Interdisciplinary Environmental Review

ISSN online: 2042-6992 - ISSN print: 1521-0227
https://www.inderscience.com/ier

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DOI: 10.1504/IER.2024.10063818

Article History:

Received:	11 July 2023
Last revised:	02 November 2023
Accepted:	21 November 2023
Published online:	28 June 2024

Networked into a sustainable world – conclusions for leadership and education

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Abstract: To make the world sustainable, research has long realised that it requires network collaboration and education. A freshly published worldwide interdisciplinary Delphi-based scenario study (Blumenthal, 2023) has addressed the question of how future leadership in a digital and networked world could look like and what could follow from this for leadership education. As a future research perspective on leadership and networks is seldom, it seemed interesting to consider the results again in the context of sustainability. Transferability was examined based on a comparison with scientific papers and discourse on practical developments. Also possible implications were discussed. The transfer indicates that a specific leadership understanding, setting a stronger focus on networking, could become more relevant. Furthermore, due to the complexity of the world that can only be handled together, it could become more than ever necessary to stress cooperative, multi-level learning processes.

Keywords: change; collaboration; complexity; cooperation; Delphi technique; diversity; education; foresight; leadership; learning; management; networks; organisation; scenarios; sustainability.

Reference to this paper should be made as follows: Blumenthal, I. (2024) 'Networked into a sustainable world – conclusions for leadership and education', *Interdisciplinary Environmental Review*, Vol. 23, No. 3, pp.199–217.

Biographical notes: Ineke Blumenthal is responsible for the development and further development of existing and new Master's programmes at the School of International Business and Entrepreneurship (SIBE). Since 2021, she is also involved in the business development in the area of scientific and innovation projects. She earned her Doctoral degree at the Department of Educational Sciences at Ludwig-Maximilians-Universität (LMU) in Munich, Germany. Her research was part of a joint research project of the Department of Educational Sciences at LMU Munich and SIBE. Her publications include articles in the field of leadership, leadership education, and talent management.

1 Introduction

Not yet overcome the consequences of the pandemic, the world faces new political, military and economic crisis situations (Mainzer, 2023). Simultaneously, the consequences of the climate change become more and more visible (IPCC, 2021). Already throughout the pandemic it became observable that it takes joint effort to

overcome these circumstances (WEF, 2021). Also against the background of the world situation, authors like Mainzer (2023) required more plurality and diversity in solution proposals to overcome short-term thinking and come to sustainable innovations. However, this finding is not new. Already in 1996 the German Advisory Council on Global Change (WBGU, 2008) accused in the context of environmental change too little international orientation and too strong of a focus on individual disciplines to deal with the complexity of the problems and their interlinkages.

Thus, Pendergraft et al. (2019) summarised that many of the most important problems organisations and societies facing today require intensive collaboration across systems and their integrated groups and teams. This type of collaboration across system boundaries can be called network collaboration.

It might not be surprising that multiple literatures call for an interorganisational diverse actor response to build a sustainable economy (Harrison et al., 2023), which is also needed to achieve a sustainable society (Elkington, 2018). At the same time, Harrison et al. (2023) highlighted that much more research needs to be done. One area where they saw a need for research is in the field of network change and dynamics, including the restructuring and reorganising within and across networks to meet sustainability challenges. In this field, it seems among other things interesting to learn more about the leadership and management of networks.

A worldwide interdisciplinary Delphi-based scenario study (Blumenthal, 2023) has addressed the question of how future leadership in a digital and networked world could look like and what could follow from this for leadership education. Statements that were made within the study suggest that the findings can be applied to other contexts. Within this article it should now be examined if a transfer to sustainability context is appropriate. A possible transferability should be supported by a comparison with external knowledge of scientific papers (Zimmermann et al., 2012) and discourse on practical developments. This seemed interesting, since leadership, sustainability, and networks have already been studied, but only a few had a future perspective and therefore seldomely considered possible future developments.

In the following, the theoretical background between sustainability and networks but also between leadership and education will be introduced. Then, the Delphi-based scenario study, its methodology, and results will be presented. Finally, based on the outcomes of the study, transferability to sustainability context will be explored and possible consequences will be derived to get better clues about possible future developments.

2 Theoretical background

2.1 Sustainability and the added value of networks

A widely used and accepted definition from the United Nation's World Commission on Environment and Development report (UNGA, 1987) defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (p.24). Sustainability is discussed in particular in environmental, economic, and social context, balancing the interests of preservation, growth, and progress (UNGA, 2005). These pillars of sustainability seem to be not conclusive and introduce considerable complexity (Camarinha-Matos et al., 2010): Objectives pursued in

the different pillars appear multidimensional, need to be coordinated within a long term vision of performance and development and might deal with possible conflicts of objectives in addition to questions of how to measure the achievement level. Furthermore, different organisations, systems, and levels interact (Bennett et al., 2021; Donges et al., 2021), all of which answer the question for themselves how to respond to changes in the environment in order to set up sustainably (Snyder et al., 2008).

