



sustainability

Higher Education Institutions and Sustainable Development Implementing a Whole- Institution Approach

Edited by

Marco Rieckmann and Inka Bormann

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Higher Education Institutions and Sustainable Development

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Editors

Marco Rieckmann

Inka Bormann

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Editors

Marco Rieckmann
University of Vechta
Germany

Inka Bormann
Freie Universität Berlin
Germany

Editorial Office

MDPI
St. Alban-Anlage 66
4052 Basel, Switzerland

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About the Editors

Marco Rieckmann is Professor of Higher Education Development in the Department of Education of Faculty I—Education and Social Sciences at the University of Vechta. He is Presidential Advisor on Sustainability of the University of Vechta, representative of the German Educational Research Association (GERA) in the Council of the European Educational Research Association (EERA) and Speaker of the German-speaking network “Teacher Education for Sustainable Development” (LeNa). His main research interests are higher education development, (higher) education for sustainable development, and sustainable university development.

Inka Bormann is Professor of General Education at the Free University of Berlin. She is a member of the Ad Hoc Group on Indicators for Education for Sustainable Development of the United Nations Economic Commission for Europe (2019–2020) and an elected member of the German Commission for UNESCO. Her main research interests are trust in and towards educational institutions, educational governance, transformative learning through engagement, education for sustainable development, and sustainable university development.

Preface to “Higher Education Institutions and Sustainable Development—Implementing a Whole-Institution Approach”

Sustainability is an urgent developmental task for our society and is attracting increasing attention. Therefore, higher education institutions (HEIs) are also called upon to deal theoretically, conceptually, methodically, critically, and reflectively with the associated challenges and the processes and conditions of transformation in order to contribute to sustainable development. But how can complex organisations, such as HEIs, succeed in initiating and maintaining the process of sustainable development within their own institutions and make it a permanent responsibility? How can as many protagonists as possible be persuaded to get involved in sustainable development? For these questions, there is no patent recipe, no guidelines to action, no checklist that would be equally helpful for all universities or that could be applied across the board by all. HEIs are too different, for example, in terms of their legal form (private or public), their location (rural or metropolitan), or size (small and specialised or large universities). In addition, HEIs are influenced by external framework conditions that promote aspects of sustainability to varying degrees, depending on national or regional policies. While the higher education landscape is currently still characterised more by individual sustainability projects and the addressing of sustainability issues in individual courses, the focus should be more on implementing sustainability in the structures – understood as a holistic transformation of learning and teaching environments. HEIs should see themselves as places of learning and experience for sustainable development and should therefore orient all their processes towards principles of sustainability. For Education for Sustainable Development to be more effective, each HEI must be transformed as a whole. Such a whole-institution approach aims to integrate sustainability into all aspects of each HEI. It involves rethinking the curriculum, operations, organisational culture, learner participation, leadership and management, community relations, and research. In this way, the institution itself acts as a role model for the learners. This book deals with the promotion of sustainable university development and provides an overview of how universities can be organised sustainably and how sustainable development can be implemented in their various functional areas. In the sense of a “whole-institution approach”, which encompasses entire HEIs, the focus is not only on the core areas of teaching (higher education for sustainable development) and research (sustainability in research) but, also, on the operational management of HEIs. In addition, this book focuses on sustainability governance and transfer for sustainable development at HEIs as cross-disciplinary issues.

Marco Rieckmann, Inka Bormann

Editors

Article

The Role of Universities in a Sustainable Society. Why Value-Free Research is Neither Possible nor Desirable

Markus Vogt and Christoph Weber *

Chair of Christian Social Ethics, Ludwig-Maximilians-Universität Munich (LMU), 80539 Munich, Germany; m.vogt@lmu.de

* Correspondence: ch.weber@lmu.de; Tel.: +49-89-2180-2296

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Abstract: The current climate crisis confronts us with a deep discrepancy between knowledge and action. Therefore, this article is looking for a readjustment of the relationship between science and society. The positivist self-understanding of science and its fragmented organizational form lead to a marginalization of ethical questions. Instead, sustainability calls for a re-examination of the preconditions and embedding contexts of supposedly value-free research. Faced with the increasing complexity of the modern world, ethics must spell out a new “grammar of responsibility” that addresses the prevalent “declamatory overload of responsibility”. Ethicists can fulfil this role by uncovering and regulating conflicting goals and dilemmas. Instead of playing the role of “marginal echo chambers”, universities ought to assume their social responsibility as structural policy actors. This article suggests a methodology of responsible research as a specific ethical contribution to the model of “transformative” and “catalytic” science for a “post-normal age”. True to their founding mission, academia should herald a “New Enlightenment” that is more self-reflexive regarding its own practical and ethical preconditions, foundations, and consequences. This article presents a possible practical method for fostering the dialogue between the natural sciences and the humanities and to link research, education, practice, and social communication in new ways. It is concluded that a foundation of a whole-rationality approach with a multidimensional understanding of wisdom and, respectively, rationality and sagacity is necessary for sustainable universities.

Keywords: sustainability in science; transformative science; grammar of responsibility; ethics of knowledge; universities as echo chambers of society; catalytic science; whole-institution approach

1. Introduction—Humanity is Running out of Time

The current situation of global society in the upheaval of modernity is marked by a discrepancy between knowledge of probable future disasters and a lack of adequate reaction of today’s society. Theoretically, available technology could ensure proactive protection for the environment and climate that respects the “planetary boundaries” [1] (p. 1) of a safe and fair space for the development of human civilization. However, there is a lack of social will and of binding political framework conditions to shift from an irresponsible logic of competitive pressure to ecological and social foresight.

The development of solutions to scientific–technical problems requires great trust in an open future and in the complex interaction between self-dependent actors, with such interaction being conducted freely and reasonably. By contrast, deep mistrust is spreading regarding democracy, reason, and the concepts of progress with which science is closely interwoven. Ethically and politically, particularly precarious is the increasing distrust of international cooperation and of the ethical universalism of human-rights-based political liberalism [2–4]. Against this background, the role, communication conditions, and tasks of science in political discourse are changing.

This article focuses on a definition of the relationship between science and society, based on the “whole-institution approach” [5] (p. 19). Instead of entrusting the issue of sustainability just to

a single academic department, the “whole-institution approach” encompasses the university as a whole. On all levels and all fields, sustainability needs to be established as a core value and common goal that all stakeholders actively seek to put into practice. For instance, sustainability “involves rethinking the curriculum, campus operations, organizational culture, student participation, leadership and management, community relationships, and research” [6] (p. 46). This process can be fostered by offering financial and administrative support, training schemes, guidelines, and best practice models. The central task is to establish viable inter-institutional, interdisciplinary, and transdisciplinary networks. Thus, the university itself becomes a beacon of sustainability by linking research and practice on its own campus [6,7] (pp. 39–59, pp. 113f.).

The main thesis of this paper is that ineffective ethical knowledge relates to a deeper deficit of the current self-understanding and of the organizational form of science, namely a shortened understanding of rationality, which subsequently leads to the marginalization of ethical questions. Therefore, this article stimulates a debate with an understanding of ethics as “philosophy of science” and a norm-theoretical analysis of different ways by using the terms “responsibility” and “freedom”. It explores, in a theoretical and practical way, whether and how universities can contribute to a sustainable society under changed conditions of communication.

On the one hand, the “social grammar” of responsibility in the field of tension between actor, object, and controlling authority, and the handling of highly complex risks, is examined. On the other hand, the understanding of rationality and the associated current debate about the relationship between science and society in times of climate change as well as the “post-factual” weakness of trust in reason and democracy are analysed. The aim of this paper is to outline an ethics of knowledge that understands research, freedom, and responsibility as a unit and plumbs the academic discourse space anew.

Owing to the above-mentioned reason, the considerations are divided into five parts (a–e): (a) The current situation of science between the role of observer and actor is presented at first in Section 2. (b) Section 3 will describe the need to change the cultural patterns and guiding values of society, so that universities can become driving forces for a cultural revolution. (c) The methodology of how this change can take place follows in Section 4, and (d) the vision of a “New Enlightenment” ends the line of argument in Section 5. (e) In the final section, Section 6, all arguments are summarized together with discussion from a different point of view from that of the authors, as well as other issues not considered in this article.

2. Science between the Role of Observer and Actor

Numerous scientists around the world have raised their voices because they do not want to witness society fall into the climate trap. Inspired by the vigor of striking students with “Fridays for Future”, the “Scientists for Future” initiative has developed into a strong international network in 2019. At the level of higher education policy, there are various initiatives to institutionalize climate responsibility. Examples include the Germany-wide joint project “HOCH^N” (www.hoch-n.org), the “Network University and Sustainability in Bavaria” (www.nachhaltighochschule.de/), and the German “Science Platform Sustainability 2030” (www.wpn2030.de).

2.1. Re-Examination of the Relationships Between Science and Society

Thus, the relationships between science and society, knowledge and responsibility, and freedom and autonomy must be re-examined. The debate is conducted under various headings, but none of these approaches have received proper attention so far. They include the terms “socially responsible research” [8] (p. 38), “transdisciplinary” [9] (p. 68), “catalytic science” [10] (p. 44), “knowledge hierarchy (expert vs. lay)” [11] (pp. 86f.; 89f.), “citizen science” [12] (pp. 13f.), “dialogical” and “integral higher education system” [13] (pp. 166f.), “transformative science” [14] (p. 17), “oppositional and emancipatory science” [15] (pp. 101f.), or “science for a post-normal age” [16] (p. 739). All of these approaches urge the scientific community to play an active role in orientation and conflict resolution in

the multi-layered field of tension of the current processes of change. They establish a robust knowledge base for a just and sustainable design in a transdisciplinary, dialogical, and context-sensitive way.

In our view, Ortwin Renn's concept of "catalytic science" most succinctly summarizes the various aspects of the relationship between science and society. Renn specifies the role of science in social transformation processes by describing science as a catalyst. Scientists should not see themselves as moderators, but should contribute their knowledge as an indispensable energy to dissolve blockages in thought and processes, and to activate desirable transformations. Among the scientific public, however, the term "transformative science" has become established as a guiding concept in debate, perhaps because the term is controversial and has stimulated conceptual discussions [10].

Ultimately, the pragmatic challenges of climate change call into question the current fundamentals of science. For example, the French sociologist Geoffroy de Lagasnerie argued that scientists are already involved in social change—as soon as they begin to produce ideas and discourses [15] (p. 14):

"If the concept of science (and especially the intellectual field) is to have relevance as a sphere of discussion, then the questioning of certain structures in which knowledge is produced (and also the question of what knowledge production actually means) is not an 'attack on science', but, on the contrary, a form of the use of scientific reason, which, in this case, chooses itself as its object, a kind of academic practice which remains loyal to its concept and definition" (translation from German) [15] (pp. 81f.).

Truth is not a neutral descriptive perspective, but an "oppositional concept" that shows how and why a practice or an institution is incorrect [15] (p. 55). If one locates usefulness in this original linkage of theory and practice, then it is not an externally applied measure to evaluate utilitarian consequence. Instead, usefulness represents an inherent moment of the practice of knowledge. It is a counterpart to the self-referential nature of science. Especially in the humanities, such self-referencing increasingly refers to itself through a flood of footnotes and thus forms a closed system that seems to decouple itself from the outside world [17].

2.2. Three Dimensions of Sustainability Research

The best politically established term in the search of responsible, transformative, catalytic, or public science is "sustainable research". However, there are three quite different ways of understanding the concept:

- (1) Sustainability research in a broad sense focuses on particular questions of sustainability, such as climate change, renewable energy, and biodiversity.
- (2) Research procedures respect guidelines about sustainability, for example, with regard to the use of natural resources, animal welfare, and social compatibility
- (3) Sustainability research in a narrow sense examines the coherence of the concept and its normative logic. This is essentially a logic of integration, inclusion, and balance, which seeks to harmonize heterogeneous and conflicting goals and to establish strategic networks between different fields and levels of action. Ethical reflection should not stop at asserting synergies. It is also necessary to analyze conflicts and trade-offs, to reflect on priorities, to define criteria for appropriate decisions in different contexts, and to establish procedures for dealing with dissent. Of central importance here is to mediate between the different logics of the social subsystems.

The concept "research in a socially responsible way" (translation from German) [8] (p. 38) focuses on the second area: It primarily develops standards for the process of research. However, the other two dimensions are by no means excluded. Academic responsibility cannot be limited to a few formal criteria of research, but must rather deal with the grand challenges.

2.3. The Conflict between the Normative Claim of Transformative Science and the Positivist Theory of Science

The normative claim of sustainable and transformative science is an attack on the positivist theory of science. In terms of moral theory, this is associated with a profound dilemma. By reducing the

understanding of “reason” in a positivist manner to its knowledge function, it necessarily surrenders itself to a morality of subjective decisions and purposes released to arbitrariness: It declines to the means for goals about which it itself ultimately does not decide [18] (p. 33). In positivism, morality is understood as a question of subjective preferences that cannot be further justified and is therefore excluded from the concept of science [15] (pp. 17–27).

Much of what Max Weber wrote 100 years ago in his two lectures “Science as a Vocation” [19] and “Politics as a Vocation” [20] is still valid and ground-breaking. This is relevant not only in ethics, but also for the self-understanding of science and politics. Nevertheless, there are several methodological problems in his model of ethics of responsibility. Weber proposed a method of weighing consequences and strict separation between a science that ascertains and analyzes facts versus a policy that negotiates compromises between diverse interests, preferences, and value convictions [21] (pp. 97–121). The model needs critical further development, because reflecting on the rationality of the goals and ideas of a good and meaningful life are excluded from the thinking space of science. The concept of the unity of analytical and normative reason becomes fragile. This is especially true with regard to its perception by ancient and medieval traditions, especially the concept of wisdom (*phronesis* or *prudentia*) [22,23]. Weber’s theory of responsibility as consequentialism is subjected to a calculation of purposeful rationality, in which essential dimensions of practical reason are ignored [24].

With regard to methods of ethical decision making, the concept of responsibility needs to be supplemented [18] (pp. 17–128). For Horkheimer and Adorno, Weber’s separation of ethics from research and action from knowledge in conventional social-scientific thinking neglects the practical use of the conceptual systems and one’s own public role. This tendency hides the structural preconditions and consequences as well as the perspective of scientific positions behind the appearance of neutrality instead of making them transparent [25]. It also undermines the necessary distance from the system of rules of society that has coagulated in science [26].

The positivist understanding of science needs to be critically revised [15] (pp. 17–27) and relativized regarding the preconditions and embedding contexts of supposedly value-free research [27] (pp. 201–240). A multidimensional understanding of wisdom, prudence, intelligence, knowledgeable, judiciousness, and sagacity has to be established as the foundation for a “whole-rationality approach” of understanding sustainability sciences and sustainability education. In addition, spirituality might be a crucial part of “sustainable wisdom” [28] (pp. 279–290). It is a kind of rationality which is open to the ambiguity of the world [29]. At the same time, it is a form of “practical wisdom” [22].

Thus, with new urgency, the old question arises as to whether science can be content with analyzing the world, or whether it should also immediately strive to change it. Is the role of science mainly that of an observer or an actor? What role do universities play in the society?

Universities are not only observers. They can also be seen as “change agents” by having an ethical scientific theoretical basis in the concept of sustainability. This core has established itself above all in the sphere of politics and was initially a socio-political and not a scientific concept. It is a discourse of responsibility whose strong normative charge in its deep structure does not fit with current ideas of freedom, autonomy, and scientific excellence at universities [30]. Some scientists fear that the freedom of science will be used for ethical and political purposes and thus sacrificed.

Against the background of this unresolvable tension between different models of scientific theory, the claim of responsible and transformative science should not be interpreted primarily as a moral appeal. Such a claim should first be reflected in theories of science and norms. Science in the era of climate change should not lose itself in activism under the pressure of supposedly urgent political goals. It will only succeed if it methodically and structurally reflects the search process in the field of tension between empirical research, normative demands, and social transformation in relation to the self-conception and organization of science. The reflections of de Lagasnerie [15], Schneidewind [31], Grunwald [14], Müller-Christ [13], and others support this idea, but require greater ethical depth.

The following part combines a reflection about the role of universities in society with some considerations about the underlining concept of rationality and its normative implications. The thesis

is that we need a new discovering of the traditional idea of wisdom. The aim of the argumentation is a contribution to overcoming the dualism between science and society by connecting theoretical and practical competences as well as empirical and normative approaches. Universities are understood as “structural policy actors” that actively reflect upon and shape their own working conditions. This leads to a shift in understanding progress which underlines the need to change the cultural patterns and guiding values of society.

3. Universities as Driving Forces for a Cultural Revolution

3.1. The Crisis of the Wise—Universities as Marginal Echo Chambers?

The science journalist Manuel Hartung became known for his “College Novel”, published in 2007, about the everyday life of modern students. He diagnosed a “crisis of the wise” that is ignited by the question of whether universities want to remain in their “marginal echo chamber” or become “centers of social certainty” (translation from German) [32].

This harsh criticism can be read as a call for transformative science. The current highly differentiated scientific world produces heaps of detailed data-fed studies and reflections; these mostly generate neither existential knowledge nor the will to act. Not least due to the vast increase in scientific publications that are produced with great effort but seldom read, many sectors of science are threatened with becoming self-referentially closed systems. This would mean that “scientific impact” is insufficient as a criterion for excellence, and should be accompanied by “societal impact” to ensure quality [33] (p. 27). This complaint is not new (cf., e.g., the educational theoretical analyses of Alfred North Whitehead dating back to a lecture cycle held at Oxford University in 1912 [34]). In the context of the challenges of climate change and digitization, however, such a sentiment is topical and urgent [35] (pp. 150–163). In brief, people do not know what to believe, and do not believe what they know. We are displacing ecological knowledge because we do not want to admit it. The announced catastrophe reaches our consciousness superficially because we are trapped in the comforts of everyday life and cannot imagine its loss. We compensate with a bad conscience and moral appeals to third parties. There is a lack of a sense of reality, because the uncomfortable facts of climate change and global poverty remain abstract for most people. They are of little immediate sensual significance.

Science is faced with a communicative dilemma. If it points out its unavoidable fuzziness, “then it develops no appellative force and fails to make the point that the world could very soon become very similar to the fictional scenarios of doom” (translation from German) [36] (p. 4). An apocalypse of global warming and extreme events seems to be perceived as a myth, and “any resembling prognosis seems to be untrustworthy precisely because of this resemblance. That is where the effect we are experiencing right now comes from. If the present actually bears (pre-)apocalyptic traits, this is not perceptible, or can easily be repressed or rationalized on a small scale” (translation from German) [36] (p. 4).

