders realize that the world keeps changing and that change must be facilitated (Morgeson et al. 2010). This orientation can be separated into improvement and autonomy. Improvement consists of behaviors like innovative and developmental leadership, while autonomy includes consultative and empowering leadership behaviors.

Finally, *Principle*-oriented leadership focuses on leader behaviors aimed at taking care of followers and protecting themselves and others against a clear set of values and guidelines (Anderson and Sun 2017; Morgeson et al. 2010). These principles offer some guidance and stability on how to lead with integrity and moral values to keep everyone safe. Consequently, this orientation can be differentiated into stability with behaviors like following rules and bureaucratic leadership, and security, which includes ethical and protective leadership behaviors.

Linking the Big X of leadership to circular economy, the “progress” dimension, and more specifically improvement, encompasses activities aimed at positive impacts for future generations and the environment (Millar et al. 2012). However, in light of the more holistic nature of responsible leadership behaviors, we argue that mastery of *all four dimensions* is vital for implementing CE approaches. For meaningful change to occur, leaders must build relationships with stakeholders both inside and outside the organization, excel in their day-to-day operational performance, and embody moral integrity that resonates with entities affected by and contributing to change. In essence, we consider responsible leadership as a “polymathic leadership concept”, signifying that genuinely responsible leaders should possess mastery across all dimensions rather than merely excelling in one or a few. Still, we agree with Yukl and Gardner (2020) that all leaders possess weaknesses that should be somehow addressed. Whether or not these weaknesses are addressed is also a key consideration.

In the next section, we show how being a “polymathic” responsible leader helps when implementing CE

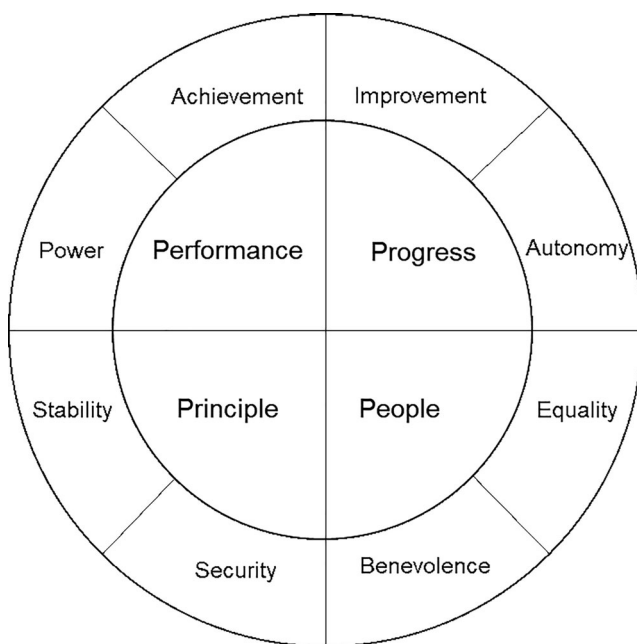


Fig. 1 The Four Dimensions of the Big X of Leadership

approaches. We use a case study to highlight retrospectively how CE approaches are supported by leaders' behaviors across all four dimensions of the Big X.

2 Application of the polymathic approach to the circular economy

Founded in 2005, Elvis & Kresse (Hopkins 2023) initially set out to address the problem of material-value loss occurring with the disposal of London's decommissioned fire hoses, which were being sent to landfill after reaching their 25-year service life span (Dominguez and Bhatti 2022). The complex material composition of a fire hose prevents it from entering traditional recycling systems. However, the founders of the company developed a method to transform the old fire hoses and used the material to create consumer products, initially handbags.

Elvis & Kresse has meanwhile expanded and now captures many different streams of waste and reuses materials in the production of a series of luxury goods through innovative methods of upcycling. The business model involves visionary changes through the creation of new processes and products via logistics that include rescuing, reusing, and remanufacturing otherwise wasted materials (Hopkins 2023). The founders' visionary approach allowed the company to create change within a waste area that had gone largely unnoticed. As such, the founders demonstrated *progress*-oriented leadership (Table 1), as they realized that the current linear model was not sustainable and created new business opportunities by developing problem-oriented solutions to "niche waste".

However, the company was not only successful because its founders were progress oriented. They also followed the concept of *principle*-oriented leadership, since the main reason for founding the company was the founders' view

that simply dumping materials, like decommissioned fire hoses, in landfills was a symptom of focussing too narrowly on financial returns rather than the wider societal and environmental impacts of operational waste. Thus, the founders' core value of focussing on the environment guided their approach and created a stable and innovative business. Furthermore, their principles are now internationally recognized and have led to further innovation (and therefore further *progress*) within their organization.