Camarinha-Matos et al. (2010) stated that sustainability challenges therefore clearly call for a wider collaboration as the needed changes exceed the capacity and capability of individual actors. As already mentioned also other authors also argued in this direction, proposing connectedness as central to understanding networked, interorganisational responses to the sustainability shift (e.g. Harrison et al., 2023).

Networks describe these forms of cooperation, that are realised beyond the boundaries of organisations and are seldom taking place via markets (Powell, 1990; Weyer, 2014). Networks consist of nodes and the ties (relationships) that connect them (Jansen, 2003; Brass et al., 2004). In a broader definition, networks can be understand as changing exchange relations between mainly autonomous, but interdependent actors such as organisations, individuals, but also technology that organise mostly in less formal structures and coordinate often on the basis of informal rules such as expectations of reciprocity to better reach goals than by non-coordinated action (Blumenthal, 2023 based on Weyer, 2014).

Networks differ among other things due to their network ties (Rehrl and Gruber, 2007). From the perspective of diversity it is discussed that networks should especially maintain weak ties, bridges between unconnected actors, to have access to a wider range of information (Burt, 2005; Davidsson and Honig, 2003; Granovetter, 1973).

To arrive at collaborative sustainable responses Harrison et al. (2023) argued that a look at network structure is helpful as it gives the opportunity to better understand exchange relationships, effects on changes in these, potential interdependencies, and relational action.

2.2 Leadership, sustainability and the relevance of networks

Since the beginning of the 20th century leadership became one popular topic of research (Yukl, 2013). Following the broad variety of research streams diverse definitions of leadership were developed (Stogdill, 1974).

Also against the backdrop of changed framework conditions different forms of leadership developed: Based on electrification throughout the second industrial revolution assembly line work, mass production, and division of labour became relevant (Kreutzer et al., 2018). It became thus necessary to introduce among other things a clear structure and process organisation (Haber, 2015). It is therefore probably not surprising that the term ‘management’ is mainly associated with planning, organisation, budgeting, and control (Kotter, 1990). It was Kotter (2013) who realised that other forms of leadership in an ever more changing world were needed. A fast and flexible adaptation seems hardly possible with classical management methods and techniques (Carbon et al., 2021). Kotter (1990) summarised the tasks that are consequently necessary by the help of the term ‘leadership’: one generic definition explains that “Leadership means to lead oneself and human communities with personality – reasonably, responsibly, and ethically into an innovative and creative future in open and complex situations under unclearly defined and dynamic conditions while always considering the framework conditions and

collective rationality" [Faix et al., 2020, (Definition of leadership)]. In the context of organisations, leaders contribute to a sustainable corporate development by realising innovations (Kisgen, 2017), as innovations can help to adapt to changing circumstances (Blumenthal, 2023). Even if the term 'sustainable leadership' is, according to some authors still in the stage of infancy, already various definitions with different accents exist (Liao, 2022). Nevertheless, in the following, the above introduced leadership definition seems sufficient in the context of this article.

Authors like Uhl-Bien and Arena (2017) described that complexity and thus adaptive challenges for organisations exist. In their view complexity becomes visible as new problems arise which can only be solved by the help of partnerships that are, among other things, characterised by conflicting views but also high interdependence of the different partners. It becomes thus obvious that organisations have to act in the context of networks. Consequently, networks are of high relevance for leadership.

Even if research has already dealt with the relationship between leadership and networks, the field seems not to be sufficiently explored and diverse research gaps and perspectives on leadership in networks exist (Sydow, 1999). Furthermore, in the future leadership may also be subject to the influences of a digital and networked world (Blumenthal, 2023). Some studies dealt with future skills of leaders (e.g. Güttel, 2021; O'Brien and Robertson, 2009; Philip et al., 2023) or described futures literacy as important competency of leaders (Gracht and Kisgen, 2022), beyond that there are hardly any contact points between foresight and leadership or networks.

Among other things because of this a worldwide interdisciplinary Delphi-based scenario study on future leadership in a digital and networked was conducted (Blumenthal, 2023). It seems reasonable to take a closer look at the results again against the background of sustainability.