Against this background, the crisis of the wise is not simply a failure of individual intellectuals, but is deeply rooted in the modern concept of rationality and science. This diagnosis calls for the transformation of science. Climate and environmental change, which are increasingly harsh real experiences, challenge scientists to question the current patterns of thought and action. Under great time pressure, they need to make the knowledge base available for comprehensive transformation of the economy and modern ways of life. This undertaking will not succeed without a revision of our human self-understanding. The Anthropocene takes philosophical anthropology to new horizons of reflection. This period can be described as a new phase of enlightenment with a changed thrust [37] (pp. 92f.), focusing on the integration of fragmented knowledge.

Sustainability science as an educational method can be measured by whether it enables an ethically founded reorientation in the Anthropocene and links diverse segments of dissociated knowledge landscapes. It aims to enable students to acquire the knowledge to generate judgement and the will to act. This can also be described as “emancipatory science” (translation from German) [15] (pp. 101f.).

3.2. Transforming the Concept of Rationality into a Reliable Normative Compass

The controversial debate about the role of universities in society in times of climate change challenges the self-understanding of science, which also has to answer to the contempt of rationality in parts of the public debates. The “crisis of the wise” can also be interpreted as the consequence of a limited understanding of rationality through loss of the classical concept of wisdom [22]. This includes analytical as well as normative and everyday practical skills. It combines a precise perception of the situation with qualitative standards of value resulting from wishes, interests, and convictions in order to compare different alternatives for action and to make goal-oriented decisions. Wisdom enables individuals and collectives not simply to blindly follow their own preferences, but to judge, weigh, coordinate, and implement those preferences according to the situation. Wisdom establishes a concept of rationality that integrates the discourse about a successful lifestyle and enables decisive action as the central moment of all virtues. It constitutes “our personal grammar of importance, preference, and desirability” [22] (p. 10) and self-esteem as an “evaluative gravitational field of personal identity” [22] (p. 11).

In modern times, wisdom is “moved from its ethical center. Wisdom is losing its ethical impregnation and has no longer the character of a life-management authority” [22] (p. 7). Wisdom becomes a “contingency management technique” that serves interests. It is focused on an “ethically neutral optimization of consequences of action” and “loses the dimension of supervision over one’s own quality of life” (all translations from German) [22] (p. 7). The common good can thus only be understood as the intersection of private interests. However, this remains a highly fragile construct, which—given the complex challenges of the Anthropocene—cannot generate sufficient stability for long-term global cooperation.

Science has become the catalyst for such profound change in society that ethical reflections are scarcely able to follow. The German Advisory Council on Global Change (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen) therefore proposes a “normative compass”; at its center is the concept of dignity [38] (pp. 2f.). This is flanked by the maxims of participation, the protection of individual character and diversity, and the conservation of natural resources. However, these concepts remain abstract and powerless unless they prompt science to shape the digital future and promote ethical–political development. If humanity, as “Homo Deus” [39], with our increased use of technology, is seen godlike, the inversion of all values in favor of a transhumanism can hardly be stopped. Then, the humanistic foundation of the universities would be a leftover of the past [40].

3.3. Redesigning Discourse Spaces by Overcoming the Dualism between Science and Society

Transformative science relativizes the significance of the disciplinary professional community as a delimitation of discursive spaces and affiliations. According to de Lagasnerie, the supposed autonomy and neutrality through subject-related membership generates a dualistic two-world constellation. The first constellation is that of academic discourses and the second is the public in media, politics, and society [15] (p. 94). Emancipatory science overcomes this dualism by creating situational spaces for discussion in the common struggle for justice. It establishes an inclusive relationship between intellectuals, politics, and the public sphere [15] (p. 102).

This adjustment in the relationship between science and society can be described as overcoming a dual chronology. The old model initially envisaged an “internal” discussion and knowledge generation reserved for specific disciplines, which were then confronted—in a second step—in their encounter with the “outside world” through some kind of dialogue [15] (p. 102). Models of “citizen science” [12] (pp. 13f.) and “dialogical science” [13] (pp. 166f.) understand the public as well as every day and practical knowledge of supposed laymen as always present in the process of knowledge acquisition. This results in a “heterogeneous intellectual space, [...] to which activists, artists, writers, and authors with the most diverse horizons belong” (translation from German) [15] (p. 103). In this space, thinking occurs; it represents a public exterior space to which science refers before the practice of knowledge emerges.

The structural change of the public through digital media is also changing the way science is conducted and communicated. This raises fundamental questions, both practical and philosophical. The practical aspect concerns data protection, transparency, and the suggestive power of digital algorithms. The philosophical aspect concerns human self-understanding in view of the increasingly superior functional performance of artificial intelligence in certain areas [35]. Fair, inclusive, and humane coping with the complex radical processes of change associated with digitization requires new discourse spaces in the dialogue between scientific, social, entrepreneurial, and political practice. This is the only way to involve complex expert knowledge without installing the exclusive rule of experts that Strohschneider rightly rejects [41] (p. 190). Digitization offers many opportunities for innovation, without which adaptation to the challenges of climate change would be slow or impossible [42].

Citizen Science does not mean that the difference between spontaneous, civic, and scientific knowledge is leveled. Scientists always seek what others cannot see, even in practical social contexts. Through their scientific perspective, they discover new and uncomfortable questions [15] (pp. 104–106). If the people abandon the idea of academic discipline as a community and commit themselves to ethical spaces of discussion, society does not abandon research and science at all, but affirms both, because, in this way, the citizens address both of them [15] (p. 106). Since the judgement of everyday experience plays an important role in ethical questions, and questions of sustainability have an ethical dimension, the various models of civic science are of particular importance here.

The most methodologically differentiated and long-established guiding concept for redesigning scientific discourse spaces is transdisciplinarity [9]. Three aspects are guiding here [10] (p. 46): Research practices that adapt their objects of investigation, methods, and questions to social problems; cross-disciplinary development of analyses and options for action, considering empirical knowledge of contextual conditions and areas of application in practice; integration of knowledge carriers outside of science, throughout all phases of the knowledge and research process, to develop practical and socially accepted solutions.

Transdisciplinarity is a hybrid of three concepts of science. These are 1) the classical, which offers orientation aid with the help of systematic analyses of complex contexts, 2) the instrumental, which formulates problem-solving options for action with the help of scenarios, and 3) the catalytic, which contributes co-creatively to controlling decision-making and communication processes on the basis of a procedural design [10] (pp. 49f.). The success of scientific social and policy advice regarding the current transformation processes and governance problems in the context of climate change, digitization, and sustainability depends to a large extent on whether a synthesis of these three strategies succeeds at the level of “high-quality knowledge” [43] and whether science establishes itself as an “honest broker” [44,45] (p. 113, pp. 2f.) of mediation in complex conflict situations. The prerequisite is that science should cultivate and promote communicative intelligence in heterogeneous discourse spaces as an integral part of its self-image and working method.

To adequately fulfil this demanding role, transformative science needs places and arenas in which its socially productive impact can be experienced and tested [33] (pp. 27f.). Institutional innovations and resources are also important to overcome the strong inertia in the science system and to open up transdisciplinary discourse spaces more than just selectively—or with a loss of quality [46] (p. 64).

What the concepts of transdisciplinary research and transformative science have in common is the goal of “reviving the relationship between science and society and supporting it with proposals for political innovations to promote sustainability research” (translation from German) [33] (p. 26). It deals with the self-image of the scientists as well as with institutional questions of change and the distribution of resources. The concept is about the “scientific impact” in connection with the “societal impact” [33] (p. 27), regarding the role of science in deliberative democracies based on reason [44]. The various concepts can also be summarized as science in the service of society.

3.4. *Universities As “Structural Policy Actors”*

Against the background of the complex debates briefly outlined here, what has been said is applied in this final section on the role of universities and a new concept of transformative science. That is, how can sustainability—in the sense of a “whole-institution approach”—be anchored in the depth structure of the university so that it becomes an influential structural policy actor?

Universities face heterogeneous role expectations: Education of a growing number of students with a simultaneous integration of all learners; producers of innovative knowledge for the economy; a place of critical thinking. The multitude of expectations creates considerable pressure. Autonomy helps to mobilize productivity and efficiency potentials. Often, however, this is a sham autonomy, since it merely addresses the resource constraints with a range of management instruments, which usually follow a business rationality model [13,15,47] (p. 171, pp. 24–27, 33–36, p. 84). The increase in university autonomy through liberation from state and political influence often leads to appropriation by other subsystems (e.g., by industry as a third-party donor).

Securing autonomy requires a critical examination of one’s own institutional conditions for action. Universities are structural policy actors; they are institutions whose actions do not simply react to social framework conditions, but actively influence those social conditions with their strategies [15,47] (p. 82, p. 102). To this end, universities must perceive the multiple demands placed on them as an opportunity for further development, to become social bridge-builders between the various social subsystems. In the sense of a “whole-institution approach”, holistic approaches to the design of higher education institutions should aim to shape the curriculum and the management of the organization. Cooperation with other local institutions, initiatives, and actors in the sense of sustainable development are also crucial. Autonomy means moving freely between systems in the field of plural demands. This can succeed only if the areas of tension in the sense of an intelligent dilemma management, a high tolerance of ambiguity, and transparency and credibility are mastered and placed into a productive relationship [6,47] (pp. 46–48; pp. 86f.).

Sustainability is not an externally defined goal, but an open search process with heterogeneous target components, which are thus plural and culturally variable [28] (pp. 134–179, 369–372). It does not replace normative debates, but challenges them. A precondition for this challenge is that the adjective “sustainable” is not used synonymously with “good”. Instead, the relevant ethical and cultural guiding values—such as freedom, human dignity, justice, or prosperity—must be reflected. The conflicting goals must clearly be named. Transformative science addresses the conditions and goals of research. It does not aim at softening quality standards in favor of practical purposes, but at a self-reflexive and pluralistic value debate about good education and excellent research. It understands the ability of science not only to collect data, but also to evaluate them and to recommend actions as a criterion for excellence. In such an understanding of science, “ethics” is not a single criterion among many, but provides a framework for reflection and a structure for argumentation of the whole. It aims at “excellence of responsibility”. This has proven its worth in the ability to identify the epistemic and structural causes of conflicts of values and justice and to identify dilemmas, while representing clear options and priorities.

3.5. *A Paradigm Shift in the Understanding of Progress*

The scientific system reflects information highly selectively, using specific codes that reduce complexity and guarantee efficiency, effectiveness, and verifiability. These features enable specialization and dynamism, but at the same time create limited perception [47] (p. 88). Non-system subordinate sequences are produced, but are usually not recognized and therefore not adequately processed. In a reflexive modernity [11,48], however, it will be important to think systemically about the social side effects of technical and socio-economic innovations from the outset. To achieve this, rapidly changing knowledge societies depend on a prospective responsibility among scientific institutions. Ultimately, it is about a “cultural revolution” [49] (p. 3), a “World in Transition—A Social Contract for Sustainability” [50]. This is not only the postulate of some scientists, but is already a political decision:

With the Sustainable Development Goals (SDGs) and the Climate Treaty of Paris, the international community has committed itself to such a revolution. By addressing old and new industrialized countries as well as countries of the Global South, these documents bid farewell to the development concept that the United Nations previously promoted [51]. However, this farewell has not been consistent, and many contradictions arise in the tension between ecological and socio-economic goals [52] (pp. 13–20, 55–67). Awareness of the consequences of the SDGs for everyday politics, economy, and society seems limited. Thus, the potential for conflict associated with the SDGs is considerably underestimated.

The implementation of the SDGs cannot be achieved without a change in the cultural patterns and guiding values of society. These cannot be changed by decisions from above, but must change gradually in a complex interplay between value change, institutional design of framework conditions, and pioneers of transformative practice. So-called Leaderships are indispensable at all levels. One of their core tasks is to illustrate new ways of understanding progress. In this way, universities can change their role from marginal echo chambers to driving forces for a revolution of the society in favor of sustainability. In order to grow up in this role, they have to provide a better understanding of transformation and the challenges of responsibility not as a moralistic proclamation, but as a scientifically reflected concept. Some considerations about this are the content of the next paragraph.

4. Transformation and the “Social Grammar of Responsibility” as Methodology

The claim of a “World in Transition” [50] derived from the moral principle of sustainability aims for a global, intergenerational, and ecologically unbounded responsibility. Responsibility can be defined as a relationship that contains three elements. It is a competence that (1) lies with someone, (2) for something, (3) towards someone.

All questions of accountability and liability occur in such a three-dimensional field of tension [53] (p. 23). The relationship between subject, object, and addressee constitutes the “social grammar of responsibility” [21] (p. 11). The thesis is that all three dimensions are today specifically unsettled. Our legal system, international institutions, and sense of morality are insufficiently prepared to identify and attribute responsibility in dealing with ecological collective goods or diverse socio-cultural values. In addition, the universities are overstrained with that kind of unbounded claim of responsibility. The future of democracy depends on whether it is possible to spell out the “social grammar of responsibility” in such a way that subjects for action, accountability, and control become tangible in the complex processes of delimited development. The goal cannot be absolute control, but it can be counteraction in the most conspicuous fields of irresponsibility. The task of universities is also to enable interdisciplinary and methodological reflected research about ethical questions, especially about moral dilemmas and not trivial ethical conflicts.

Beyond the orientation for such a system of rules, an ethical–systematic reflection on the concept of responsibility can provide access to an existential understanding of ethics. Ethics is neither mere optimization of consequences, nor simply the deductive application of norms and principles. It is more than a benevolent attitude or an altruistic willingness to renounce advantages in favor of others. Ethics must address the challenge of people living together in a given situation. This responsive character is directly expressed in the concept of responsibility. Ethics refers to attentive care in dealing with people as well as complex technical and social challenges. Responsibility as a virtue requires active planning and the willingness to learn more about life’s creative possibilities. It is a basic attitude that can be enforced or calculated only to a limited extent from the outside. Responsibility manifests itself in the willingness to account for one’s actions, to both oneself and others. When applied to universities, that means that the claim of responsibility cannot be handled adequately just by delegating it to a special discipline, but it has to be implemented in the habitus of responsible scientists and a sustainable reorganization of universities regarding their social and ecological impact.

4.1. *The Declamatory Overload of Responsibility*

Instead of harmonizing and thus resolving conflicting goals, the more convenient path is often chosen: Many different goals are set up without taking into account that some of them contradict each other and thus cannot be easily fulfilled at the same time. The result is an excessive demand [54] and “declamatory overload of responsibility” [55] (p. 298). For example, the SDGs seem to initiate a renaissance of utopian thinking [56] (pp. 13–109). This results from the unresolved tension between their developmental policy and ecological goals. However, they simply lack conceptual coherence. Unfortunately, the Paris Agreement in its present state that wants the countries to pursue efforts to limit the increase of climate warming to 1.5 °C must now also be regarded as a largely utopian target [57].

The commitment of all governments to implementing the “2030 Development Agenda” is accompanied by a blatant contradiction in the form of measures not taken [51] (pp. 247f.) This could be called a mode of “Symbolic Politics and the Politics of Simulation” [58], or perhaps a dilemma of politics in the field of tension between national and international challenges. Preserving the claim to rationality of deliberative democracy, however, especially in post-factual times, depends on an active role of science in the complex and conflictual transformation processes of the present. These overtax the traditional arenas and forms of communication of politics [44].

From an ethical perspective, the arenas, limits, and conditions of responsibility need to be reassessed. Without dealing with the structural political prerequisites of their active perception and implementation, the full-bodied rhetoric of responsibility is just an “uncovered check” [53] (p. 187). The limits of attributing responsibility, planning sustainability, and controlling political processes must be remeasured [59] (pp. 1–6). The ethical critique of utopian thinking thus does not primarily aim at reducing the goals to an extent that is supposedly achievable in realpolitik. Rather, it aims at reflecting on the conditions for action, resistance, and coherence problems in which the serious will must prove itself. Such a critique aims at dilemma management regarding the difficulty of acting correctly under wrong systems or conditions. It is also concerned with transformation and governance knowledge regarding the change of regulatory structures.

The SDGs have established themselves as a ground-breaking document in the struggle for sustainable development. There are now quite demanding reflections on ways and conditions of implementation. However, the dilemma of the great promises of responsibility associated with the global, intergenerational, and ecological expansion of responsibility threatens to lead to excessive demands. This would result in a permanent crisis of legitimacy.

The problem, however, goes even deeper. The promises of humanity that have been promoted in modern times [53] (pp. 49–72) are being tested in new ways. The great success of the development idea is bought by “wear and tear of the biosphere” (translation from German) [51] (p. 251). Wolfgang Haber also saw a fundamental contradiction between humanitarian development goals and the “uncomfortable truths of ecology” (translation from German) [60] (pp. 45f.). This contradiction is not solved by SDGs, but is hidden, and it renders the full-bodied speech of responsibility in the anthropoid debate a short-sighted suppression of planetary boundaries [61]. Promises of prosperity and responsibility are unsustainable in the age of the Anthropocene. That dilemma situation is also a crucial problem of universities because they are driving forces of the traditional promise of progress. The challenge is to define a new version of a humanism which is aware of ecological interconnectedness and the dialectic tension between progress and risk. To establish this new understanding of progress and humanism, there is a need for deep inter- and transdisciplinary discourses. They have to be pluralistic and intercultural, but not without engagement and obligation. Universities have to become “transformation labs” in search of a culture of sustainability and responsibility.

One of the crucial challenges for a sustainable society is that responsibility is eroded by the anonymous system logic of the modern age. In the confusion of late modern societies, it is often impossible to determine with certainty the subjects of action, the objects, and the addressees of responsibility [55] (p. 299). Familiar models of addressing, delimiting, and monitoring responsibility are often no longer applicable to the anonymous, widely ramified, and confusing networks of actors of

late modern societies [21]. The dynamics of functionally differentiated system logics with partially incalculable effects, such as the highly complex financial system, do not seem to be effectively managed within the framework of the traditional concept of responsibility. In view of the side effects of action that no one wants or can calculate, virtue ethics runs into nowhere. Consequentialist concepts of responsibility—that is, concepts related to weighing consequences—fail because of the unpredictability of the non-linear results of action in complex chains of effects [21] (pp. 23–66).

4.2. Promoting a Culture of Risk-Taking and Innovation

In assessing technological innovation, “the heuristics of fear” [62] (p. 27) emphasizes the prognosis of calamities. However, this may paralyze the capacity for action and innovation in many areas, thus possibly generating more dangers than limiting them [63]. The contribution of research to a sustainable society consists essentially in innovation. The evaluation of innovation cannot be sufficiently performed within the framework of classical concepts of technology assessment.