The success of their international recognition would not be possible without establishing an effective core business. The founders of Elvis & Kresse were also proficient in practising *performance*-oriented leadership. As performance-oriented leadership is concerned with daily operations and their effectiveness, it is required to facilitate the other orientations. It took Elvis & Kresse five years to meet their target of repurposing all London-decommissioned fire hoses in a year. But without an effective business model, the company would have neither been able to meet this target nor would it have had the means and reputation to expand their business to other products lines while also building new partnerships.

Finally, *people*-oriented leadership serves as the glue between the other orientations. Not only is the consideration of the environment as an additional stakeholder exemplary, so is the company's ability to build and extend collaborations with other companies to maintain progress and performance. Again, it becomes apparent that these orientations are interconnected. Without *principle* and *progress*, the collaborations could not have been established, and *performance* boosted the credibility of the organizational business model. Furthermore, Elvis & Kresse also increased its number of employees around the globe while growing, and making sure that employees are valued and supported based on the core principles the company established. This includes certification as a b-corporation, certifying that the company meets specific standards in social and environmental performance (B Lab 2024) as well as recognition as living wage employer (Hopkins 2023) to ensure that employees salary meets the cost of living (Living Wage Foundation 2024).

In sum, the retrospective analysis of the case study has illustrated explicitly for the first time that leaders need to utilize *all* leadership orientations to be successful as the different orientations complement each other and facilitate the effectiveness of each.

3 Discussion and implications for theory and practice

In our paper, we challenge the traditional view that it is sufficient for leaders to primarily focus on principles of sus-

Table 1 Overview of the Founder's behaviors mapped on the Big X of Leadership

Leadership orientation	Behaviors shown by Founders
<i>Performance</i>	Creating new processes and products Effective business model to keep the company going during start-up Meeting recycling targets Extending product lines
<i>People</i>	Building collaborations Support of employees Company growth Authentic leadership
<i>Progress</i>	Upcycling of fire hoses Development of problem-oriented solutions
<i>Principle</i>	Value-based approach to recycling Focus on environment

tainability (e.g., sustainability leadership) in order to have a positive impact on the environment and society. In contrast, we draw from the concept of responsible leadership and leadership taxonomies to propose a *polymathic* view on leadership that recognises the complexities that leaders face when implementing circular business models. To effectively generate, implement, and facilitate positive environmental change, leaders within organizations must not only be change-oriented, they also need to be well versed in other leadership orientations.

These leadership orientations can be summarized as progress, principle, performance, and people. While progress-orientation captures innovative approaches to implement CE, the principle-orientation provides leaders with the ethical value system and guidelines to lead change from a linear to a more CE. However, an orientation towards day-to-day performance is needed to complement these orientations, in order to establish credibility and financial support to enable change, i.e., progress-orientation. Finally, responsible leaders also need to consider many different stakeholders and build connections and collaborations between these while also being supportive and considerate.

Using a circular economy case study, we have illustrated for the first time how the orientations complement each other to create a positive CE outcome not only for the organization, but also the external stakeholders (e.g., environment and society). Thus, the application of the Big X framework of leadership in CE can provide future avenues for applying the framework to other areas that are affected by leadership.

3.1 Implications for research

As such, our work has several implications for research. First, our work shows that the primary and sole focus on sustainability leadership (Bendell and Little 2015) might be underestimating the necessary skillsets and behaviors leaders need to be more successful in their sustainability endeavours. Moving away from the operation-oriented approach of sustainability leadership (Millar et al. 2012) can enable leaders and organizations to implement circularity practices and principles more systematically.

Next, our work extends the concept of responsible leadership by linking it to a set of clear behaviors that leaders should show. While multidimensional approaches of leadership effectiveness have been discussed for quite some time (DeRue et al. 2011; Yukl 2012), such approaches are largely absent from the concept of responsible leadership. By linking a value-based leadership taxonomy with responsible leadership, we broaden the scope of responsibility and highlight the complexity of leadership in contemporary organizations. Instead of simply being the effective change agent or relationship-oriented leader, responsible leaders

need to possess all qualities to a certain extent. Applying such principles therefore has the potential to not only change how leaders see their tasks in organizations, but also structure research approaches in the area of sustainability leadership or other related areas, going beyond our illustrative example of CE.

Finally, linking responsible leadership and CE addresses calls for more engaged contributions to the social dimension of CE research (e.g., Mies and Gold 2021; Monciardini et al. 2023). Integrating CE research with human aspects that facilitate the transition to circularity enables scholars to investigate how leaders can manage, facilitate, and implement CE change that increases organizational effectiveness. Furthermore, it underscores the importance leaders play in creating an inclusive, equitable, and consistent understanding of sustainability that addresses the global needs (United Nations 2015).

3.2 Implications for practice

Our research also highlights several practical implications. First, we raise awareness for the multi-faceted approach of leaders that is needed to implement circularity in organizations. Instead of relying only on principle-based sustainability leadership (Bendell and Little 2015), our understanding of responsible leadership provides leaders and organizations with complementary behaviors that create necessary foundations and accompany transitions by considering the complex nature of stakeholders involved when implementing circularity. Viewing responsible leadership as polymathic highlights the absence of single or multiple orientations, which can result in a fragmented approach that may not be effective or even detrimental.