2.3 Education and sustainability

Following the just introduced definition of leadership, leadership education has the goal to foster individuals across their entire lifespan to develop their personalities, which is demonstrated by their innovative actions and contributions that empower them to take a leading role in society (Kisgen, 2017; Mergenthaler, 2017). To support the development of personality, education should among other things set a specific focus on the development of competencies, as they give individuals the ability to act in the world (summarised in Blumenthal, 2023). Faix (2020) further added certain normative criteria in leadership education's objective:

> "To be educated as a leader means lifelong development as an autonomous, rational, and responsible person who researches theoretical aspects, takes on practical leadership tasks, and permanently considers their goals within an ethical and sustainable framework." (p.45)

As such, leadership education is directly linked to sustainability.

Research has investigated the connection between education and sustainability in diverse contexts. Some articles examined sustainability awareness in school contexts (Rahman et al., 2018), others focused on questions of curricular design such as for example experiential learning or place-based pedagogies (Bushell et al., 2011; Keller, 2017; Lyons et al., 2001), questions of interdisciplinarity (Farrell and Quiros, 2005), peer education (Gordon and Ball, 2015) and other methods to strengthen ethical awareness

(Atkinson, 2015). But even beyond that education has long dealt with sustainability, as for example the concept of Education for Sustainable Development showed that was already introduced more than 20 years ago in Germany (de Haan and Harenberg, 1999). In this view, education thus offers opportunities that support learners in developing competencies that help them contribute actively and responsibly in a sustainable world society (de Haan, 2002). In this context different relevant sub-competencies were mentioned such as:

- the ability to build knowledge based on an open mind and new perspectives
- the ability to think and act with foresight
- the ability to gain knowledge and act in an interdisciplinary manner
- the ability to plan and act together with others
- the ability to participate in decision-making processes
- the ability to motivate others to take action
- the ability to reflect upon one's own guiding principles and those of others
- the ability to plan and act independently
- the ability to show empathy and solidarity for the disadvantaged
- as well as the ability to motivate yourself to become active (de Haan, 2008; OECD, 2005).

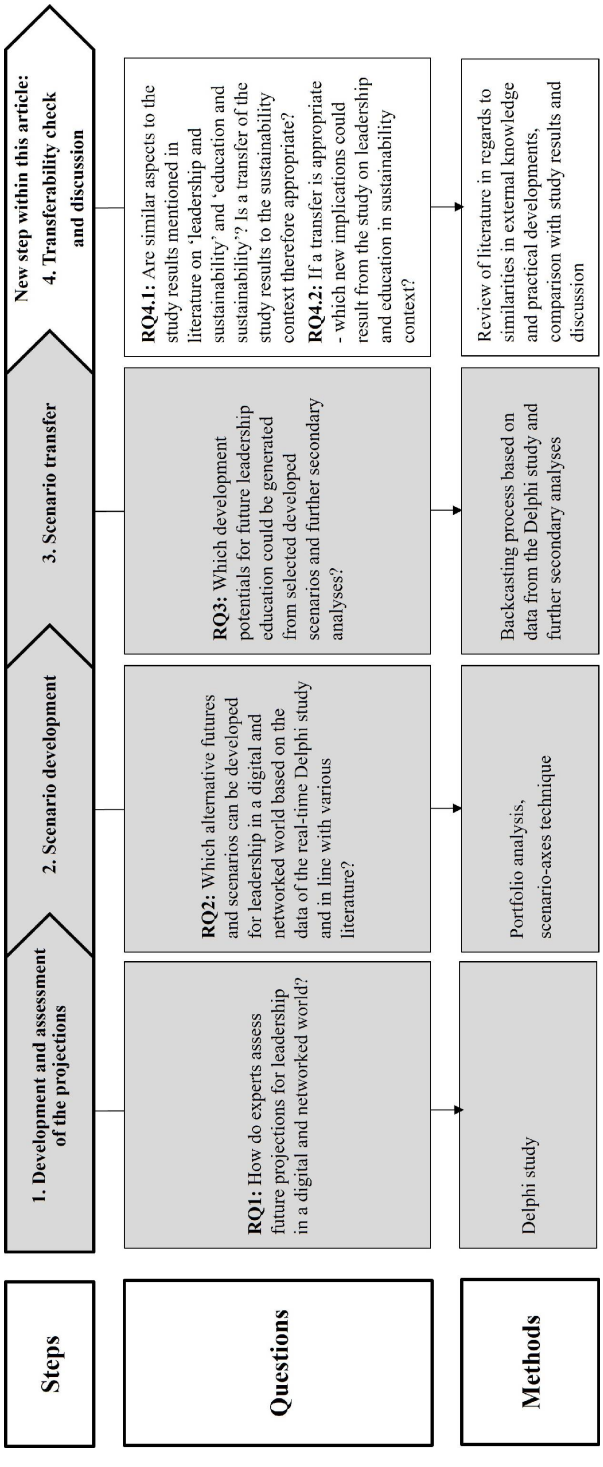
Against the background of the just mentioned relevance of networks in the context of sustainability it seems more than understandable that abilities that support the cooperation in networks, such as for instance the ability to gain knowledge and act in an interdisciplinary manner, as well as the ability to plan and act together with others, are part of this concept.