Often, the effects of technological innovation cannot be predicted in advance, but become visible in an open research process. The concept of responsible innovation thus needs philosophical–ethical as well as socio-theoretical and legal basic research on how to deal with ignorance and uncertainty [64]. In recent years, a process-accompanying resilience concept has established itself as a normatively rich and open category, neither purely defensive nor risk-blind [65,66]. The systematic core of an ethic of innovation is the theoretical reflection of action and institutions on how to deal with systemic risks and the different types of ignorance with which the search for responsible decisions is confronted [67]. It needs “risk maturity” [28] (pp. 347–372) in the sense of a culture-conscious and self-reflexive handling of systemic risks. It also requires an ethical foundation that goes beyond a consistent weighing of consequences. Innovations are always risky and difficult to control. Without openness to innovation, however, the specific problem-solving potential of science can hardly unfold. Up to now, universities missed the development and practice of a differentiated model of freedom and autonomy in the context of climate change. This has to include an adequate degree of ecological responsibility and services for the public in order to be clearly different from arbitrariness.

A theory of responsibility in and through science must distinguish between the necessary freedom for desirable innovations and the equally necessary restrictions to avoid the escalation of systemic risks. Humanity knows too little about social transformation processes in many areas, and often fails because of path dependencies of technological developments. Responsible science needs an intelligent combination of scientific–technical, entrepreneurial, political–institutional, cultural, and social innovation. The EU concept of “Responsible Research and Innovation” could be a pioneer in this respect. Due to the complexity of cause–effect relationships, it is insufficient from an ethical–systematic viewpoint to interpret “responsibility” primarily in the space of a utilitarian–consequentialist-oriented technology assessment and linear intervention models. Rather, these models must be fundamentally extended by participatory, democratic–theoretical, systemic, and cultural aspects [42,63,68]. To date, “Responsible Research and Innovation” has been mainly a buzzword that points to a field of research that is still underdeveloped in ethical–systematic terms. It is not yet a normative, clearly structured concept for the political governance of responsible research [69] (pp. 753; 757).

A crucial strategy to counter uncomfortable environmental–ethical claims in the context of climate change is to try to get rid of those claims by questioning the truth or precision of the scientific analysis of reality. In the worldwide movements of the “Science March” and “Scientists for Future”, scientists have protested against the fact that scientific findings are not taken seriously enough in many areas of shaping society’s future.

Julian Nida-Rümelin diagnosed a connection between the refusal to take note of scientific facts relevant to action and the “ideology of anti-realism” [70] (p. 33). Political powers may insinuate that there is no reality, but rather only opinions conveyed by the media. Digital media are being cleverly used to reinforce this impression. Many people nowadays seem to form their opinions in “digital bubbles” that immunize against criticism because they select and reinforce predetermined opinions. This

dynamic is politically dangerous and explains the deep uncertainty behind the superficial political excitement about the rhetorical phenomena of the post-factual. The uncertainty of communication in the age of digital manipulation of opinions demands active effort from the sciences to provide solid information to the public and to maintain standards of rationality.

As the binary logic of the digitally comprehensible and operationalizable forms of rationality becomes dominant, the fiction of measurability and quantitative comparability within linear logics leads to a unification of the world [29]. This allows the old development model to be revived in the operationalization of SDGs because it corresponds to the logic of comparability and optimization [51]. There is no room in the model of digital algorithms for the perception of cultural peculiarities and identity conflicts. In relation to ethics, the question arises whether normative reason is mere convention and a question of subjective preferences; or is content that is scientifically accessible and true suitable for such reason? [70] (p. 82). If it is assumed that ethics has a scientifically founded truth content, then it can and must be uncomfortable and must not depend on public opinion. The contempt for expert knowledge and reason undermines the foundations of our culture, as do self-generated systemic constraints that prevent politics, business, and society from doing what is reasonable [21] (p. 10). These questions are not just abstract problems of the philosophy of science, but affect the heart of self-understanding of universities and their role in the society.

4.3. The Grammar of Responsibility—Uncovering and Overcoming Conflicting Goals and Dilemmas

The decisive task is therefore to spell out the “grammar of responsibility” in such a way that subjects for action, accountability, and control become tangible again in the complex processes of delimited development. The art of responsibility is the distinction between primary and secondary issues as well as between different levels of responsibility and degrees of commitment. It aims at empowerment justice in the sense of a subsidiary strengthening of autonomy, personal potential, and participation. In this context, freedom is understood not merely as freedom of choice or arbitrariness, but refers to the propensity for self-determination that creates identity as a moral subject in conflict situations.

Such conflicts should not simply be ignored in the sustainability discourse. Although the discourse is ethically and systematically geared towards integration, it is necessary to distinguish between objectively appropriate, productive compromises versus lazy and short-sighted compromises. Such questions are not only, as Weber suggests, the tasks of politics, but also of ethics as method-guided scientific reflection of normative reason [18]. The transformation of SDGs into a scientific concept depends on whether the complex problems of their conceptual coherence and the associated attributions of responsibility are reflected in an interdisciplinary manner.

Global society is losing sight of the moral and cultural foundations of social cohesion, because there is no consensus on the changed conditions of the interplay of freedom and responsibility in the processes of disruptive change in an increasingly polycentric world. Climate change poses enormous challenges to the idea of freedom that Ghosh classifies as the most important political concept of modern times [71]. In a society that has banned the idea of collectives from politics, business, and literature in equal measure, it is difficult even to think about the collective structure of climate responsibility. An individualistic narrow concept of freedom and responsibility, devoid of its cultural and institutional embedding contexts, fails because of the complex chains of action and causality in climate change. The purely formal understanding of freedom as the maximization of options is empty because it leads to an ultimately uncontrollable indeterminacy.

Ethics should not surrender to the apparent autonomy of system imperatives, but must analyze actor constellations in complex networks in a new way. In doing so, it can negotiate moral and legal attributions of accountability on the basis of social–anthropological, institutional, and action– and property–theoretical approaches [72]. This will in turn require a critique of the “neoliberal revolution” that has “elevated the market to the center of society” and “weakened public institutions” (translation from German) [73] (p. 16).

According to Patrick Deneen's diagnosis, the transnational universalism of ethics has ended because the elites in politics, business, and science are unilaterally exploiting their opportunities for freedom for private gain [2] (pp. 15–27). The normative basis of an open democratic society, namely the interplay of responsibility and freedom, had been abused and systemically eroded. Thus, the social embedding and legitimation of modern science seems fragile. Universities in some countries are already experiencing this fragility on a large scale. Deep distrust against the academic elite is breaking ground worldwide in populism and is becoming a political force [4].

This accusation hits science hard, which can only develop its potential under the condition of fundamental trust in the reason of freedom. Science is challenged to defend the trust in reason and freedom as the basis of democracy by proactively assuming responsibility for overcoming the central social challenges. Instead of hiding behind the non-binding nature of a systemic, ultimately questionable concept of freedom and idly watching its structural incapacitation in many countries, it must become more political and transformative. The necessary knowledge for a sustainable model of global development requires a transdisciplinary approach that can be generated and communicated to key actors in a broadly effective and comprehensible manner. Such methodological, practical, and scientific–political reflection is the necessary first step to a science of sustainability that is both aware of its responsibility and respects the freedom of research. It is a prerequisite for science not simply to adopt declamatory large goals from the outside, from the political realm, but to adopt goals from the inside. The competencies of science in analyzing problems, opportunities, and strategies for action should be methodically reflected upon. Strengthening the voice of science in the context of political decision-making processes improves the chances of responsibility. This would not, as the critique of transformative science proposes, imply an “atrophy” of the political [41] (p. 190). Exactly this is an indispensable task of ethics. If ethics is to be more than a trivializing Sunday rhetoric, it must not stop at conjuring up desirable things, but must uncover and overcome conflicting goals and dilemmas. Responsible science's task is to be the voice of those who have no voice in the arena of power.

After this norm–theoretical approach, the following reflections will focus on the relation of scientific research to society and the societal impact of research and education in the context of the actual discussion about climate change and the challenges of sustainability.

4.4. Research and Its Social Responsibility

Transformative science should help students to reflect on key problems in depth and to develop action knowledge suitable for their era [13] (p. 162). How this can be achieved is a topic of its own, to which reference can only be made in the context of the reflection focused here on research ethics. Such a reference, however, is necessary and integral if one adheres to Humboldt's idea of the university as a unity of research and teaching. Clever and responsible graduates are an indispensable “resource” of modern knowledge societies. Since students are the first addressees of the knowledge generated at universities, models of transformative and emancipatory science must always prove themselves. This can only succeed if students are not seen as passive recipients of knowledge, but are increasingly involved in the generation and communication of knowledge. Transformative science and transformative education belong together [6,7,74] (pp. 46f.; pp. 113f.; pp. 51f., 69). With regard to the “whole-institution approach”, even “the institution itself functions as a role model for the learners. Sustainable learning environments, such as eco-schools or green campuses, allow educators and learners to integrate sustainability principles into their daily practices and facilitate capacity-building and competence development, and value education in a comprehensive manner” [6] (p. 4).

If thinking is interpreted as the capacity for critical reflection, then thinking will always be questioning and uncomfortable. The debate on sustainability has often been oriented towards compromises. Now, the mood seems to be turning to radical criticism of culture and the system. In this situation, the voice of a science that weighs complex arguments and remains objective without trivializing conflicts is essential.

5. Towards a New Enlightenment

5.1. A Methodically Controlled Reflection on the Epistemic and Normatively Rich Premises of Every Science

The discourse on sustainability leads to a philosophical–scientific reflection on the epistemic and ethical–political foundations of the project of modernity, which have become fragile and need further development. It is important not to give up on human rights universalism, but at the same time to become more sensitive to cultural contexts and ecological preconditions, which are often decisive for its concrete perception. Equally important is a critical revision of notions of rationality, space, and time, as well as the freedom and political control that underlie the project of modernity.

Ernst Ulrich von Weizsäcker and Anders Wijkman postulated a “New Enlightenment” [37] (p. 92), which they characterized as Enlightenment “that is fitting for the ‘full world’ and for *sustainable development*” [37] (pp. vii). Its core, according to the authors, is a methodically controlled reflection on the epistemic and normatively rich premises of every science, even supposedly value-free fields. Fundamental to the success of a New Enlightenment is a new quality of dialogue between the natural sciences and the humanities, which for decades have been divided into “two cultures” [75]. An explanation of the prerequisites and limits of the different models of rationality in the sciences is the decisive impulse for interdisciplinary discourse. The predominant model of enlightenment and rationalization as linearly increasing secularization and “disenchantment” is questioned [27]. The New Enlightenment strives to regain the unity of reason and faith that was a central guiding idea in the founding of European universities; however, it does so in a changed context, as an impulse for a comprehensive understanding of rationality [37] (pp. 92–98).

The current challenges of global development are concerned with fundamental questions as well as human and world views. Hence, theological and religious aspects play a constitutive role—for example, regarding the ideas of progress, prosperity, quality of life, and social cohesion. Notions about nature, the meaning of history, and the sources of responsibility and morality are also addressed. The significance of enlightened theology in a pluralistic public sphere and scientific culture is not limited to updating and revising religiously orientated knowledge. In the interest of enlightened reason, theology must also counter the false public use of religion, above all religious self-exaltation of the political, ecological, or economic. Often, the religious factor expresses itself in “post-secular societies” [76] (p. 328) by granting a quasi-religious status to the ecology and linking “green religion” with sense-making [77]. Here, the task of interdisciplinary dialogue among theology, philosophy, and the humanities or social sciences is to distinguish between “neomythic” ways of thinking and a critical awareness of the mutual referentiality of faith and knowledge [76] (pp. 328–338). The often-subliminal equation of freedom with market freedom, of the model “*homo economicus*” with an image of man, or of profit maximization with claims to the creation of meaning also challenges the sciences to a New Enlightenment. Such demarcations are as much a scientific–theoretical task as a cultural one. They require new forms and forums for transdisciplinary dialogue.

A New Enlightenment uncovers ambivalences of modernity. For example, human identity cannot be construed as an isolated point-shaped self. It is rather formed in relationships with others and the other, with self-understanding depending on the absolute other [78] (pp. 6f.; 321–324). Critical examination of the “anthropic principle” of modern idealism [79] is an indispensable deep dimension of spiritual and moral reorientation in the upheaval of late modernity.

The classification of empirical, normative, and transformative aspects of knowledge must be reflected in a new way if science is to promote not only factual knowledge, but also judgement and action competence [21] (pp. 436–456). What is needed is an ethics of knowledge that fosters conversation among the various forms of rationality. This is the only way in which universities can guarantee comprehensive education in the claim to genuine, cosmopolitan “*universitas*” and to develop problem-oriented interdisciplinary approaches to solve the increasingly complex questions of the future concerning society, the environment, and technology. A self-reflexive enlightened science focuses on the institutional embedding of knowledge generation and reception. In turn, this focus is associated

with contingent perspectives, interests, and prerequisites. It is up to such a science to give more space to the old concept of *phronesis* (wisdom) as a value-led and context-sensitive judgement [80] (p. 65). In addition, a rediscovery of the spiritual dimension of ethics and of sustainability could be part of such a new phase of upgrading Enlightenment [28] (pp. 279–282, 482–494).

One possibility of implementing a New Enlightenment—including critical awareness of values and history—would be a philosophical and theoretical examination of the fundamental models of the respective subject at the beginning of all courses of study. Each course could begin with conceptual training, learning to think about and understand the normative premises of the subject-specific guiding models. A general philosophical–ecological study program could also be implemented for first-year students at universities to introduce sustainability knowledge in the fields of general education, environmental sciences, and social sciences.

5.2. A New Understanding of the Relationship between Sustainability and Freedom

A crucial part of that enlightenment in the age of climate change is a new understanding of the relationship between sustainability and freedom. Sustainability has to be understood as empowerment to freedom. People are not only entitled to have freedom and human rights, but should also be empowered to exercise them by securing the necessary ecological, socio-cultural, and economic conditions for all. This includes future generations and people in the Global South. By referring to the basic capabilities, freedom becomes concrete. This understanding of sustainability can be inspired by the capability approach of Amartya Sen and Martha Nussbaum. Following Amartya Sen, one could spell out “sustainability as freedom”: Sustainability promotes freedom by securing the increasingly decisive preconditions. This also applies to universities; that is, commitment to sustainability requires enforcing the freedom of research and teaching through securing their essential prerequisites [74] (pp. 84f.).

Freedom arises by assuming responsibility [81] and through the practice of independent and resistant thinking. Hannah Arendt did not define “The Freedom to Be Free” [82] as the absence of fear and limitations. In the sense of the Aristotelian understanding of man as “*zoon politikon*”, she defined freedom as participation in the political process. This is also a task of higher education, not only individually, but institutionally. Universities can only secure freedom and autonomy if they actively shape their own conditions for action as structural policy actors. The striking discrepancy between knowledge and action in times of climate change challenges educational institutions to link research, education, practice, and social communication in new ways. These are aimed at enabling independent analysis and catalytic participation in shaping social change. Knowledge that takes itself seriously seeks to reduce the discrepancy between critical thinking and everyday action; therefore, it has an ethical dimension. Creating such a transdisciplinary ethics of knowledge is a crucial task for universities during this time of climate change [74] (pp. 87f.). Shifting from the abstract idea of freedom to an awareness of socioecological preconditions of freedom to be free lies at the core of the new enlightenment.

5.3. Overcoming the Fragmentation of Knowledge

The central thesis of this article is that value-free research is neither possible nor desirable. Therefore, the following steps of argumentation are crucial: Science in a knowledge-driven society is one of the challenges we face in the context of sustainability, just as it is part of the solution. Because of this ambivalence, science has to be self-reflexive regarding its own practical and ethical preconditions, foundations, and consequences. This could be the starting point of a new phase of enlightenment. Therefore, this article proposed a philosophy of science as a methodological frame for such a “New Enlightenment” through inter- and transdisciplinary research and a transformative role of science under the demands of sustainability. This role can be described as catalytic because it is not the main force for transformation, but just a specific element of it. Philosophy of science can help to overcome the fragmentation of knowledge and be an enabler for the dialogue between the

natural sciences, humanities, ethics, and society. Finally, philosophy of science resists the positivist self-understanding of science which leads to a marginalization of ethical questions [15,21]. Instead, sustainability calls for a new emancipation of science as a structural policy actor.

Thus, this essay proposed a multidimensional understanding of wisdom, rationality, and sagacity as a foundation of a “whole-rationality approach” for a sustainable university. The challenges of sustainable, transformative, or responsible science are grounded in the current self-understanding of the organizational form of science, namely a shortened understanding of rationality. Therefore, it needs a philosophy of science and a norm–theoretical analysis of the different models of understanding science. Only on this basis can universities contribute to a sustainable and responsible society under the conditions of the age of Anthropocene.

Faced with the increasing complexity of the modern world, ethics must spell out a new “grammar of responsibility” which organizes accountability in a complex world [74] (pp. 29–47). Ethicists can fulfil this role by methodologically reflecting, uncovering, and regulating conflicting goals and dilemmas. The morally overloaded avowal to sustainability needs to be transformed into a rational discourse about common but differentiated duties in a pluralistic world. The model of transformative and catalytic “science for a post-normal age” [16] (p. 739) requires a foundation in ethical reflection.

The acceptance of sustainability depends on whether it is thought of as a limitation of what humanity is not allowed to do, or understood as an authorization to act through long-term reason, cooperation, and fairness. The problem facing the global sustainability debate does not seem to be different definitions of objectives, but rather the question of how moral claims can be enforced given the dominance of particular interests. Focused on content, the sustainability and transformation discourse lacks reflection about what norms are and how they work [21] (pp. 9–20). The function of norms is not to indicate moral reasons when there are no obvious material reasons and interests for certain actions. Norms rather serve to open up an area of freedom by creating a certain distance from the world of the factual. In the modern knowledge society, solutions to the challenges of climate change and sustainable development can only be found on a scientific basis. Science can be only productive under conditions of self-dependence. It needs anticipation of trust. To justify and vindicate this, the scientists have to develop methods of self-control regarding criteria of responsibility. Sustainability could be a frame for the search for new models of ethical universalism in a broken world. The scientific frame of this is an understanding of responsibility as accountability in the field of tension between actor, object, and controlling authority, and the handling of highly complex risks. It has to be seen as an integral element of understanding rationality and the associated concept of science and society in times of climate change. The aim is to outline an ethics of knowledge that understands research, freedom, and responsibility as a unit, and plumbs the academic discourse space anew. Only the reunification of freedom and responsibility can build up a strong resistance against the “post-factual” weakness of trust in reason and democracy.