Next, we identify two actions that are necessary to enable leaders to implement circularity. First, management education in leadership needs to integrate the broader conceptualization of responsible leadership. Instead of relying solely on stakeholder perspectives, students and leaders need to learn about the necessity and importance of being a polymathic leader. This requires reflection on these different orientations in order to allow (ongoing) leaders to adequately integrate the importance of these orientations into their value system.

Second, professional training and executive education offerings must consider the nature of polymathic leadership. As our case studies have illustrated, effective leaders are good actors in all orientations. However, traditional leadership training programmes mainly focus on single aspects of leadership (e.g., training in people management, or strategy development and implementation). While such snapshot approaches might be quite common and based on the availability of time, educators, trainers, and leaders now need to re-evaluate their understanding of leadership and adapt it to

address the societal and environmental challenges humanity is facing (United Nations 2015).

Alternatively, we suggest that leaders that are aware of their weaknesses surround themselves with individuals that can complement their strengths by adding the skills and expertise leaders are missing or unable to develop (Yukl and Gardner 2020). In the end, responsible leadership is the goal, and leadership behaviors are the means to achieve the required level of responsibility. Whether it is one leader or a leader with a team who achieve this should be secondary.

3.3 Limitations and future research directions

Of course, our paper is not without limitations. First, we primarily focused on CE as one aspect of sustainability. Although our arguments can easily be extended to other sustainability efforts, these links and explanations need to be made explicit. However, we would argue that the polymathic approach also applies to different forms of sustainability, but it might be that the relative degree of involvement for the different leadership orientations changes. Next, we have used a retrospective case study to illustrate the applicability of the polymathic leadership approach. While this provides initial insights into the complexity of leadership and how circularity can be achieved, more prospective studies and in-depth case studies are needed to examine how the orientations interact in practice to foster effective sustainability. We encourage other researchers to consider and use the Big X taxonomy as a holistic approach to responsible leadership to broaden the empirical foundations and utility of using the Big X.

Furthermore, our research offers several avenues for future studies. Regarding the integration of leadership and circularity, future studies could investigate the relative impact of leadership orientations compared to operations-based approaches.

Next, future studies should also consider time as a contextual element. The process of transforming an organization from a linear to a CE is lengthy, and the leadership orientations may play a different role at different stages of that problem. For example, it is possible that the principle- and progress-orientation come into effect at the beginning of strategy development, when the shift to circularity is initiated and developed. Later people-oriented leadership becomes more important to facilitate the communication of change and allow for consideration of different stakeholders. At the same time, while change initiatives take place, continuity plays an important role in increasing confidence in the organization and its management (Gibb and Buchanan 2006). Thus, leaders are required to sustain daily business operations, thereby engaging in performance-oriented leadership. Examining circular transformations over

time and the associated leadership behaviors in different stages of this transformation might provide novel insights.

4 Conclusion

We have argued that CE approaches need to focus more on the social aspects of leadership. Thus, we introduced the concept of responsible leadership by integrating different viewpoints in the literature on what constitutes responsibility and provided an integrative taxonomy, the Big X of leadership. The Big X consists of four different orientations, progress, principle, performance, and people, and we argued that responsible leadership should be seen as a polymathic approach that enables leaders to be effective across all four dimensions. We supported this argument with an illustrative case study, demonstrating how circularity was achieved by a company through the four different dimensions that acted together to provide positive outcomes.

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Andreas Wihler is Associate Professor of Management at the University of Exeter Business School. With his background in organisational psychology, his research focuses (ir-)responsible leadership, organisational politics, and their consequences at work.



Ryan C. Nolan is a Research and Impact Fellow at the University of Exeter Business School. He is interested in collaboration networks within various organisational settings, especially in the context of sustainability and circular economy transitions.



Yaxin Zheng is a PhD student in Management at the University of Exeter and a visiting PhD student at the Erasmus University. With her background in organisational behaviour, her research focuses leadership assessment, leader-follower interactions such as LMX and self-disclosure.



Hannes Leroy is Full Professor of Leadership Development at Erasmus University and a Distinguished Research Professor at the University of Exeter Business School. With his background in organisational psychology, his research focuses (authentic) leadership development and leader integrative complexity.



Ilke Inceoglu is Professor of Organisational Behaviour and HR Management at the University of Exeter Business School. Her research focuses on well-being at work, leadership, the impact of technology on work behaviour and work/career transitions (e.g. healthy ageing at work). Her research has been published in HRM, applied psychology, leadership, organizational behaviour and management journals.



Fiona Charnley is Professor of Circular Innovation at the University of Exeter Business School. She is co-director of the Exeter Centre for the Circular Economy and the UKRI funded Circular Economy Hub.