Education for Sustainable Development is also integrated in the Sustainable Development Goals (4.7), stating that all learners acquire the knowledge and skills needed to promote sustainable development. In Germany, Education for Sustainable Development is systematically pursued since the year 2000 in different activity fields and integrated in European and international action (BMBF, 2021). Also, Education for Sustainable Development was integrated into the different educational levels such as early childhood education, school, higher education, and vocational training (de Haan and Harenberg, 1999).

3 Method

In 2021 a worldwide interdisciplinary Delphi-based scenario study was conducted asking how leadership in a digital and networked world could look like until the year 2041 and what could follow from this for leadership education (Blumenthal, 2023). As such, the study was based on a classic foresight research approach. In contrast to probabilistic forecasting, future in foresight is something multiply envisioned and can be influenced by today's choices (Mauksch et al., 2020).

Figure 1 Research design



Source: Blumenthal (2023)

The study was divided into three steps (Blumenthal, 2023): First, future projections for leadership in a digital and networked world were assessed in a Delphi study. Based on the large amount of generated qualitative and quantitative data within the Delphi study, futures and scenarios were developed in the second step by the help of portfolio analysis and scenario-axes technique. Finally, within the scenario transfer step, development potentials for leadership education were derived based on the findings of the previous steps via a backcasting process. Within this article, step four was newly integrated into the research process, clarifying if a transfer of the study insights to the sustainability context is appropriate [research question (RQ) 4.1] and what implications could result from the study for leadership and education in sustainability context (RQ4.2). In order to do so, literature was reviewed.

In the first step of the study, Delphi technique was used as it helps structuring group communication processes dealing with a complex problem (Linstone and Turoff, 1975). The choice of experts is a key developing stage in a Delphi study (Hsu and Sandford, 2007) and especially in foresight studies, as different viewpoints should be considered (Poli, 2012). Therefore, a heterogeneous panel from three stakeholder groups was built: besides a group of practitioners from business and applied research institutions, scientists, and experts from politics, associations, networks and communities were addressed. Within the Delphi study 10 projections, systematically derived future theses (Warth et al., 2013) for leadership in a digital and networked world until the year 2041, were discussed (Blumenthal, 2023). The projections also were evaluated against the background of probability of occurrence, impact, and desirability of occurrence.

In the second step, qualitative and quantitative data of the Delphi study was used to develop futures and scenarios (Blumenthal, 2023). Within the portfolio analysis (Markmann et al., 2013) results were clustered based on the generated quantitative data. The portfolio analysis gave insights which future developments according to the experts seem to which extend probable and desirable. However, the results are not relevant in the context of this article and therefore omitted in the following. Then, scenarios were developed by the help of scenario axes technique. Scenarios can be described as internally consistent, plausible, and challenging narrative descriptions of possible developments in the future, based on a complex network of influencing factors (Markmann et al., 2013). Influencing factors with a high impact are the starting point for the development of the scenarios as they build the axes within which the scenarios unfold (Heijden, 2005). They were derived in workshops based on the qualitative Delphi results. After the two axes were identified, the scenarios were filled with content along various dimensions based on the Delphi statements and structured in line with discussed aspects in the literature and again in consultation with different experts (Blumenthal, 2023).

The third step focused on the transfer to leadership education by the help of a backcasting process (Herrmann, 2011; Zimmermann et al., 2012). Based on two scenarios of the Delphi-based scenario study as well as on a literature review, a desirable future for leadership education in the year 2041 was developed. Based on a sound theoretical foundation, this desirable future was compared to current requirements for a leadership education curriculum and critically examined in the context of certain framework conditions. On this basis possible development potentials for a leadership education curriculum were derived.

Already in the discussion of the scenarios with different experts it became obvious that the descriptions can possibly also be transferred to other transformation processes which are not necessarily linked to digitisation (Blumenthal, 2023).

Therefore, a fourth step was added to the research process within this article. It should now be examined if a transfer of the study results to sustainability context is appropriate. A possible transferability should be supported by a comparison with external knowledge of scientific papers (Zimmermann et al., 2012) and discourse on practical developments. For this purpose articles in the context of 'leadership and sustainability' as well as 'education and sustainability' were screened for similarities.