6. Conclusions

The argumentation of this article was developed in five steps:

- (1) In the present situation of climate change and the great acceleration in the epoch of the Anthropocene, humanity is running out of time. Therefore, the role, the conditions of communication, the perceptions, and the tasks of universities in the present public discourses are changing. Universities are no longer only observers, but also become “change agents” and have to deal with the request of a proactive relationship between science and society.
- (2) There is a wide call for a new role of science in society which is discussed under different headlines, e.g., transformative, responsible, public, sustainable, or catalytic science. All of these models are in a deep conflict with the positivistic theory of science, which is still dominant. Scientists are involved from the beginning in social change—as soon as they begin to produce ideas and discourses. It is their task to reflect upon this situation.

- (3) Against this background, universities are part of the problem and part of the solution as well. If they shall become driving forces for a sustainable society, they have to undergo a cultural revolution regarding the concepts of rationality, freedom, wealth, and progress. Therefore, the universities have to overcome a shortened understanding of rationality that leads to the marginalization of ethical questions. There is often a lack of scientific research about moral dilemmas on the way to a sustainable society. To deal with this adequately, sustainability science in the Anthropocene that recognizes the claim of the SDGs needs a comprehensive ethically founded reorientation as well as a transdisciplinary approach that establishes an inclusive relationship between intellectuals, politics, and the public sphere. Sustainable science includes wisdom, which constitutes our personal grammar of importance, preference, desirability, and identity. By beginning to act as “transformation labs”, the universities become self-reflective “structural policy actors” that see sustainability not as an externally defined goal, but as an open search process with heterogeneous target components that have to be clearly specified. Hence, the normative claim of sustainable science is an attack on the positivist theory of science.
- (4) A responsible shaping of the accelerated change in society needs a “normative compass” with the concept of dignity at its heart. The centerpiece of this cultural and scientific revolution is a differentiated understanding of the concept of responsibility. The art of responsibility is the distinction between primary and secondary issues as well as between different levels and degrees of commitment. Needed is an analytical approach to the “grammar of responsibility” in its three dimensions. The relationship between subject, object, and addressee that constitutes the “social grammar of responsibility” helps to overcome the idleness of declamatory overloaded concepts of responsibility in favor of a better understanding of conflicts between ecological and social demands and a down-to-the-earth distance to utopian thinking. The challenge is to define a new version of a humanism which is aware of ecological interconnectedness and the dialectical tension between progress and risk. Responsible science’s task in this context is to strengthen risk maturity that opts for innovations and avoids system risks. Scientists always have to be the voice of those who have no voice in the arena of power.
- (5) These considerations lead to the program for a “New Enlightenment” with three dimensions:
 - (a) The autonomy of research requires a critical examination of one’s own institutional conditions for action. So, science needs a methodically controlled reflection on the epistemic and normatively rich premises of every science.
 - (b) The lack of consensus regarding the interplay of freedom and responsibility imperils the social cohesion. There is a need for a new understanding of the relationship between sustainability and freedom.
 - (c) Regarding a whole-institution approach, transformative science and transformative education belong together. In order to promote a sustainable society in the age of Anthropocene, science needs to overcome the fragmentation of knowledge, the dualism between natural and social sciences. Thus, universities need a “whole-rationality approach” that is aware that value-free research is neither possible nor desirable. In this manner, sustainability enables the “freedom to be free”.

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Article

University 4.0: Promoting the Transformation of Higher Education Institutions toward Sustainable Development

Bror Giesenbauer * and Georg Müller-Christ

Faculty of Business Studies and Economics: Sustainable Management, University of Bremen, Enrique-Schmidt-Str. 1, 28359 Bremen, Germany; gmc@uni-bremen.de

* Correspondence: giesenbauer@uni-bremen.de

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Abstract: Higher education institutions (HEIs) could act as pivotal change agents for sustainable development (SD) in times of global climate action. However, HEIs have to respond to increasingly complex demands simultaneously, such as massification, globalization, marketization, and digitalization. Based on Graves' model of systemic development, this paper discusses two main strategies to deal with increased complexity in order to meet the challenge of SD: (a) Promoting general systemic development of a given HEI, progressively opening up to various stakeholders and focusing on co-creative collaboration, and (b) participating in inter-organizational networks to find inspiration for dealing with challenging trends. Four distinct phases of higher education development are presented. It is argued that transdisciplinary research and research-based learning will increasingly be needed for tackling societal issues and that HEIs should address different organizational subsystems individually. Furthermore, four types of inter-organizational networks are proposed and implications for network management are discussed. A case study of the HOCH-N network illustrates the practical application of the presented ideas. Finally, adopting a multi-dimensional and networked organizational model as an integrative University 4.0 is argued to be suitable for increasing the capacity to deal with complexity, thus meeting the challenge of sustainable development.

Keywords: higher education development; sustainable university development; systemic development; inter-organizational networks; sustainable development; worldviews; societal transformation; systemic transformation

1. Introduction

In times of climate change and massive societal change, universities and other higher education institutions (HEIs) are called to become change agents for societal transformation [1]. However, HEIs are facing complex times, juggling very disparate roles and demands [2]. From educating increasing numbers of students to conducting internationally competitive research, from acquiring grants and even making profits to serving society, from managing large physical campuses to integrating digitalization, from serving the local while keeping an eye on the global, and from supporting excellence in research in disciplinary niches to championing interdisciplinary topics such as sustainable development (SD): HEIs have to react to global trends that are difficult to chase at the same time and that indeed often impose conflicting goals. As the success of HEIs is mostly measured by international rankings and leadership in specialized disciplines, the advancement of cross-cutting topics such as sustainable development is often compromised [3].

Being part of the German research consortium on 'Sustainability at Higher Education Institutions' (*Nachhaltigkeit an Hochschulen*) HOCH-N [4], we wondered how HEIs could possibly come to integrate the pressing challenge of SD into their actions while also having to manage the aforementioned

challenges. Two blog articles by Massachusetts Institute of Technology (MIT) scientist and consultant Otto Scharmer on the systemic development of HEIs toward SD sparked our interest and seemed promising [5,6]. Therein, Scharmer proposes that HEIs should focus on “systemic upgrades” and increased inter-organizational collaboration in order to be able to deal with the challenge of SD. However, as the intersection between HEI development and SD is a relatively new one, the underlying systemic framework of Scharmer’s articles has not yet been linked to sustainable higher education development in a scientific context.

The main research question we set out to answer is therefore: (A) Which general systemic strategies would help HEIs to deal with the complex challenges of the 21st century in order to live up to the challenge of sustainable development? Two secondary research questions were derived from our practical application of the presented ideas in the HOCH-N project: (B1) How can models of systemic development be applied to the development of HEIs? (B2) How can inter-organizational networks contribute to the integration of SD into HEIs and to the general systemic development of HEIs?

Having a background in the research on corporate sustainability management and systemic development in particular, we chose to focus our research on conceptually applying scientific models of systemic development that have proven to be of value to the analysis of corporate sustainability to the field of HEI development and SD and that seem to inform Scharmer’s ideas scientifically. It is our understanding that all sound empirical research needs to be built on sound conceptual models and sound operationalization thereof. Thus, this contribution is intended to advance theory building on the transformation of higher education by systematically applying Clare W. Graves’ model of systemic evolution to sustainable higher education development. This novel conception of higher education development will help to differentiate existing broader conceptions (cf. [7–9]), like the idea of a continuum of sustainability governance by Niedlich et al. [9].

As the overarching theme of this paper is the transformation of HEIs toward meeting the challenges of sustainable development, the latter is shortly introduced in Section 2.1. In order to set the stage for introducing two systemic strategies for managing complexity at HEIs, an encompassing theoretical framework is introduced in Section 2.2 and later applied to the advancement of sustainable development in higher education: Clare W. Graves’ [10,11] theory of systemic evolution, originally derived from empirical data in the 1950s and 1960s [12]. Four distinct developmental phases of worldviews are presented and applied to HEIs in Section 3 (answering research question A and B1) and to inter-organizational networks in Section 4 (answering research question B2). The latter application is illustrated with examples from the German network for sustainability at HEIs “HOCH-N”. Finally, the role of networks in promoting systemic change is discussed and further implications for change agents are inferred.

Thus, based on our practical work and the ideas of Scharmer [5,6], this paper introduces two strategies of how HEIs and their members are managing the complex demands of the 21st century: the first strategy is to promote the transformation of higher education in general, resulting in HEIs that are able to handle more complexity, requiring an update of a given HEI’s self-concept and worldview (see Section 3). This strategy will lead to a multi-dimensional and networked organizational model, described as HEI 4.0 or University 4.0. The second, more specialized strategy is to engage in inter-organizational networks in order to connect with members of other HEIs dealing with similar challenges (see Section 4). The second strategy is essentially already implied by the first strategy. Conversely, the purpose of networks is often to nudge systemic transformation.

A case study of the German HOCH-N network is included in order to illustrate the proposed ideas on network management (Section 4.2). This case study focuses on the key structures, services, and products of the HOCH-N network, linking them to the presented systemic ideas on network management. It is not intended to “prove” the preceding conceptual framework as case studies are not suited to falsify conceptualizations in a classic way. However, the main scientific contribution of a case study can be described as “case-inspired self-reflection” [13] (p. 347) (cf. [14]). In this sense, the case

study on HOCH-N is intended to illustrate the practical application of the systemic theories at hand, to validate their subjective *usefulness*, and to inspire ideas for application in the reader.

Combining Graves' theory with the development of higher education and inter-organizational networks is the main contribution of this paper to the existing body of research, substantiating the ideas of Otto Scharmer on sustainable higher education development. It is further intended clarify the role of networks in promoting the systemic change of HEIs toward SD.

2. Background: The Challenge of Sustainable Development and Systemic Development

How can higher education institutions (HEIs) live up to the challenge of sustainable development (SD) while also having to deal with complex issues such as internationalization, massification, or marketization [2,15]? Following the reasoning of Otto Scharmer, HEIs would need to upgrade their "operating system" (cf. [6]) and increase their network activities in order to integrate SD as a whole-institutional approach [5,6]. But what is meant by sustainable development in higher education? And how can the upgrading of a HEI's operating system be understood?

In the following section, the topic of sustainable development is thus shortly introduced and linked to HEIs. Thereafter follows an overview of Clare W. Graves' systemic theories which have been applied successfully to the field of corporate sustainability and are linked to managing increasingly complex challenges [16,17]. Section 2 closes with a reflection of principles of systemic development to countervail the popular misconception that systemic development models are overly deterministic and judgmental models (see e.g., [18]).

2.1. Sustainable Development in Higher Education

Education for sustainable development has become increasingly important for HEIs and societies in general during the past three decades and thus, has created a more complex environment for operating a HEI. While this paper deals specifically with the challenge of integrating sustainable development (SD) into HEIs, the issue of SD is also used to illustrate complex systemic demands in general.

The publication of "Our Common Future" in 1987 by the world commission on environment and development [19] promoted the term "sustainable development" and gave birth to large global efforts to spread and develop the concept. Therein, SD is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." [19] (p. 41). From the mid-1990s on, researchers have conceptualized ways of implementing SD both as a concept and as a way of thinking at universities (see e.g., [1,20]). Since then, the research on universities' role in supporting sustainable development has matured, especially in the context of competencies for future challenges (see e.g., [21–23]).

In September 2015, the United Nations [24] General Assembly adopted the Agenda 2030 resolution and thereby amplified the commitment to SD with the 17 sustainable development goals (SDGs) [25]. This framework aids in breaking down the complexity of SD into more practicable fields of action. Education for sustainable development (ESD) is part of SDG 4: High quality education.

Along those developments, the cause of sustainable development has received widespread attention and a lot of effort has been put into promoting it at higher education institutions [26,27]. In particular, the adoption of the SDGs and an increasing societal awareness of climate change urges HEIs to integrate SD into their actions.

But even though the idea of sustainability has reached the general public—for example, through Greta Thunberg and the *Fridays for Future* movement—the concept of sustainability itself has not yet made it to mainstream academia [8,28,29]. For example, the SDGs are rarely integrated into existing curricula or campus operations at German HEIs in spite of the fact that Germany has strong political initiatives for SD and ESD such as the German Council for Sustainable Development of the German Federal Government (*Rat für Nachhaltige Entwicklung*), the German Advisory Council on Global Change (*WGBU*), and the German National Action Plan for ESD (*Nationaler Aktionsplan BNE*) [30]. Moreover, the term sustainability is subject to several misconceptions which impedes the advancement of SD at HEIs [31].

One of the reasons that SD has not made its way into mainstream academia and management of HEIs is likely to be found in its inherent complexity, as SD requires systemic transformation and not only adaptation [7,32]. In other words, taking the challenge of SD seriously will lead to more tensions and dilemmas and therefore, to increased complexity [33]. Consequently, Bauer et al. [7] argue that HEIs should implement SD as a whole-institution approach in order to encourage transformative practices at all levels. If a given HEI wants to get serious about integrating the idea of sustainability, it should therefore aim to build its capacity to deal with complexity and ambiguity and lean into a more integrative worldview, which will be explained and discussed below.

2.2. Theoretical Background: Worldviews and Systemic Development

To understand complex systems such as universities and the field of higher education in general, it is helpful to build on a framework that is able to structure and explain the evolution of systems in general—the “upgrading of operating systems”, as Scharmer coins it (cf. [6]). The psychologist Clare W. Graves developed such a systemic theory from the 1950s to the 1970s, trying to explain adult human development based on his own empirical data [10–12]. Graves distinguished eight distinct worldviews, also described as value systems, phases, or levels, and later, a ninth worldview was proposed. His teachings were made popular in the 1990s by his followers Don Beck and Christopher Cowan under the name of *Spiral Dynamics* [10]. In this paper, we rely mostly on the adaptations by the Dutch researchers Annick Hedlund-de Witt [34–36] and Marcel van Marrewijk [37,38], as well as on our own works [3,16,17,30,39] and on a few popular science works that shed light on practical nuances of the model [5,6,10,40,41].

According to Graves, the development of systems and adults oscillates between worldviews that focus on the individual and worldviews that focus on the collective [10,38]. In simplified terms, whenever societies or smaller groups start focusing almost exclusively on the needs of the collective while suppressing individual interests, individuals tend to fight for their right of self-expression. This will usually lead to more individual freedom which in turn can develop into an exaggerated individualism and a loss of social cohesion, resulting in a renewed call for more considerate behavior and a stronger focus on the needs of the group [10].

This oscillation between the collective and the individual in reaction to environmental challenges is described as an upward spiral development, similar to the double-helix model of DNA [11]. The idea of a spiral development also implies that certain phases or worldviews cannot be skipped—they have to be run through sequentially, though different speeds and depths of development are possible. For example, universities are expected to start from a solid infrastructure and orderly formal settings for teaching and studying, to then go on to building capacities for high quality research and only later to champion transdisciplinary research focusing on solving relevant societal problems. However, when new institutions are founded, they can of course build on the lessons from older institutions and speed their own development—especially compared to the systemic development of universities that were founded in medieval times with a focus on dissemination of factual knowledge.

2.2.1. Four Worldviews: From Traditional to Integrative

Not all of the worldviews or phases of Graves’ model are relevant for the discussion of this paper. Following the reasoning of Hedlund-de Witt [35], only four worldviews from Graves’ model will be discussed in detail as the preceding three worldviews are more applicable to e.g., tribes, early empires, and mafia-type organizational forms and later worldviews are currently mostly expressed by individuals or in spiritual contexts. The four worldviews in question can theoretically be applied to the development of both individuals, organizations, and societies as a whole. They are, therefore, first introduced in general terms before being applied to the development of HEIs in particular (Section 3) and to different types of inter-organizational networks (Section 4). Table 1 contrasts the four relevant worldviews with respect to their central values and foreshadows their application to HEIs and SD.

Table 1. Overview of four different worldviews ¹.

	Traditional Worldview	Modern Worldview	Postmodern Worldview	Integrative Worldview
guiding principles and values; keywords	order; security; absolute truths; correctness	success; goals; optimization; professionalism; materialism; efficiency; finding good deals	taking care; inclusion; community; individual expression; humanism; awareness; responsibility	finding non-dogmatic solutions; effectivity; relativity; acting in spite of complexity and tensions
purpose/self-concept	creating structure in a chaotic world	optimizing an overly rigid world; designing a functional world	slowing down an exploitative world; creating safe spaces	mending a broken world; integrating all levels
common societal examples	bureaucracy; formalized religion; classic family-owned corporations	shareholder owned corporations; evidence-based medicine	NCOs; stakeholder-oriented organizations (esp. employees and customers)	purpose-driven organizations; self-managed teams
basis for solutions	authority (moral, legal, or patriarchal); rules; goodwill	optimal allocation of resources; process analysis; competition; calculations	collaboration; common ground; community; purpose	competence; synergy; co-creation; purpose
possible negative expression	unfair; bureaucratic; ideologist; unengaged individuals	too egocentric; disrupting cooperation by competing; lost in detail; too opportunistic	ineffective; overly political correct; complacent; allowing only certain aspects of individual expression	too unbound and detached; not empathetic; arrogant
typical topics related to sustainable development	waste management; hygiene and basic health; basic infrastructure; public policies; understanding and documenting changes in ecosystems; nature protection	resource efficiency and efficient resource allocation; green tech; renewable energies; health; modeling future scenarios	education for sustainable development; externalities; health; agriculture; sustainable economic processes (production and consumption); peace	systems transformation; climate change; green infrastructure; spirituality; enabling and sustaining capacity to act in times of complexity; co-creative democracy
prototypical scientist	objective observer	professional, objective user of scientific method	developer of new methods; hearing the unheard; highlighting pressing global problems	co-creator and broker of effective methods and solutions

¹ Based on [12,16,36,38].

The traditional worldview is marked by a focus on absolute truths, rule obedience, and a trust in authorities [38]. This kind of value system laid the foundation for very stable empires and organizations that were able to last for hundreds of years, e.g., the Catholic church and some universities like those located in Oxford, Salamanca, or Heidelberg. It is not by chance that these universities were indeed founded to disseminate absolute truths from a Christian perspective [42]. The traditional worldview enabled societies to adopt a long term perspective, going beyond patterns of instant gratification found in earlier empires, and thus gave birth to enormous projects such as the construction of the Gothic cathedrals that often took several hundred years to be finished. However, its focus on one right way and bureaucratic regulations makes the traditional worldview less able to deal with unplanned incidents and oftentimes prevents people from thinking on their own [10].