Even if links between leadership, sustainability, and networks are already known, a transferability of the study results could give the chance to explore these interrelationships again against the background a future horizon of this foresight study. It could sensitise for possible new future implications on leadership and education in sustainability context.

4 Results and discussion

4.1 Overall results of the Delphi-based scenario study

All subsequent results within the three following subchapters 4.1 to 4.3 were described in detail in Blumenthal, 2023. Subsequently, the reference to it is omitted. Within the Delphi study 113 experts (thereof 31 women and 82 men in six different age groups) completed the assessment of all 10 projections within a period of 7 weeks. The study consisted of two surveys: While within the first survey 24 participants from the stakeholder group of science (experts from futures research, innovation, digitisation, leadership, networks, and education) discussed with 24 participants from stakeholder group of politics, networks, associations, and communities, as well as 35 participants from practice in mostly leadership positions, in the second survey 30 experts from practice with limited years of professional experience and mostly not in leadership positions discussed the similar projections. Even if more than 70% of the participants were situated in Germany, experts came from 19 additional countries (Austria, Bulgaria, Brasil, Canada, China, Denmark, Finland, France, Hungary, Iceland, Iran, Italy, the Republic of Korea, Lithuania, the Netherlands, Romania, Saudi Arabia, Switzerland, and the USA).

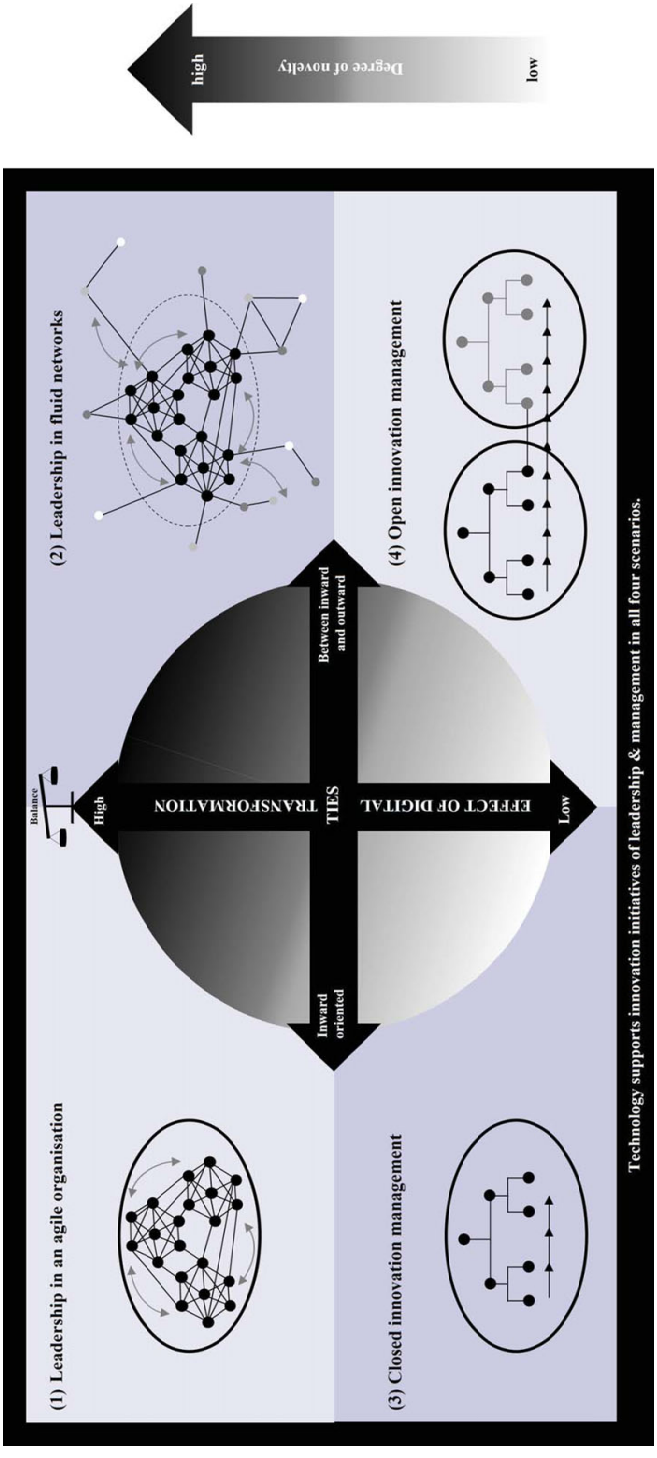
Besides diverse quantitative assessments more than 2,064 qualitative comments were made within the Delphi study giving diverse qualitative impulses for the following questions:

- In which context could leadership act in the future?
- Who could lead in the future?
- How could leadership tasks be shaped in the future?

4.2 Derived Delphi-based scenarios

By the help of the scenario-axes technique four scenarios were developed (Figure 2). Experts suggested that developments of the different scenarios can coexist and maybe differ between regions, fields of activities, and further. Within a later transfer whole scenarios but also only individual aspects of the scenarios can be pursued further (Gracht et al., 2021).

Figure 2 Four scenarios for leadership in a digital and networked world (see online version for colours)



Source: Blumenthal (2023)

The two scenarios below ('closed innovation management' and 'open innovation management') describe circumstances in which the effect of digital transformation is still low and so is the need for change. Smaller incremental further developments seem sufficient. The lower the degree of digital transformation, the more widespread are classic management tasks of leaders. Management focuses on the best possible implementation of innovations through a formal organisational and operational structure (hierarchy and processes). No incentives for external cooperation exist. Network structures only exist between internal network actors and only up to a certain degree as team constellations are quite stable and clear responsibilities within innovation teams still dominate for an efficient and effective realisation of innovations. In contrast to the just described 'closed innovation management', the 'open innovation management' allows an integration of external competencies (as they are relevant but do not exist in the own organisation) by the help of stable partnerships that are secured via contracts.

The two scenarios above ('leadership in an agile organisation' and 'leadership in fluid networks') are under strong influence of digital transformation and therefore undergo great change and complexity that make radical and disruptive innovations necessary to best adapt to those changing conditions. However, they both use different strategies to deal with these framework conditions. In order to reduce the complexity of the external world, 'leadership in an agile organisation' draws clear demarcation lines towards the outside. To meet the external challenges of this magnitude, organisations benefit best from shared responsibility, internal diversity, and changing team constellations. Creative personalities – 'leaders' – are responsible to inspire and offer direction for new innovation goals under open and complex framework conditions, but they also build and support creative agile teams that take over the responsibility to develop and establish innovative solutions and act as self-organised as possible.

The second scenario, 'leadership in fluid networks', builds on changing network structures and no clear differentiation between the inside and outside is possible. Again, creative personalities – 'leaders' – share their responsibility for the realisation of innovations with creative agile and self-organised teams. However, it also becomes highly relevant for leaders to attract independent network actors for joint innovation initiatives and thus teams consist of a larger diversity of actors.

Some experts mentioned that future leadership potentially has to balance the degree of network openness between closed internal networks in the first scenario and fluid networks of the second scenario in order to find the right balance between the need for stability but also opportunities for change. Technology supports innovation projects in all four scenarios. Leadership and management actively integrate technology in diverse innovation initiatives.

4.3 Derived development potentials for leadership education

Development potentials were basically derived based on the first and second scenarios as classic management education was already highly explored and these two promised the newest findings. The transfer basically focused on the transfer to a leadership education curriculum. A curriculum can be understand as academic plan (Lattuca and Stark, 2009) and offers guidelines for teaching and learning (Barnett and Coate, 2005); in this case a focus was set on goals, contents, and methods (Faix et al., 2020).

In Chapter 2.3 it was mentioned that the development of personality is a central goal of leadership education. Furthermore, creative personalities who shape the world through

innovations under changing and complex conditions play a central role in the first and second scenarios. The development of personality thus might become even more relevant in context of high complexity and change dynamics. Furthermore, leadership education presumably should not only address selected individuals to prepare them for leadership tasks. Due to the complexity of the world that can only be handled together, leadership education should probably address the collective and should be integrated as compulsory element at all educational stages.

Further accents could also be set in terms of content: besides accents on framework conditions such as the potentials of technology for innovation, complexity, the relevance of change and stability, and the idea of agility, a stronger emphasis in this setting could be put on the relevance of learning [Blumenthal, (2023), p.245]: "One scientist within the Delphi study drastically described that learning management today is only considered as a marginal component which thus results in the fact that leaders basically focus on self-directed learning and learning by doing". Within the scenario transfer it was thus concluded that it could become even more important to raise further awareness for learning not only in practice but also in theory. Besides individual learning, knowledge and its management, as well as self-organisation, networks, diversity, and a stronger focus on multi-level learning processes (which can be described in accordance with Bontis et al. (2002) and Noe et al. (2010) as combined learning processes at individual, interpersonal, and organisational level) could be useful.

As other authors already described (e.g. Faix et al., 2020), a leadership education curriculum should combine theoretical learning, real-world-experience, and reflection. However, as group work is of high importance in the context of innovation, it could be useful to set a stronger focus on cooperative elements: self-organised team work, changing team compositions, roles, and diversity, as well as the guiding of (cooperative) learning processes need to be experienced practically. Finally, exploration of technology and the critical reflection of its use seem important.