The modern worldview can be seen as a reaction to the inherent rigidity of the traditional worldview. Modern science, technology, and neoliberalism are expressions of this way of thinking, which highlights individual effort and the pursuit of success [3]. Indeed, the modern worldview has led to enormous breakthroughs for civilization [43], exemplified by the material wealth of industrial nations and the invention of airplanes, satellites, computers, and advanced medical treatments. However, the rise of the modern worldview has also brought about massive negative ecological and social side effects. When both people and the earth are merely seen as means to an end, ecological and social systems are often subject to abuse and deterioration.

The postmodern worldview can in turn be seen as a reaction to the side effects of phenomena such as neoliberalism, materialism, and consumerism and is often expressed in an attempt to go “back to the roots” and to find more “natural” solutions [10,38]. Trying to make minorities and underserved groups heard, postmodern activists will often take a critical stance toward neoclassical economics and quantitative science. More moderate and forgiving expressions of the postmodern worldview can be seen in the rise of team work and in the focus on customer and employee satisfaction [17]. This type of worldview has therefore brought about more humane, ecological, and considerate procedures and championed topics such as gender equality, diversity, and sustainability [38]. In general, it will favor community building over hierarchy and consensus over individual competence, sometimes leading to inefficient and even ineffective ways of responding to challenges.

Finally, one of the more current developments of society has brought about the integrative worldview (also called synergistic, integral, or systemic) [17,38,44]. The integrative worldview can be framed as a reaction to ever-increasing societal complexity: Issues such as globalization, global migration, and climate change challenge traditional ways of decision making and problem solving and highlight the interconnectedness of various systemic phenomena. As a consequence, individuals and organizations alike are often called to take action in spite of not being able to foresee the probable main and side effects of each action. A certain tolerance of ambiguity is therefore needed in order to maintain the ability to take action [17,38]. Consequently, the management of tensions has been made the center-piece of the integrative framework for corporate sustainability by Hahn et al. [45,46], which was recently applied to the development of HEIs by Annina Lattu and Yuzhuo Cai [33].

The historic breakthrough of the integrative worldview is thus the ability to see both the relative truths and pitfalls of each preceding worldview and therefore being able to act as a broker in times of extremism and societal separation [3,44,47]. Instead of taking a fixed position, the integrative worldview facilitates effective problem solving based on co-creative and competency based methods of innovation, thereby challenging conventional ways of operating businesses, politics, or HEIs [48]. However, when the integrative worldview is only developed in the cognitive line of development and does not include emotional development of the same magnitude, it might lack empathy and thus lead to aloofness and arrogance. Therefore, intention setting and mindfulness are important parts of integrative practices, shifting the focus from “ego” to “eco”, as Otto Scharmer puts it [41] (cf. p. 3).

While the descriptions above seem to imply a hierarchy of development and therefore dismiss the modern and especially the traditional worldview, all worldviews are inherently equally important. However, they can be more or less suited to handle different environmental conditions. Furthermore,

worldviews are often combined and can be temporarily adopted depending on the situational context. As these finer points are important for the application of the model, various systemic principles are compiled in the following section.

2.2.2. Principles of Systemic Development

Before the four worldviews are applied to HEIs and inter-organizational networks, we would like to highlight a couple of important principles of systemic development to provide a more differentiated view and to countervail possible misconceptions.

1. *Each subsequent worldview is able to handle more complexity than the preceding ones* [11]. Worldviews are adapted to changes in the system's environments. When a system is facing increasingly complex challenges, as HEIs currently do, an upward movement to a more complex worldview might be needed to effectively deal with the novel threats and demands.
2. No worldview is inherently "better" than another—different worldviews are simply more or less suited to handle environmental conditions [3]. More complex worldviews enable individuals and organizations to deal with more complexity—which can sometimes be "better", as stated above. However, a person just coming from drug rehabilitation might, for example, require a setting with a more structured and rule-focused worldview (traditionalist worldview) in order to tame a chaotic life and might actually be overwhelmed with the requirements of self-management (integrative worldview). Similarly, a country without a stable educational system might first need to implement more traditionalist forms of education before it starts implementing more integrative practices.
3. *Subsequent worldviews transcend and include preceding ones* [38,40]. For the sake of simplicity, each worldview is illustrated by its prototypical and novel characteristics. However, the lessons and principles from preceding worldviews are not annihilated. For example, when societies moved from more hierarchical and feudalistic structures (pre-traditionalist and traditionalist worldview) to more fluid capitalist democracies (modern worldview), the use of common rules was not suspended but merely reframed: rules were still regarded as important, but more as means to an end (like material success) than as ends in themselves.
4. *Worldviews might be dominant but not necessarily exclusive* [16]. Certain worldviews are often conjoined. For example, leaders of multinational corporations often follow strict metric-based strategies of profit maximization (modern worldview) while promoting team work and focusing on customer-satisfaction on a more operative level (postmodern worldview). Likewise, HEIs can simultaneously be places of more traditionalist teaching (e.g., massive lectures in general undergraduate education) and both modern and postmodern research practices (e.g., stakeholder-oriented mixed-methods approaches).
5. *Systems are made of subsystems* [16]. Organizations are in effect stratified and usually include several worldviews at once [49]. In HEIs, technical, administrative, and scientific staff tend to have their own distinct (world-)view on things. While a more traditionalist rule-focused worldview often suits administrative work, scientists might often gravitate more toward process optimization with regards to their career (modern worldview) and toward a stakeholder-perspective with regards to their students (postmodern worldview). However, the integrative worldview is the first one to not only be aware of different worldviews, but to explicitly acknowledge their respective strengths and shortcomings.
6. *Worldviews can be adopted temporarily* [10,40]. While each individual, subsystem, and system is usually centered around one or two dominant worldviews, other worldviews can temporarily become dominant. Indeed, it is common to operate from different worldviews or states of consciousness in different contexts—for example, when talking to a police officer, attending a sport event, making a sales call, or during meditation.

7. *Development can go both ways* [10]. When being confronted with changed environmental conditions and threats, systems might react by opening up and embracing complexity or by shutting down and regressing to a perceived “tried-and-true” way. The latter is illustrated by the rise of populist political parties in Western societies in the face of globalization.
8. *A novel worldview will usually contest its predecessor*. When a certain worldview is emerging, its proponents will, from our observations, usually focus on the shortcomings of the preceding worldview to underline why the novel one is more suited to the current environmental conditions. However, both worldviews might later be reconciled and form a functional alliance. As an example, the postmodern worldview found an early expression in a certain kind of environmentalism that not only highlighted the negative side effects of modern market economies (modern worldview), but that also rejected business endeavors in general; whereas today, both worldviews are often combined in ideas such as social entrepreneurship.

These principles are important to keep in mind because models of systemic development are otherwise too easily misinterpreted as judgmental models, separating “the highly evolved” from “the primitive”. On the contrary, each worldview represents an important contribution to the development of individuals and societies. The main question is, therefore, not “Which worldview is better?”, but “Which feature of which worldview is best suited for the current environmental conditions?”.

3. Systemic Development of Higher Education Institutions

As pointed out in the introduction, HEIs and especially research universities are placed under tremendous pressure by a variety of societal trends, creating an environment of enormous complexity [50]. Following the rationale of systemic development and Clare W. Graves’ [10,11,51] assumptions, this should lead to minor and major updates to the prototypical worldview of a given HEI. In order to deal with the increasing complexity, HEIs are likely to adopt more and more postmodern and integrative values and practices. But what does that mean for the character of a HEI? In the following, four types of worldviews in the systemic development of HEIs are shortly introduced, following the ideas of Georg Müller-Christ [39], Otto Scharmer [5,6], and Bror Giesenbauer and Merle Tegeler [3]. As these four HEI specific worldviews have historically evolved in a sequential manner, they are also described as phases of HEI development. Furthermore, as these phases can be described as major upgrades to the “operating system” of a HEI [5], they are labelled with numbering from 1.0 to 4.0, following the nomenclature of software development. When abstracted from their historic occurrence and translated into a conception of sustainability governance, they can be framed as representing four distinct conditions along the continuum of sustainability governance proposed by Niedlich et al. [9].

The major characteristics of each phase of HEI development are summarized in Table 2 and described in Section 3.1—with a focus on the conception of an integrative HEI or University 4.0, which is argued to be needed in times of complexity. Section 3.2 will then explore implications for management of sustainable higher education development based on the presented phases of HEI development in Section 3.1 and the principles of systemic development laid out in Section 2.2.2. In order to make these theoretical implications more tangible, Section 3.2.1 provides examples for the central fields of education, research, and governance.

Table 2. Four phases of higher education institution (HEI) development from a worldview perspective.¹

	Traditional HEI 1.0	Modern HEI 2.0	Postmodern HEI 3.0	Integrative HEI 4.0
general focus on	<ul style="list-style-type: none"> input, authority and hierarchy 	<ul style="list-style-type: none"> output, efficiency and competition 	<ul style="list-style-type: none"> dialogue with stakeholders and learners 	<ul style="list-style-type: none"> systemic solutions, co-creativity and sustainability
education	<ul style="list-style-type: none"> teacher-centric; the scientist reads his books; memorizing standardized knowledge; learning for recognition and academic titles 	<ul style="list-style-type: none"> test-centric; disseminating factual knowledge, analytic strategies and sound methods; modules and projects; learning for the test; learning as a competitive game for future success 	<ul style="list-style-type: none"> learner-centric; competencies-oriented transfer of self-reflective knowledge; focus on dialogical seminars and project-based learning; blended learning; learning as personal growth 	<ul style="list-style-type: none"> system-centric, holistic; whole-person approach; dynamic balance between subject matter, group, individual learners and context; research-based learning; co-creative and mindful learning
research	<ul style="list-style-type: none"> search for absolute truths; self-concept: observing universal natural laws; focus on strong theories based on both deduction and induction; construction of disciplines 	<ul style="list-style-type: none"> standardization of research; processes and peer-review self-concept: testing and applying natural laws; competition for grants; measurement of success with rankings, impact factors etc.; focus on quantitative methods 	<ul style="list-style-type: none"> inter- and transdisciplinarity; action research; self-concept: understanding social dynamics; dialogical research processes dealing with societal issues; integration of qualitative research methods 	<ul style="list-style-type: none"> transdisciplinarity; co-creative research; self-concept: co-creating systemic transformation; global action university; living lab approach; focus on real-life solutions; idea of open science
governance, operations and culture	<ul style="list-style-type: none"> focused on teaching, basic research and technological transfer; building palaces of knowledge: impressive buildings and extensive libraries; legitimacy by authority; compliant to regulation, e.g. waste management and safety; one-dimensional approach to sustainability 	<ul style="list-style-type: none"> focused on quantitative growth; rapid growth in functional buildings with little energy awareness; control of cash flows and process management; entrepreneurial activity; science parks; sustainable development as a management task 	<ul style="list-style-type: none"> HEI as a place for meeting diverse yet like-minded people; facilitating community and individual expression; diversity management; legitimacy by participation; goal of climate neutrality; sustainable development as a community task and third mission content 	<ul style="list-style-type: none"> HEI as a space for encounter, reflection and inspiration; physical and virtual integration of different societal and ecological systems; whole-institution approach to sustainability; additional fourth mission: co-creation for sustainability

¹ Based on [3,5,6,9,39].

3.1. Four Phases of HEI Development and Their Respective Worldviews

Traditional HEI 1.0. Universities were historically invented from the catholic idea of preserving and teaching universal truths in medieval times [42], which can be framed as an expression of the traditionalist worldview. A supposedly “all-knowing” scholar dressed in academic gown would then read his teachings to relatively passive students, separated by strong disciplines. The impressiveness of large classicist university buildings as palaces of knowledge reflects this kind of focus on authority, stability, and persisting truths [39]. The prototypical HEI 1.0 might seem outdated and yet has succeeded in preserving academic education for several centuries. Indeed, its worldview still influences the ethos of modern universities—based on the systemic principle of *transcend and include* (see Section 2.2.2). By itself, a traditional HEI or University 1.0 is not likely to integrate fast-paced societal change and address cross-cutting topics such as sustainable development (SD) as a whole as these topics demand more openness, dialogue, and at least some degree of interdisciplinarity. However, even traditional universities had to adapt to societal change following the Age of Enlightenment and the rise of modern democracy.

Modern HEI 2.0. Universities were reinvented in Germany in the 19th century by Wilhelm von Humboldt and others as research universities [52], which were later adapted into the American model, combining the German research idea with the English collegiate tradition and the American idea of service to society [2] (cf. p. 8). As an early expression of the modern worldview (see Section 2.2.1), it focused on the research *process*, allowing for more fluidity and leading to the idea of continuous improvement and process optimization. The rise of the research university model enabled massive breakthroughs in terms of research methods, standards of publication, and historic innovations for civilization in fields such as technology, engineering, and medicine.

Current academia is mainly shaped by this reinvention of higher education in light of the modern worldview. Quantification, professional specialization, and competition form the basis for most endeavors of HEIs. HEIs 2.0 compete for grants, students, and placements in rankings and thus, in short, for quantitative success [15,53]. This orientation toward quantitative success is amplified by the trends of massification (as participation in higher education grows on national and international levels), globalization, and internationalization and leads to increased marketization and privatization [2,50]. Consequently, teaching has become test-centric and modularized and HEIs have come to adopt entrepreneurial activities. Furthermore, scientific careers can nearly exclusively be advanced within disciplinary niches based on metrics such as numbers of publications and impact factors, hindering the advancement of interdisciplinary fields and cross-cutting topics such as SD [3]. These trends seem to intensify at the moment even though there are parallel lines of developments.

Postmodern HEI 3.0. The main alternative development of higher education is currently shaped by the postmodern worldview, especially in the social sciences and humanities. Dismissing positivism and objectivism, the subjective viewpoints from both research participants and students stand at the center of research and education at postmodern HEIs. Seminars, project work, and qualitative research methods have been developed in the spirit of this HEI 3.0. Learning arrangements are then focused on competencies rather than on knowledge accumulation only [23]. Moreover, forerunners such as Kurt Lewin have introduced alternative approaches to research such as action research [3,54]. These developments occurred together with student movements from about the 1950s, protesting against patriarchal hierarchies of HEI 1.0 and the somewhat mechanical teaching styles of HEI 1.0 and 2.0. This type of postmodern HEI or University 3.0 has brought about a focus on societal issues such as SD and led to the rise of interdisciplinary research. Researchers operating from a postmodern worldview will usually try to make everyone heard and to include regional and international stakeholders [22]. However, researchers often have to play by the rules of the modern worldview of HEI 2.0 in order to advance their careers, leading to trade-offs and tensions on a personal level [3] (cf. p. 645).

Integrative HEI 4.0. As conventional ways of decision making and education (including postmodern dialogical practices) are put under pressure by increasingly fast-paced and complex societal changes in times of globalization and digitalization, some parts of HEIs have come to adopt novel practices in line with the integrative worldview. So far, there are few pure examples for these

Universities or HEIs 4.0. However, experiences from smaller academic projects and other organizational forms (e.g., businesses) operating from an integrative worldview allow for preliminary descriptions of this emerging type of HEI.

Integrative HEIs 4.0 will likely exhibit a focus on self-management, a strive for wholeness, as well as an awareness of their evolutionary purpose, taking responsibility and trying to actively participate in societal change [3,43]. Taking systems as a whole into perspective, the co-creation of effective solutions for pressing societal issues such as SD will be emphasized in HEIs 4.0. Based on Graves' model of systemic development, HEIs or Universities 4.0 are bound to act as brokers for integrative processes, facilitating synergies between different societal sectors.

Building almost exclusively on Russian research and philosophical works, Alla Lapteva and Varlerii Efimov come to very similar conclusions and conceptualize a University 4.0 as "an infrastructure platform" for a variety of activities [55] (p. 2691). Focusing on the technical basis for HEI development, analogous to the waves of industrial revolution, Lapteva and Efimov stress the importance of telecommunication technologies for Universities 4.0. Consequently, HEIs and Universities 4.0 would be expressions of a "cognitive society" [55] (p. 2690), making use of hybrid technologies and collective intelligence [56]. HEIs become, in short, "a very open environment – a hub for a variety of communications, a node at the intersection of multiple networks (...). These communications, research works and development projects involve not only professors and students, but also a wide range of external participants." [55] (p. 2691).

Consequently, new concepts for higher education such as the living lab approach [57] are built around the idea of inclusive and dynamic research processes (see Section 3.2.1). The inclusion of students and citizens in the research process is intended to facilitate deep learning and to link research with education, knowledge transfer, and real-life application [58]. And even without direct field testing of ideas, research-based learning and co-creative innovation methods can be applied in courses. At the very least, learners should be encouraged to personally engage with sustainability and to learn by *experiencing* and *becoming aware*, going beyond mere cognitive processing [59].

Emphasizing the transformative aspect of HEI development, Otto Scharmer and Katrin Kaufer propose that learning at integrative HEIs 4.0 will be shaped by action learning, global classrooms, innovation hubs, and individualized lifelong learning journeys [60]. Scharmer goes on to argue in two blog posts that the university of the 21st century should in essence focus on providing *vertical development literacy*, i.e., the ability to understand systems and their respective worldviews and to guide these systems through a systemic upgrade, if needed [6]. According to Scharmer, this leading of transformative change requires the skill of "deep listening", self-awareness, and compassion [5].

Similarly, Uwe Schneidewind [61] proposes that HEIs should focus on facilitating *transformative literacy*, i.e., the ability to understand and participate in social transformation, including the technological, economic, institutional, and cultural dimensions of transformation. Sustainable development will then supposedly not be a special topic to deal with, but an integral part of a HEIs' DNA and governance [3,62]. Interestingly, the qualitative data from a multi-case study by Niedlich et al. [9] suggest a linear relationship between the orientation toward organizational learning of a given HEI and the degree of holistic orientation of its sustainability governance, supporting the general assumption that the development of HEIs from 1.0 to 4.0 equals a general systemic upgrade, going beyond incremental and isolated updates.

3.2. Leading Multi-Level Development of HEIs

The presented four phases of systemic HEI development are intended to provide a map for navigating the transformation of HEIs in the 21st century. In times of increasing complexity and a "knowing-doing gap", as Scharmer [5] coins it, HEIs would do well to prepare for a systemic upgrade in order to keep up with societal demands, specifically the challenge of sustainable development. Currently HEIs around the world are at very different stages of development, described as stratification of higher education [63]. We would go one step further and argue that each HEI in itself is stratified as

is, as different organizational subsystems emphasize different worldviews and exhibit different levels of maturity within a given worldview. Transformation would thus necessitate a consciously chosen multi-level approach.