4.4 Transfer to sustainability and discussion of implications

Already in the discussion of the scenarios with different experts it became obvious that the descriptions can also be transferred to other transformation processes which are not necessarily linked to digitisation (Blumenthal, 2023). As described at the beginning of this article, sustainability also is subject to high complexity (Camarinha-Matos et al., 2010). Thus similar frame conditions for leadership could exist. Within this subchapter it was now checked by the help of literature, if a transfer of the generated insights to sustainability context is appropriate (RQ4.1) and what implications could result from the study for leadership and education in sustainability context (RQ4.2).

4.4.1 Transferability check and implications for leadership

From the results of the study (Blumenthal, 2023), it could be concluded that the greater the complexity, the more important a different understanding of leadership could become for the development of sustainable solutions. Classic management of structure and process organisation could not be sufficient. It could rather take leaders that create future through inspiration and offer direction for new sustainable innovation goals under changing framework conditions. However, they could not bear the sole responsibility for

the development of sustainable solutions as problems on this scale can only be handled together.

Articles showed that studies on leadership in a sustainability context discuss similar topics:

In a recent literature review on sustainable leadership (Liao, 2022) the concept of transformational leadership (Bass et al., 1987) was described as one leadership style in the context of sustainability. Similar to the description of leadership tasks derived from the study, transformational leadership motivates for common visions. While doing so, sustainability priorities, like for example green value orientation (Taşçı and Titrek, 2019), are taken into account. In line with the described leadership tasks of the first and second scenarios, several articles on sustainable leadership explained that it is a leadership task to create the necessary framework conditions (for example shape a respective organisational culture, supporting organisational learning, and further), which allow all actors to unfold their potential for the development of sustainable solutions (Iqbal et al., 2020; Liao, 2022).

Also the importance of networks was already described in scientific literature in sustainability context: Authors declared that it needs leadership to create networking with various stakeholders to cope with big sustainability questions like climate change (Al-Zawahreh et al., 2019). Early on, other authors noted the relevance of shared decision making (Hargreaves and Fink, 2004), among other things asking if shared leadership is an answer to responsible leadership (Pearce et al., 2014).

Literature thus showed that many of the derived possible development potentials of future leadership were also already discussed in some context with sustainability. In response to RQ4.1 a transfer consequently seems appropriate.

However, it became also visible that research on leadership and sustainability is quite broad. Liao (2022) for example found out that sustainable leadership was discussed in diverse articles focusing on three levels (the individual, organisational, and cross level) and in five perspectives, always requiring different performance. Thus, also many other aspects than the study findings were discussed in the context of sustainable leadership. Networks, shared leadership, transformational leadership, and further did not play a superordinate role in these articles. Consequently, a conclusion from the Delphi-based scenario study on RQ4.2 possibly could be that the just mentioned aspects could get higher relevance in the future. Especially networks could play a more important role, which became visible in the high degree of networking within the first and second scenarios. Within the scenarios networking was described as useful strategy under open and complex framework conditions among other things, as the diversity of network actors promises to make use of diverse tie relationships and heterogeneous knowledge. Also accompanying challenges for leadership resulting from networking were described, which makes a differentiated examination possible.

4.4.2 Transferability check and implications for education

One conclusion of the Delphi-based scenario study was that leadership education should probably be integrated into the different educational levels, so not only selected persons are approached but the collective (Blumenthal, 2023). Furthermore, attention should probably be paid especially to the development of personality and cooperative, multi-level learning processes.

Also within sustainability context similar viewpoints and insights on education can be found in scientific papers. Again, in response to RQ4.1 a transfer thus seems appropriate:

As already mentioned in Chapter 2.3, Education for Sustainable Development was considered from the start to be integrated at different educational levels. This can be noted as similarity.

Within the same chapter the development of personality was described as a central goal of leadership education. It should thus be an inherent part of educational programmes, as it for example helps to face new situations and deal with normative social problems which are necessary considerations to come up with sustainable solutions (Faix, 2020). However, some authors (Faix, 2020; Kisgen, 2017) found out that many management master programmes still focus on functional management knowledge or even utility maximisation. Again it was mentioned that competency development is a condition for personality development. Also in sustainability contexts authors highlighted the relevance of competencies (such as applying human-centred research methodology, systems-based thinking, awareness of human behaviours and impacts, tackling complex problems, and employing creative approaches to solutions) more than technical skills (Murdoch-Kitt et al., 2015). They again argued that recent graduates often lack these capabilities.