However, this systemic upgrading is no easy task, especially with the principles of systemic development in mind (see Section 2.2.2). For example, how does one ensure and maintain the quality of teaching and testing while experimenting with new forms of education? How does one decide what to keep from the “old” system and how to transcend it in light of newly adopted core principles? And how should one address different subsystems of a given HEI? As these questions do not have a fixed answer, change agents might profit from engaging in peer networks (see Section 4).

At the very least, HEIs should practice self-reflection, open up to societal discourse, and prepare for necessary change, if judged to be appropriate. This includes that not all subsystems have to embrace complexity and transdisciplinary research. If, for example, a molecular biologist finds that robust quantitative methods (based on the idea of falsification and statistical inference) and exclusive discourse within their disciplinary niche are still the most fitting approaches, then change agents would do well to support them in continuing that type of research. At the same time, the communication of research results and processes might be adjusted by publishing in open access journals and including students in the research process to facilitate research-based learning. Similarly, research questions connected to hot topics such as climate change might be favored.

As most HEIs are expected to be centered around the traditional 1.0 or modern 2.0 worldviews, the next step would likely be one of strengthening the ideas of quality control (traditional worldview) and process optimization (modern worldview), while also championing dialogical forms of research and education (postmodern worldview). Inspiration for taking the predominant HEI 2.0 one step further can be found in J.G. Wissema’s 3GU model [64], mainly with regards to restructuring HEIs—enabling more interdisciplinary research in institutes, professionalizing HEI management, and promoting entrepreneurial activities and outreach.

In sum, the integration of more participatory, open, and transdisciplinary practices should be encouraged at all levels while simultaneously consolidating methodological rigor and effective process management—rethinking prevalent ways of HEI organization. In this way, a University or HEI 4.0 will become an infrastructure platform for cross-sectoral communication, facilitating open science and co-creative problem solving.

3.2.1. University 4.0 Practices for Education, Research, and Governance

Even though the systemic development of a given HEI can hardly be prescribed generically, some examples for different fields of action might be helpful to inspire customized measures. Thus, we will present a couple of loosely chosen best practices for the areas of education, research, and governance.

Education. As HEIs will move toward a larger proportion of postmodern and integrative practices, education will likely be focused on a whole-person approach, developing (personal) competencies in co-creative settings, rather than on knowledge and methods only [65]. One didactic approach that has been proven vital for leading co-creative seminars with learning groups of all levels is Ruth Cohn’s *Theme-Centered Interaction* (TCI). TCI offers a clear framework for dynamically balancing different factors of group learning—namely, the subject matter (“it”) at hand, the needs of the group (“we”), the needs of each individual (“I”), as well as the demands of the specific context (the “globe”) [66] (see Figure 1 for a display of the TCI model). Although it was originally developed for facilitating group therapy sessions, it has successfully been applied to classrooms in both primary, secondary, and higher education (see the work of Sylke Meyerhuber et al. [67] for its application to higher education). Its goal is to promote what Ruth Cohn called “living learning”, a kind of learning which is based on the humanistic ideal of meeting the psychological needs of the group members in order to facilitate personal growth [66] (cf. p. 19). Living learning is further described as being “emancipatory in nature” and thus, supporting self-leadership; as viewing the group as a “source of learning”; as being led by teachers that are also co-learning; and as being oriented toward meaningful experiences

and behavior [68] (p. 142). Due to its holistic nature, this approach seems well suited for facilitating transformative learning, especially education for sustainable development.

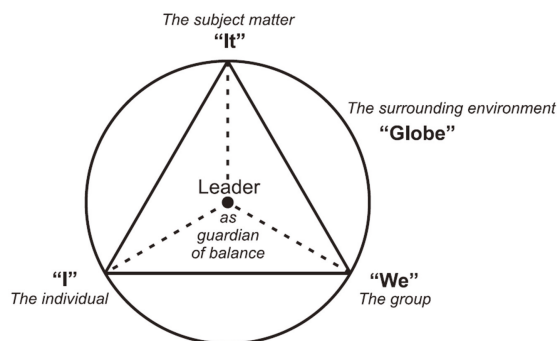


Figure 1. The four-factor model of Theme-Centered Interaction (TCI): group facilitation in dynamic balance (source: [66] p. 20).

From our experience, the Theme-Centered Interaction (TCI) approach is especially helpful for dealing with emerging topics and for integrating all kinds of disturbances (e.g., personal irritation, side talks, group conflicts, or arising needs) that would otherwise negatively impact the learning process [69]. Moreover, it accounts for both the relative autonomy and interdependence of human beings [70]—facilitating mutual respect and self-responsibility at the same time—and thus, sets the stage for co-creative learning and working. As a principles-based approach, it can theoretically be used with all kinds of group settings, regardless of the underlying worldview, and seems to be a promising approach for gently paving the way toward integrative education of HEIs 4.0. HEI leaders could therefore offer personnel development courses to lecturers of all levels on the TCI approach to facilitate a systemic upgrade of teaching methods. Furthermore, HEIs could initiate courses or information material on other didactical topics such as competency-based learning, blended learning, whole person education, research-based learning, and education for sustainable development (see e.g., [71,72]).

Research. The transdisciplinary *living lab* approach illustrates how a University or HEI 4.0 can attempt to contribute to sustainable development through novel research practices. The basic idea is to “leverage the campus as a test bed for sustainability” [73], integrating faculty, staff, researchers, and students into the process and using rapid prototyping methodologies for finding local solutions for global sustainability challenges. Living labs are moreover described as “open innovation ecosystems based on a systematic user co-creation approach” and have similarities to approaches such as real world laboratories, urban transition labs, and transformation labs [57] (cf. 32). In essence, they are focused on real-world application and effective problem solving through collaborative and open research. As such, living labs are not confined to the research category, but strongly interlink research with education, campus operations, and outreach, mirroring the cross-sector collaboration that is needed for promoting sustainable development. However, while the living lab approach is still emerging and preparing the ground for the integrative HEI 4.0, HEIs should not forget to also strengthen sound research practices on all levels, for example, by supporting open access publication or by prescribing study pre-registration to fight *p-hacking* [74,75].

Governance. As the example of living labs goes to show, governance for sustainable development will increasingly be framed as a community task with the advent of postmodern HEIs 3.0 and integrative HEIs 4.0. According to Niedlich et al. [9] (p. 11), HEIs will then describe their purpose as that of being a change agent and not merely a knowledge producer, closely tied to civil society and other external actors. In this way, HEI management becomes a part of the community. Furthermore, sustainability governance will increasingly be based on a whole-institution approach and facilitate cross-sectional and inter-organizational decision-making processes. This includes pursuing multiple dimensions of

sustainability and other cross-cutting issues simultaneously in an ambidextrous approach [9] (cf. p. 14). Living labs are one possible expression of integrative sustainability governance at HEIs 4.0, especially at older institutions. However, smaller and more rural institutions might be better able to make the transition toward postmodern and integrative practices of sustainability governance than larger institutions with a long history of traditional and modern practices.

In essence, the development of higher education can be described as a process of progressively opening up to stakeholders of all kinds and of integrating participatory methods. This movement of opening up enables HEIs to keep up with societal change and to provide learning arrangements that not only address cognitive development, but also emotional and even moral and spiritual development.

Thus, the main strategy to deal with increasing complexity is argued to be found in the facilitation of systemic development toward more integrative approaches, while trying to consolidate lessons and standards from preceding phases. As HEIs are invariably stratified organizations including a multitude of subsystems and worldviews, this strategy should be consciously adopted as a stratified or multi-dimensional approach, enabling each subsystem of a given HEI to take the next necessary step or to strengthen what is working well. In other words, HEIs should be wary of a one-size-fits-all approach and address each subsystem independently, allowing for stratified, parallel development with a general tendency toward integrative practices, as reflected in the whole-institution approach for sustainability governance and the broader model of University or HEI 4.0.

As the complexity of this task could easily overwhelm local change agents, we have found that this main strategy is often supported by inter-organizational networking among peers. Moreover, inter-organizational collaboration can be seen as a central organizational element of the University 4.0 model. Therefore, inter-organizational networking will be discussed in the following section as the second, more specialized strategy for dealing with increased complexity.

4. The Role of Inter-Organizational Networks for Higher Education Development

To reiterate, if higher education institutions (HEIs) are willing to meet the complex challenge of sustainable development (SD), they would do well to raise their general capacity to deal with complexity. This strategy of living up to SD by upgrading the metaphorical operating system of a given HEI has been argued to be the primary strategy of choice for sustainable HEI development. However, if dealing with evermore complexity can be described as a process of opening up to various stakeholders and thus increasing inter-organizational collaboration, how can this process be designed and formally supported?

One of the more tangible ways of inter-organizational communication and collaboration is that of participating in specialized networks, especially for cross-cutting topics such as SD. The second strategy to deal with increasingly complex demands is therefore described in the following as the strategy of inter-organizational networking. As Kurt de Wit [76] and Jeffrey Selingo [77] point out, successful HEIs are increasingly networked and work in alliances to tackle common challenges. Their networking activities include both internal and external stakeholders. In this paper, we are going to focus on the latter.

Scientific conceptions of networks come in many shapes and sizes. One dominant line of research views basically all relationships as part of a bigger network of relationships that make up society as a whole [78]. This perspective is built on the idea that “networks do not have boundaries” [79] (p. 1039) and forms the basis for quantitative network analysis and the famous “small worlds” theorem.

However, another line of research uses the term network to describe informal patterns of coordination that are based on personal relations and that bypass formal ways of decision making [80]. Thus, from this point of view, networks are seen as a *special* form of social coordination and are usually linked to phenomena such as cliques, corruption, and insider relationships [78].

Both lines of research have in common that they highlight the power of personal relationships for the distribution of information and resources. In this paper, we are assuming a middle ground position: on the basis of the works of Heiko Kleve [81,82], we regard networks as both formal and informal patterns of coordination that cut across other forms of organizations in highly specialized

societies, such as higher education institutions or enterprises, or even sectors such as politics and higher education in general. Networks thus fulfill the function of bridging units that are functioning separately from one another in order to solve problems that are hard to solve for each unit separately. In this sense, phenomena such as public-private partnerships can be seen as networks [83].

According to Kleve, networks are formed when highly differentiated expert organizations (e.g., hospitals, enterprises, or HEIs) are not able to solve current issues on their own or when the contribution of formal ways to problem solving is doubted [82] (cf. p. 354). In line with the sociological systems theory of Niklas Luhmann [84], networks are characterized by the principle of personal reciprocity, i.e., by the binary code of giving and taking [82] (p. 360). In other words, the power of networks relies on trust, the principle of mutual exchange, as well as on mutual expectations.

In higher education, inter-organizational networks are formed to enable flow of information and problem solving across organizations, usually with respect to specialized administrative and operative topics like that of digitalization, international recruitment, legal affairs, or online education [77]. Furthermore, cross-cutting research topics such as sustainable development or advancement of research methods can also be the focal point of inter-organizational networks, connecting professionals experiencing similar challenges.

Building on Kleve's conception, the success of inter-organizational networks should be dependent on the degree of exchange (and thus, giving and taking) within the network and on the degree of perceived reduction of complexity among its members. Ideally, both factors would help members with solving issues—both complex and trivial—at their respective organizations. However, we propose that the prototypical conception of a network differs greatly depending on the worldviews of the participating members, be they individuals or organizations. Hence, if network managers want to initiate lively exchange and to reduce the perceived complexity of their network's members, they should account for different expectations and worldviews.

In Section 4.1, we will thus bring forward different conceptions of networks on the basis of Graves' worldview model (see Section 2.2) and discuss implications for network management, especially in the context of higher education and sustainable development. The theoretical exploration is followed by a short case study in Section 4.2 on how the presented ideas were applied in the network "HOCH-N". The project name HOCH-N stands for "Sustainability at Higher Education Institutions". The project was funded by the Federal Ministry of Education and Research (BMBF), Germany to conduct research on sustainability at HEIs from the view of a whole-institutional approach and to build a network of HEI members that engage in SD [4,85]. This project serves as an empirical back-drop for the presented ideas. The authors are part of the HOCH-N network management team and thus have had the opportunity to compare theoretical ideas on networks with practical experiences.

4.1. Network Management from a Worldview Perspective

When HEIs are increasingly seeking out inter-organizational networks in order to tackle complex cross-cutting issues, the question has to be answered how these networks should be managed. As pointed out above, the term network is used to describe social phenomena of very different scope and sizes—a circumstance that complicates the conscious initiation and coordination of networks. If all relationships are part of a large invisible network, how could networks possibly be managed? Or if networks are seen as informal corrupt cliques, is their use not immoral *per se*?

However, combining the idea of networks as inter-organizational patterns of giving and taking with the idea of systemic worldviews, the following table and paragraphs are intended to highlight different conceptions of networks and principles of network management. From a worldview perspective, four types of networks are relevant for the advancement of HEIs or other expert organizations (see Table 3). These four types could be preceded by a fifth type of network, but as this one would indeed be marked by the aforementioned bypassing of formal decision making (and therefore, disposed to corruption), it is not included as a viable or advisable basis for deliberate network management.

Table 3. Four types of networks from a worldview perspective.

	Network Type 1.0	Network Type 2.0	Network Type 3.0	Network Type 4.0
Label	traditionalist	modern	postmodern	integrative
motivation to participate in a network	staying in synch with the herd; standing and fighting together	staying in touch with the best; finding an audience; bartering of ideas with peers; reaching influential people	meeting like-minded people; finding support and supporting others; sharing challenges with peers	sparkling and finding inspiration; co-creating solutions for common challenges
conception of giving	administering; providing; offering; depositing	investing (ROI)	tending needs; paying it forward	sharing gifts; helping to build a thriving system
taking is seen as	justified (based on principles and liability)	a reward and the point of the exchange	selfish or as a cause for feeling indebted	an opportunity for growth; a means for building something bigger
character	brotherhood/lobby	competitive game/market	campfire	jazz session
types and characteristics of meetings and events	official, regular, structured, and orchestrated	big, output oriented, scientific conference with shorter sessions and market of ideas	conference or camp with workshops; organic and plant-based food; cosy	hubs, labs, and camps; leaving space for experimentation
implications for network management	focus on stipulating standards; political work; adopting resolutions; strict admission criteria; clear network structure with committees, boards etc.; communication with authorities in the field	focus on high quality input and visibility; highlighting best practices; organizing conferences; enabling exchange and opportunities for presentations;	focus on creating a safe space to discuss common problems; strengthening bonds; organizing workshops; sustainable catering; providing resources	focus on enabling co-creation and innovation; holding the space; highlighting creativity methods and inspiring solutions; open source and sharing culture
examples from HOCH-N	three distinct levels of membership (from individuals to institutions, criteria based); practitioner's guides; support by federal ministry; consulting committee with experts	practitioner's guides with toolboxes and best practices; collection of more than 700 best practices on digital map; scientific and networking conferences	stakeholder-oriented interdisciplinary research; practitioner's guides; regional networking hubs; digital map of sustainability researchers in Germany; free resources	co-creation hubs with innovative methods (LEGO Serious Play®, systemic constellations, Theory U) focused on systemic transformation and whole-institutional approach

Network type 1.0. When a network is characterized by more traditional traits (see Section 2.2), it will likely be focused around the idea of finding and voicing common standards and concerns. Likewise, traditionalist network members might participate in a network in order to stay in synch with their peers and to comply with authorities in the field. If a network manager considers her network to be a more traditional network type 1.0, she could thus focus on more formal rules for admission and meetings, on providing orientation for its members, and on enabling communication with experts and authorities in the field.

Network type 2.0. A network type 2.0, based on the modern worldview, would in contrast be geared toward friendly competition among its members, seeking to learn from the best, and to find an audience themselves. Giving and taking are then seen more as a transaction and networking itself as an opportunity for marketing oneself or ideas. In order to fulfill the expectations of a network that is best characterized in terms of the modern worldview, network managers should then focus on providing plenty of opportunities for the presentation of ideas and personal exchange. Furthermore, it could be well-advised to champion best practices and to favor shorter and frequent sessions during events. With respect to higher education development, typical themes might include resource efficiency, quantitative methods, mainstream quantitative science, and digitalization.

Network type 3.0. When networks are formed around topics of social or environmental issues, they tend to focus much more on community building and workshops than on career advancement or efficient presentation of research results. A network type 3.0 is in essence built around the idea of mutual support and sharing, and giving and taking are likewise seen as a matter of tending needs and humble receiving. Its members might, therefore, expect more workshop-like formats during events, freely available resources, and low admission criteria. The topics of sustainable development or advancement of qualitative and transdisciplinary research lend themselves quite naturally to these postmodern network types 3.0. Network managers of more postmodern networks would therefore be well-advised to focus on dialogue, transparency, and responsible event hosting (especially with regards to catering).

Network type 4.0. When networks are more centered around the integrative worldview, they tend to be less predictable in their choice of tools and structures as their main focus lies on flexible problem solving and co-creative work with open outcomes. The main driver of a network type 4.0 seems to be the challenge of complexity and the desire to go beyond dogmatic and pre-defined solutions. While integrative networks might commit to a certain type of method (such as systemic constellations, *LEGO Serious Play*®, or methods from *Theory U* or the *Art of Hosting*), their key feature is that of co-creative work in the present moment—which can be likened to a jazz session, building both on a strong base of competence and on common standards while striving on present-moment interaction and improvisation.

In that regard, tools might be important for a network type 4.0, but only on the basis of mindful application and benevolent intentions as giving and taking are seen as a matter of sharing gifts. To set the stage for mindfulness, integrative networks often include relaxation techniques, meditation, or other practices from spiritual traditions. A network manager of an integrative network type 4.0 thus needs to fill the role of a facilitator, setting and holding the space for safe sharing of ideas. Because this type of interaction is rather atypical in mainstream scientific communities, integrative network events are usually either smaller-scale events (often labeled with alternative terms such as hubs, labs, or camps) or sub-tracks at larger, more typical scientific events.

Taking everything together, several distinct types of networks can be described through the lens of Clare W. Graves' worldview model. On the basis of the principles of systemic development laid out in Section 2.2.1, it is, however, unlikely that a network or its members will be a pure representation of one of the four network types. Nonetheless, network managers should be aware of the values and worldviews that are most prevalent in their respective field in order to promote coherent structures, facilitating the problem solving capabilities of networks. When the character of a network is experienced as incoherent to its contents, it puts the integrity and ultimately the liveliness and effectivity of the network at risk.

All in all, we propose that the design of a network should be intended to roughly match the worldview of a network's members and, in short, meet the network's participants where they are. This will most likely lead to a multi-level approach, serving multiple worldviews at once, while stressing one or two in particular. A bias toward inclusion of integrative approaches (network type 4.0) might furthermore be called for when a network is dealing with a particularly challenging issue in order to facilitate effective and co-creative problem solving.

4.2. Case Study: Managing the HOCH-N Network

Some examples from the HOCH-N network on sustainability in higher education in Germany are to illustrate the application of the presented ideas and to find the first answers to research question B2: How can inter-organizational networks contribute to the integration of SD into HEIs and to the general systemic development of HEIs? The case study is intended to explore practical application of the aforementioned conceptions (Section 4.1), thereby inspiring self-reflection in the reader (cf. [13,14], see Section 1). Hence, it demonstrates how key structures, products, and services of the HOCH-N network are set up to serve different worldviews and to promote systemic transformation.

Being part of the HOCH-N network management team, we could build our analysis on both publicly available resources and on internal documents and discussions. As the first step, we identified the most pivotal aspects of the network's design and outputs. Thereafter, we analyzed both the conceptualization and realization of those aspects on the basis of Graves' model (see Sections 2.2.1 and 3.1) and its application to networks (see Section 4.1), identifying (a) main drivers of participation in the HOCH-N network and (b) the respective worldviews that are predominantly served.

Case Study Results

The general design of the HOCH-N network is mostly based around postmodern ideas (network type 3.0) as the HOCH-N network is intended to promote the inclusion of sustainable development into HEIs' practices and curricula and the topic itself is typically associated with a postmodern worldview. This includes free membership and resources, low admission criteria, stakeholder inclusion, and a focus on smaller regional events (in order to facilitate personal exchange and to minimize travel costs and carbon footprint). However, in order to make the network more resilient and agile, the core structures, tools, and products of HOCH-N are designed to serve multiple worldviews at once, building on our own ideas and on empirical research on networks of HOCH-N network members [86,87].

To begin with, as HOCH-N is touching issues of both higher education politics and HEI governance, it has come to adopt certain traits of a more traditional network type 1.0. For example, three distinct levels of membership were defined with different barriers of entry. On the lowest level, each interested individual can participate. On the second level, members of HEIs can join HOCH-N individually, as long as they have attended a HOCH-N event. Moreover, level two members appear on the digital map (see below) and have to provide three best-practice examples concerning SD from their respective HEI as well as a short motivational statement for their membership. On the third level, HEIs as a whole can join HOCH-N as long as they demonstrate their engagement for SD with examples in six different fields of action, have the explicit support of leadership, and fulfill further structural criteria (for example, publication of a sustainability report). This three-level membership structure is intended to serve both the need for hierarchy and structure (traditional network type 1.0) as well as the disposition toward community and inclusion (postmodern network type 3.0).

The most engaging feature of the HOCH-N network is probably to be found in the networking events for sustainability at HEIs, enabling personal networking, exchange of concepts and ideas, and collaborative work on common issues. As the project evolved, several types of events have proven to be vital. As we identified community building (network type 3.0) and innovative problem solving (network type 4.0) to be the main drivers for HOCH-N members to participate, the typical HOCH-N events have turned more and more into so called hubs with either a focus on regional networking or

innovative methods. The latter are usually smaller-scale events or sub-tracks with a focus on systemic methods (like LEGO Serious Play®, systemic constellations [88], or methods from Theory U [41]) in order to build the needed capacity to deal with complexity (see Sections 2 and 3). This does not mean that more standard event formats and presentations of scientific results are not valued—these formats merely play a lesser role as the topic of SD is less linked to mainstream scientific careers.

Going beyond physical events, one of the key features of HOCH-N's website is the digital map of sustainable development at German HEIs (see Figure 2), programmed and maintained at the University of Hamburg [89,90]. As all level two members have to contribute a personal picture, a motivational statement, and have to highlight three examples of engagement for SD at their HEI, the map is able to fulfill several functions at once. First of all, it is intended to facilitate bilateral exchange via personal profiles as a kind of who-is-who of sustainability champions at German HEI (fitting network types 2.0 and 3.0). Moreover, it is also a rich collection of best-practices, with currently more than 700 entries from 250 individuals from 133 different German HEIs (again fitting network types 2.0 and 3.0), representing roughly a third of all German HEIs. The map is currently being re-programmed to include a novel search and database feature, enabling users to display, for example, all best-practices dealing with education for SD or SD governance (see [90] for the URL).

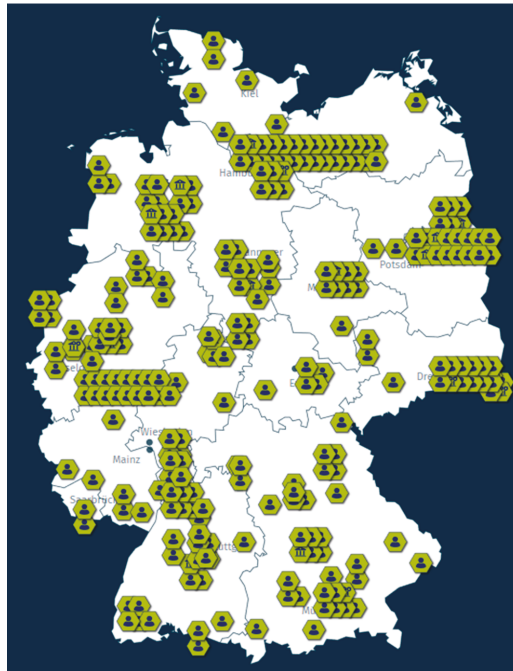


Figure 2. The HOCH-N digital map of sustainable development at German higher education institutions. Combs represent network members and link to individual profiles [90].

As HOCH-N was not only set up as a network but also as a research alliance, the project has also produced substantial results in six different fields of action: reporting [91], governance [7,9,92,93], teaching & education [94,95], research [62,96], operations [97,98], and transfer [99,100]. The six corresponding work packages have published practitioner's guides (see references above), available free of charge as print versions and PDFs (currently, only the guide on sustainability governance is available in English). These guides represent a major milestone in advancing SD at German HEIs as they help to provide interested but inexperienced members of HEIs with overviews, checklists, guidelines,

and inspiration for SD at HEIs. The practitioner's guides lend themselves to all four network types and thus help to ensure the success of the network. All guides will also be turned into short online video courses and merged on a common homepage to reflect the whole-institution approach, in line with the integrative worldview.

All in all, the HOCH-N network is intended to facilitate lively giving and taking, for example, by providing free resources and practitioner's guides, networking events, and by involving members and other stakeholders in the development of said resources. Its main focus is on serving the postmodern and integrative worldviews with networking events, innovation hubs, the digital map, and with practitioner's guides, while at the same time also serving and respecting both the traditional and modern worldview. Most key features were therefore designed to reflect a wide variety of needs. In this way, the HOCH-N networks tries to strengthen local change agents at HEIs and to provide them with inspiration through best practices, handbooks, and innovative methods, gently nudging systemic transformation toward a whole-institutional approach of SD.

5. Discussion

As members of the HOCH-N project, our work is focused on supporting HEIs in integrating sustainability into their education, research, governance, operations, reporting, and transfer, implementing the whole-institution approach. However, HEIs around the world are also facing the difficult task of dealing with multiple complex trends simultaneously while trying to maintain the ability to take action in times of uncertainty. Consequently, the implementation of measures for issues such as sustainable development often falls short. Otto Scharmer summarizes the challenge of implementing sustainable development in HEIs and society in general:

"The difficulties we have in meeting today's global challenges, such as implementing the 17 Sustainable Development Goals (SDGs) worldwide, are not caused by a knowledge gap. We have all the knowledge we need. The problem is a knowing-doing gap: a disconnect between our collective consciousness and our collective actions. (. . .) To address these issues at their root requires two things: new platforms for cross-sector co-creation and an upgrade in the operating system that people use to collaborate—practices that facilitate a shift from ego-system to eco-system awareness." [6]

Similarly, we have proposed two main strategies for HEIs for dealing with the challenge of complexity: (a) promoting systemic development of a HEI by updating its self-concept and worldview, enabling the HEI to deal with more complexity, and (b) participating in inter-organizational networks in order to promote transformative capabilities and problem solving across organizations. Both strategies combined are argued to enable HEIs to deal with increasing levels of complexity in general and the challenge of sustainable development in particular.

In essence, the systemic development of higher education is laid out as one of progressively opening up to internal and external stakeholders and thus, embracing interconnected and open environments. Ideally, this enables HEIs to keep up with societal change and to deal with increasing complexity, gradually leaving professional silos behind and allowing co-creative problem solving and collaboration to occur.

As HEIs are stratified organizations consisting of diverse subsystems, this strategy should be consciously adopted as a multi-level approach, enabling each subsystem of a given HEI to take the next necessary step—or alternatively, to strengthen best practices at the current level of development. Consciously developing a stratified university or HEI following the integrative University 4.0 model requires the ability of change agents and leaders to tolerate ambiguity and tension, appreciating the value of each distinct worldview of each subsystem while still trying to plant the seed of systemic growth. It is thus dependent on the personal development of leaders and their ability to embrace uncertainty, as qualitative research by Barret C. Brown suggests [47]. Brown further concludes that in order for global sustainability to be achieved, leaders would need to build their decisions (a) on a "deep inner foundation"; (b) on the conscious application of systems theory, complexity theory,

or integral theory; and (c) on mindfully responding to emerging topics by following an “adaptive design management” approach [47] (cf. 566).

As HEIs have to manage several complex issues at once, it might be argued that the simultaneity of trends would hinder general systemic development. However, some of these trends could actually accelerate systemic development by challenging predominant worldviews and processes. Specifically the trend of digitalization might indeed create windows of opportunity for systemic upgrades, as Giesenbauer [101] argues. For example, digital administration tools might facilitate the development from HEI 1.0 to 2.0 by promoting transparent process management; interactive tools might moreover facilitate the development from HEI 2.0 to 3.0 by increasing participation, stakeholder engagement, and transparency; and new tools for networking and collaboration might finally facilitate the development from HEI 3.0 to 4.0 by enabling inter-organizational and co-creative work processes.

The latter aspect hints at a particular feature of integrative HEIs 4.0 as those are expected to be highly networked. Organizational psychologist Peter Kruse [102] proposes that the challenge of rising complexity can only be successfully managed when the density of network connections in a given organization are increased significantly in order to tap into the organization’s inherent problem solving capacities and intelligence. Analogous to neural networks, inter- and intra-organizational networks thrive on resonance and exchange of information in order to create viable solutions. Once different members are connected and resonate with each other, co-creative solutions can potentially emerge. Thus, a higher network density increases the chance of effective problem solving.

In this sense, inter-organizational networks play an important role in enabling HEIs to promote systemic development. At the very least, network managers should reflect the worldviews and expectations of their networks’ members in the design of their network in order to assist fruitful exchange. Ideally, they would additionally reflect how the systemic development of their members’ organizations is likely going to unfold and design their network in a way that facilitates and even accelerates further systemic upgrades. The case study of the HOCH-N network illustrates that different structural features, events, and products can be used to serve different worldviews in order to build an agile network.

The case study is not without limitations. First and foremost, the authors are part of the network management team themselves and thus, are possibly biased. Furthermore, a single case delivers mainly anecdotal evidence. At the same time, the case study goes to show that accounting for different worldviews can help to inform the conception of a network, strengthening its strategic flexibility. Theoretically, this should improve a network’s impact and help its members with the task of systemic transformation. However, while we are confident that HOCH-N supports the systemic transformation of HEIs in Germany toward a whole-institution approach and a University 4.0 model, these effects are difficult to operationalize and quantify. Further research, both qualitative and quantitative, would be needed to substantiate our findings and convictions.

Moreover, even while cross-sector collaboration might be needed for effective societal solutions, its implementation can be challenging, especially with regards to different narratives and organizing principles across sectors [103]. Thus, the diversity of inter-organizational networks does not only represent an asset for co-creativity, but also a liability for effective coordination. Network managers should therefore keep an eye on communication practices and trust levels within their network as co-creative collaboration is dependent on both.

6. Conclusions

How can higher education institutions become change agents for sustainable development while also having to respond to increasingly complex demands simultaneously? These demands include massification, globalization, marketization, and digitalization. The pressure is further intensified by increased competition for grants and placements in rankings. In order to deal with the increased complexity, two main strategies can be identified: (a) promoting general systemic development of a given HEI (upgrading the HEI’s “operating system”), progressively opening up to various

stakeholders and focusing on co-creative collaboration, and (b) participating in inter-organizational networks in order to find inspiration for dealing with challenging trends. The multi-dimensional and networked organizational model of an integrative University 4.0 is argued to be suitable for following both strategies and consequently managing complexity.

Building on Clare. W. Graves model of systemic development, both general systemic development as well as the development of HEIs and inter-organizational networks can be described with a single coherent framework, supplying change agents with a navigational tool for systemic development. Further research is needed to elaborate on the presented ideas and to test their practical application.

All in all, our research suggests that it would be advisable for HEI management to build on the idea of a University 4.0, focusing on increased collaboration, co-creativity, and general systemic development. If higher education institutions are to contribute to mastery of pressing societal issues such as climate change and global migration, they should therefore reflect their dominant worldviews, making sure that they are not unnecessarily stuck in practices that were developed during very different times—e.g., to disseminate absolute truths in pre-democratic societies (HEI 1.0) or to standardize the scientific process in the Modern Age (HEI 2.0). While these phases were necessary for the development of higher education and their best practices still hold value, HEIs should progressively increase collaboration with stakeholders of all kinds in the generation of both knowledge and solutions, requiring increased intra- and inter-organizational network density.

In this way, adopting the concept of an integrative HEI or University 4.0 could enable HEIs to deal with the complex demands of the 21st century. Moreover, network managers could support the systemic transformation of HEIs by designing integrative inter-organizational networks that are focused on reducing perceived complexity and inspiring lively exchange. Both strategies combined might help HEIs to live up to the challenge of sustainable development and to become change agents for a sustainable future.

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Article

What Sustainability? Higher Education Institutions' Pathways to Reach the Agenda 2030 Goals

Isabel Ruiz-Mallén * and María Heras

Internet Interdisciplinary Institute (IN3), Universitat Oberta de Catalunya, Barcelona 08860, Spain; mheras0@uoc.edu

* Correspondence: iruiz_mallen@uoc.edu

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Abstract: Higher Education Institutions (HEIs) have the mandate of promoting sustainability through addressing the Agenda 2030. However, how this is being understood and framed in both discourse and practice by HEIs remains an underexplored issue. This article interrogates the concept of sustainability embraced by ten key HEIs networks at global and regional levels while identifying and discussing the main pathways for action displayed. We rely on HEIs networks' data from available online documents related to the Agenda 2030. "Greening" is the dominant sustainability discourse among the global and many regional HEIs networks, that is, the one that refers to the links between people, planet and profit. Two other discourses are minor and regional, "resilience" and "alternative". The "alternative" discourse is the only one entailing a critical approach to the Agenda 2030 goals. All networks promote changes in HEIs organizational culture to embed sustainability values in strategic planning, academic and managerial work. Yet there is a need for further engagement with society to readdress HEIs societal role. Deep and critical reflection of the worldviews, contradictions and tensions in the discourses and practices proposed by HEIs networks at global and regional scales is also needed to build common pathways toward sustainability.

Keywords: discourse analysis; environment; Global South; Sustainable Development Goals; universities' transformation

1. Introduction

In the last century, human activities have dramatically modified natural processes while significantly affecting social-ecological systems, leading to the current environmental crisis. In the coming decades, a "point of no return" could be reached unless greenhouse gas emissions will be reduced, and responsible environmental stewardship will be promoted at a global scale [1]. Climate action is one of the 17 Sustainable Development Goals (SDGs) of the Agenda 2030, a plan of action adopted by all United Nations member states in 2015 "to stimulate action over the next 15 years in areas of critical importance for humanity and the planet" [2]. Meeting the Agenda 2030 goals requires a political willingness to build pathways toward sustainable futures by changing the current development trends. In this regard, society can exert pressure on the governments and counteract those corporate interests defending the status quo. It becomes of paramount importance to raise public awareness and reflection on the causes and consequences of the environmental crisis, as well as to build capacities to responsibly and creatively deal with related challenges. Universities and other Higher Education Institutions (HEIs) can play a crucial role in this endeavor. In particular, HEIs can prevent students from being overwhelmed by the nihilism and hopelessness of the current dramatic situation while promoting effective skills acquisition and values of connectedness between humans and nature [3].

Indeed, HEIs have been formally working on sustainability issues since Rio's Summit in 1992 through the implementation of the Agenda 21. Its Chapters 35 and 36 already called universities to (i)

improve long-term scientific assessment, (ii) build up scientific capacity and capability, (iii) reorient education towards sustainable development, (iv) increase public awareness of the interrelated nature of human activities and the environment, and (v) promote training to develop human resources and facilitate the transition to a more sustainable world [4]. Later on, in 2002, and to coordinate educational efforts of HEIs and other entities toward sustainable development, the United Nations (UN) established the UN Decade of Education for Sustainable Development 2005–2014. Overall, the Decade of Education for Sustainable Development boosted the introduction of sustainability issues into the higher education curriculum and quality systems. It also increased recognition on the value of outreach activities and attracted funding to lowering universities' ecological footprint [5]. However, progress in this regard seemed to have remained slower than desirable due to universities' resistance to adopt a whole-institution approach that can lead them to move from reductionist to more holistic and transdisciplinary perspectives [6–8]. Such transition involves moving toward collaborative work between different disciplines and proactive engagement with the society toward transformative changes [6,7].