Literature showed that learning and education are considered essential means for achieving sustainability goals, nevertheless it was also argued that the concept of learning remains rather vague (Apetrei et al., 2021; Barth el al., 2023; van Mierlo et al., 2020). Barth et al. therefore specified that it should be more important to focus on how to learn as this generates the resilience needed to face increasingly uncertain futures. They highlighted the use of transdisciplinary learning processes in networks of actors with different expertise, worldviews, influence, and further. According to them, learning in this context especially requires social interaction and iterative reflection in loops.

Earlier studies for example called for changes in university curricula to support the application of a transdisciplinary approach throughout the innovation process (Zweekhorst et al., 2001). Holst (2023) referred to different authors that discussed about Education for Sustainable Development. He summarised that from a bird's-eye perspective, Education for Sustainable Development may be described as a learning network (e.g., O'Donoghue et al., 2018), which facilitates practice-based co-learning, empowering learners and partners as agents of change (Rieckmann et al., 2017).

If a conclusion from the Delphi-based scenario study on RQ4.2 among other things was that especially networks could play a more important role for future leadership, then it might also not be surprising that especially cooperative, multi-level learning processes could be of higher relevance in future education. Similarly, Salem (2020) was convinced that the focus in education needs to change into the direction of continuous learning, support of creativity, and problem solving by interdisciplinarity.

However, Salem (2020) also pointed out that for example higher education is still stressing individual learning and glorifying competitiveness, "which results in future professionals who are not equipped for collaborative work" (p.107). Similar conclusions can be drawn from Education for Sustainable Development in German higher education institutions. Even if Education for Sustainable Development has a long tradition in Germany, it nevertheless only slowly becomes visible in university curricula (Holst and von Seggern, 2020). This might be one reason why some authors even blame higher education institutions as contributors to the current sustainability crisis (Cortese, 2003; Orr, 1993; Tilbury, 2011).

Following the assessment of Sengupta et al. (2020) concluding that imbibing sustainable development in the curriculum is not an easy task and poses several challenges, it could be useful to bring together diverse stakeholders from government, civil society, teaching faculty, and universities who work collectively on these challenges. Moreover, it probably requires holistic concepts for organisational development in educational institutions that take also other aspects besides the curriculum (for example a campus that allows collaborative learning, a strong embeddedness in surrounding communities, and many more) into account (Holst, 2023). Educational institutions probably should also consider organisational development in the direction of the first and second scenarios in order to model networking accordingly.

5 Conclusions

The theoretical examination of sustainability, networks, leadership, and education has shown that interrelations between them are evident and not new. However, possible future developments in that field are rarely considered, which is why the question arose if results from a freshly published worldwide interdisciplinary Delphi-based scenario study on future leadership in a digital and networked world could be transferred to the sustainability context and could offer new insights on implications in the field of leadership and education.

Literature indicates that a transfer of the study results to sustainability context is appropriate. Many of the potential conclusions from the study are also discussed in sustainability context. In addition, many other aspects are also discussed in the context of sustainable leadership and education in literature. Based on the results of the Delphi study it could thus become visible which of the aspects could become more relevant in the future.

Against this background, the study indicates that a specific leadership understanding, setting a stronger focus on networking, could become more relevant. As networking was described as useful strategy under open and complex framework conditions within the first and second scenarios, it is probably not surprising that it consequently could require educational institutions to stress especially cooperative, multi-level learning processes in the curricula.

As these conclusions were drawn from a Delphi-based scenario study, it must be noted that the results cannot be claimed to be representative: they are not a proven truth but provide an overview of possible future developments for leadership and education from the viewpoint of the participating experts, which came from 20 different countries, but especially Germany (Blumenthal, 2023). Furthermore, only a limited number of possible future developments were discussed and no specific sustainability experts were included in the study. Beyond that it seems important to mention that it could be a high claim to reach broader target groups in different educational levels, as some experts already within the Delphi study questioned whether it is possible to motivate and enable everyone for this further development (Blumenthal, 2023).

However, the comparison with external knowledge of scientific studies and papers also showed that educational practice is not necessarily sufficiently prepared for the future, although many scientific findings have been available for a long time. Cooperative learning as such seems to be still too little in focus. Consequently, a new debate about sustainability in education arose which can be understood as a renaissance (vbw, 2017).

To overcome the practical obstacles, Holst (2023) indicated that it probably needs holistic concepts for organisational development in educational institutions that take also other aspects besides the curriculum into account. In accordance with the results of the Delphi study, educational institutions probably should also consider organisational development in the direction of the first and second scenarios in order to model networking accordingly. Following the recommendation of Holst (2023), it therefore seems useful for future research to investigate organisation-specific pathways to sustainable education.

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