The current Agenda 2030, through its emphasis in education, can provide further opportunities for transformative change toward sustainability for HEIs. The Agenda 2030 includes an SDG devoted explicitly to education (SDG #4: Quality Education) and a target that addresses education for sustainable development (target 4.7) while highlighting the essential contribution of sustainability education to the other 16 SDGs [9]. Moreover, the UN Global Action Program (GAP), launched at the UNESCO Conference on Education for Sustainable Development in 2014 to continue the legacy of the Decade of Education for Sustainable Development until 2019, contributed to this target through scaling-up best practices and actions of education institutions including HEIs [10]. Further, many HEIs worldwide are implementing strategies for the adoption of the Agenda 2030 and its 17 SDGs. There seems to be, however, divergent and contrasting views on the adjustments they need to do toward more sustainable futures, which are also inherent to the Agenda 2030, such as the debate between the proponents of greening the economy and those advocating for alternatives to economic growth [11]. There is evidence that these different visions also permeate the way local universities are responding to the sustainability call [12]. How the sustainability mandate of the Agenda 2030 is being understood and framed in both discourse and proposed practice by HEIs at global and regional scales remains an underexplored issue. Is there a common understanding among HEIs of what sustainability means in higher education discourse and practice at global and regional levels? Are their efforts going in the same direction? Is there anything missing? This article sheds light over these issues by comparatively examining the sustainability discourses of a sample of key global and regional HEIs networks. It also identifies the main action points these HEIs are advocating for and discusses the main trends and most fundamental tensions and gaps in promoting sustainability within higher education.

In what follows, we review frameworks that are nourishing the concept of sustainability through compiling similar and contrasting visions within and beyond the educational realm, as well as methodological approaches analyzing universities' efforts in achieving sustainability goals. Based on this review, we present the analytical framework that we used in our analysis. We then explain the selection of the main HEIs networks at global and regional levels that are leading and guiding universities toward the Agenda 2030. We describe how we analyzed sustainability discourses and practices of selected HEIs networks by relying on the analytical framework previously presented. We report our findings on HEIs in this regard while revealing and discussing general trends as well as missing issues that would need to be further addressed by HEIs to improve coherence and find common pathways toward sustainability. We also highlight further research lines in this regard.

2. An Analytical Framework on Sustainability Discourse and Practice

There is no questioning about the ubiquity and ambiguity of the term sustainability as a critical concept for social change across disciplines and institutions. Previous work has identified three main trajectories of sustainability that rely on different values, processes and understandings of

the changes and transformations required for sustainability [11]. A first trajectory, based on the eco-modern paradigm, advocates for green economy supported by technological progress as the primary strategy to build sustainable futures. A second trajectory, relying on social transformation, which, in contrast to the former, challenges the current economic system by advocating for a radical change such as in the case of the degrowth movement. And, a third one, based on the resilience paradigm, promotes anticipating and controlling risks while finding solutions through socio-technical mechanisms. These main trajectories are, in turn, related to how the relationship between humans and nature is conceived within sustainability discourses. Epistemologically, three ways of approaching such a relationship can be identified. One is based on the reciprocal relationship between the environment and the tandem society-economy that supports economic growth. A second approach focuses on intergenerational equity and fairness that questions the current economic system. A third approach relies on forward-thinking, technology and innovation to find solutions [12]. These different discourses are also being projected in a variety of sustainability educational approaches within HEIs, which reproduce similar debates on the economic models and human-nature relationships that lead to sustainable futures. While some sectors advocate for market-driven, outcomes-oriented and standardized models of education mainly focused on competition, knowledge acquisition and technical skills, other educators and practitioners offer alternatives based on collaboration, emotions and values such as solidarity [13]. By taking positions on these discussions, HEIs navigate sustainability discursively but also practically.

Previous studies have reviewed and analyzed how universities are defining and implementing sustainability locally and discussed the links with sustainability discourses [6,14,15]. HEIs are doing multiple actions to engage in sustainability, such as integrating sustainability issues in the curricula, research, outreach and campus operations. For instance, a study surveyed 167 universities across five continents on the integration of the Agenda 2030 SGDs with sustainability teaching and found that lectures are the most common way they use to incorporate these issues [14]. However, other actions that could have a direct impact in society seem to be less common, such as those oriented to improving teachers' capacities to educate and empower students toward building sustainable futures and supporting inter- and transdisciplinary research to deal with complex challenges [6]. Researchers also note that efforts to reach sustainability in the university context are mostly focused on technological solutions and operational activities, such as the greening of university campuses. By contrast, actions addressed to promote HEIs reflection on behavioral and cultural issues within the organization itself are often absent but posed as crucial for a transition to sustainability. These authors frame such a transition in three stages that universities can navigate. In the first stage, called "operational optimization," HEIs increase the efficiency of the technical solutions they apply to deal with sustainability challenges and to comply with legal requirements. In the second stage, named "organizational transformation," HEIs actions keep a focus on infusing sustainability within the organization but also prioritize engaging with the behaviors and attitudes of students, teachers and other immediate actors. Finally, the third stage, called "systems building," involves a change in the vision and values of HEIs to create a sustainability culture. In doing this, HEIs reflect collaboratively with other actors on improving their role in society and extend actions beyond the limits of their organizations [15].

The transformative potential of the Agenda 2030 mandate in HEIs is thus subjected to these different understandings and implementation traits, which can potentially orient HEIs within contrasting transition navigation processes. Within this context, understanding how global and regional HEIs networks are building sustainability discourses and promoting their implementation in practice becomes crucial for assessing and orienting HEIs efforts in this regard. By reviewing online documents that state and describe the visions, goals and actions of ten key global and regional HEIs networks, we examine what type of discourses and actions are promoted by these networks globally as well as at the level of each continent (except for Antarctica). To do that, and by relying on the above-described frameworks approaching sustainability discursively and in practice, we elaborate an analytical framework for the characterization of global and regional HEIs discourses and action (Table 1). Our analytical framework includes, on the one hand, the categories of analysis characterizing HEIs

discourses. These categories are pre-defined based on the main traits illustrating the three sustainability trajectories and understandings previously described [11,12]. We also add a fourth discourse trait specifically addressed to capture HEIs views on the Agenda 2030. On the other hand, the analytical framework includes another set of pre-defined categories characterizing HEIs proposed practices. These categories correspond to the main traits of these practices in each of the three stages defining HEIs transition toward sustainability [15] as well as those previously identified actions in this regard [6,14].

Table 1. The analytical framework for the analysis of higher education institutions (HEIs) discourses and proposed practices to reach the Agenda 2030. Categories of analysis are marked in italics.

Categories of Analysis			
Discourse Traits	What Does Sustainability Mean? [11,12]		
	Ecological Modernization	Resilience	Society Transformation
Role of development and technology in the envisioned solutions to sustainability challenges	<i>Make it green</i> : becoming more active about protecting the environment with the support of technology while keeping economic growth	<i>Increase resilience</i> : confronting the vulnerabilities of the system through relying on technological progress and technocratic decision-making	<i>Search for alternatives</i> : supporting alternatives to economic growth and the global economic system while questioning the role of technology
Main strategy pushed forward to respond to risks	<i>Coping or adaptation</i> : mainly based on technical measures aiming to improve current practices	<i>Anticipation and control</i> : relying on technological solutions but focusing more on anticipating future challenges and controlling trade-offs	<i>Transformation</i> : implying a broad reflection on the organization's inherent behavioral and cultural aspects to redefine and build new practices
Nature–people relationship	<i>Utilitarianism</i> : nature understood as a resource that is at the service of people	<i>Objectivism</i> : nature seen as an object that can be controlled and shaped by people	<i>Spiritualism</i> : nature perceived at the same level than people so a convivial relationship can be established
Stance on the Agenda 2030	<i>Pro-Agenda</i> : embracing the Agenda 2030 in general terms, and/or focusing on one or several SDGs		<i>Debate</i> : questioning the Agenda 2030 vision of sustainability
Practice Traits	How Is Sustainability Promoted in Practice? [6,14,15]		
	Technological Optimization	Organizational Transformation	Systems Building
Focus of the practical actions promoted	<i>Organization improvement</i> : efficiency and the compliance of regulation	<i>Organizational culture</i> : changes of attitude and development of a new set of values and behaviors	<i>Systems' shift</i> : targeted aims beyond the organization
Types of collaboration fostered	<i>Isolated</i> : no collaborations fostered beyond the institution	<i>Academic partnerships</i> : networking and advocacy with other HEIs	<i>All types of partnerships</i> : academic, government, private, general public
Main actions proposed for implementation	<i>Technical</i> : curricula, research, operations, campus experiences	<i>Behavioral</i> : assessment and reporting, educators training, academic collaboration	<i>Systemic</i> : transdisciplinary, outreach and collaboration beyond HEIs, advocacy

3. Materials and Methods

3.1. HEIs Networks Leading the Agenda 2030 Mandate

We strategically focused our review on HEIs networks leading the implementation of the Agenda 2030 worldwide to ensure coherence with our research purpose and limit the scope within the vast field of sustainability in higher education. We studied HEIs networks instead of other HEIs such as single universities or research centers because networks accelerate the dissemination of discourses and practices.

We used a snowball sampling strategy, starting from the Global University Network for Innovation (GUNI). This global network was chosen in the first place for being the direct holder of the UN Mandate for the implementation of the Agenda 2030 across HEIs. We conducted the snowball sampling in two consecutive stages, which included HEIs at the global and regional levels, respectively. First, and from GUNI’s reviewed documents, we identified a set of seven HEIs networks of relevance at the global scale (see Figure 1 for further details). We then applied the following selection criteria: (i) being currently active; (ii) having a clear focus on sustainability, (iii) being mainly addressed at universities; and (iv) having available and balanced information about the two dimensions addressed in our review (i.e., discursive and practical). As a result, we included the following three global HEIs networks in our sample: the International Association of Universities (IAU), the Global Universities Partnership on Environment for Sustainability (GUPES) and Higher Education Sustainability Initiative (HESI). Together with GUNI, these four global networks represent a set of consolidated HEIs networks with a solid trajectory, born from different branches of the UN (i.e. GUNI and IAU from UNESCO, and GUPES and HESI from UNEP) and representing more than 800 HEIs distributed across 130 countries worldwide.

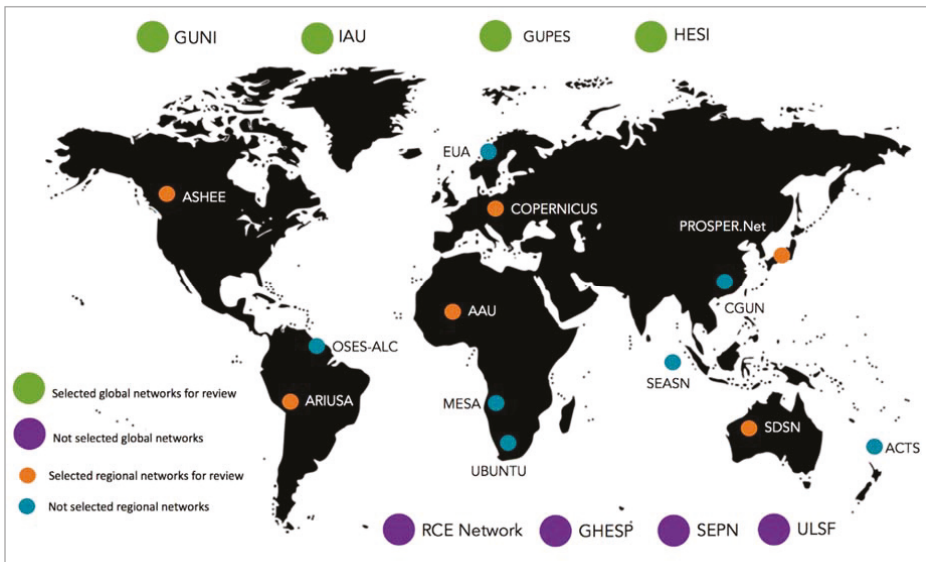


Figure 1. Global and regional networks identified in the snowball sampling. Source: own elaboration using image retrieved from Pixabay.com.

Second, from the review of the global networks, we identified 13 HEIs at the regional level. Such HEIs were distributed throughout all continents, except for Antarctica (see Figure 1). We then conducted a second screening applying the same selection criteria as in the case of the global networks and to select one network from each of the represented continents. As a result, we included six HEIs operating at the regional scale in the sample: the Association of African Universities (AAU, Africa), the Sustainable Development Solutions Network (SDSN, Australia/Pacific), the Alliance of Ibero-American Networks of Universities for Sustainability and the Environment (ARIUSA, South America), the Association for the Advancement of Sustainability in Higher Education (ASHEE, North America), the COPERNICUS Alliance (Europe) and the Network for the Promotion of Sustainability in Postgraduate Education and Research (PROSPER.Net, Asia).

Despite not being representative of all the HEIs worldwide, the resulting final set of ten HEIs represents a coherent and geographically balanced sample of acknowledged networks, both at the

continental and global scales. This sample can illustrate the main pathways currently promoted around the conceptualization and implementation of sustainability within higher education.

3.2. Data Collection and Analysis

For each of the ten selected HEIs networks, we reviewed two kinds of sources: (i) their official webpages, and most specifically, sections related to their mission and vision and their understanding of sustainability; and (ii) online documents about their links to the Agenda 2030 and/or the accomplishment of the SDGs, such as reports, declarations, charts and newsletters. Appendix A provides a list with the document types and sources reviewed for each network.

We analyzed these documents through content analysis to examine the main traits of sustainability discourses and practices promoted by the selected HEIs networks. We coded these data into the corresponding pre-defined categories of our analytical framework (see Section 2) in two ways. First, we coded data as 1=presence and 0=absence into each category. Second, we also coded data as key quotes when these reflected the meaning of the category. Even though our analytical framework was guided by the previously identified sustainability trajectories [11] and transition stages [15], this did not imply that an analyzed HEIs network should follow only one trajectory or be in a single stage. We codified the content of the reviewed documents independently by each discourse and practice trait and then grouped HEIs according to similar combinations of presence and absence into each trait to further identify the main discourses and proposed ways of action.

The two authors of this article conducted data collection and analysis. To ensure consistency of the analysis, we first analyzed two selected global networks and compared the consistency of coding among us, and then proceeded with the rest of the review.

4. Results

4.1. Main Commonalities and Differences in Global and Regional HEIs Networks' Sustainability Discourses

Three main discourses along which the analyzed HEIs networks navigate sustainability emerged from our analysis, which we have called: “resilience,” “greening” and “alternative.” These discourses are mainly shaped by HEIs networks' different understandings of the role of development in their envisioned solutions to face sustainability challenges and the strategies HEIs push forward to deal with risks. HEIs networks' stances on the Agenda 2030 are also crucial in defining their discourses as well as the visions on the nature–people relationship. Figure 2 includes the definitions of the identified sustainability discourses and places each network over the embraced discourse or discourses by global and regional levels.

Our results reveal that there is a major trend among the reviewed HEIs networks to concur with the “greening” discourse. In the visions, missions or reports analyzed, the four global HEIs and those regional networks in Europe, North America, Asia and Australia/Pacific refer to sustainability by highlighting the links between the dimensions of people, planet and profit. These HEIs understand that sustainability is achieved by guaranteeing economic growth while taking care of nature and people, which are interlinked challenges that need to be solved. As an example, IAU states the following in one of its publications about the Agenda 2030:

“Future well-being of humanity and the planet depends on successful resolution of the interconnected challenges of economic, social, cultural, and environmental sustainability” [16] (p. 10)

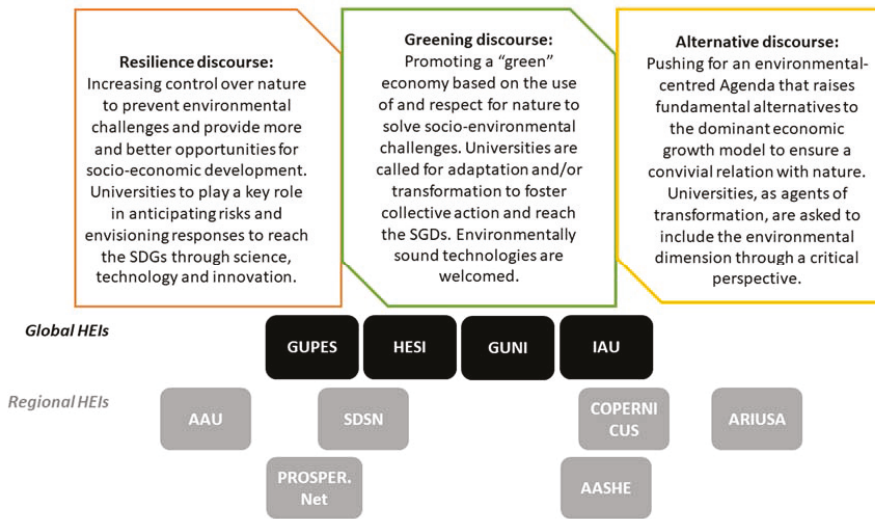


Figure 2. Main sustainability discourses identified among global and regional HEIs.

HEIs networks supporting the “greening” discourse aim to strengthen the role of universities in society as the leaders of adaptive or transformative processes toward such “green” futures through reinforcing collaboration and collective action. This approach often implies an organizational transformation within the HEIs, as we will explain in the next section. Interestingly, positions adopted on the role of technology for these sustainable futures differ among HEIs. On the one hand, IAU calls to embrace technological opportunities, ICT in particular, but also asks to analyze the potential trade-offs of these technologies. On the other hand, HESI, GUPES and COPERNICUS seem to omit this issue in their sustainability discourses. Finally, GUNi, AASHE, PROSPER.Net and SDSN emphasize the role of environmentally sound technologies in supporting sustainable development, especially in the Global South, as this quotation from GUNi shows:

“Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism” [17] (p. 13)

The other two discourses, “resilience” and “alternative” are mainly held by two regional HEIs networks: AAU in Africa and ARIUSA in Latin America and the Caribbean, respectively. AAU supports a sustainable development approach based on economic growth and effective natural resource management to prevent and control environmental risks by relying on technocratic decision-making processes. Indeed, its Strategic Plan 2016–2020 directly calls for a “resilient” higher education system:

“The onus to guide Africa on a sustainable path lies with resilient institutions like her higher education system to develop, train and retrain the human capital available on the continent; to efficiently manage her natural resources for the benefit of current and future generations; to conduct relevant research to stimulate her industries; and to build effective partnerships with multi-stakeholders (governments, civil society, industry, donors, etc.) to facilitate the development of strong institutions that are credentials of good governance.” [18] (p. 23)

ARIUSA, in turn, poses alternative views to growth and development by putting the convivial relationship between nature and people above the interests of the global economic system. Moreover, and differently from the other HEIs networks that are embracing the Agenda 2030, ARIUSA questions

the agenda's SGDs. That is why we call this discourse "alternative." ARIUSA raises the concern about the economic growth connotations of the concept of sustainable development and the SDGs and advocates for putting the focus on taking care of the environment instead:

"When ARIUSA was created, almost two decades had already passed since the concept of sustainable development had been coined (...). This concept has been the object of much criticism and resistance from major sectors of the academic community in the region that, since the seventies, has been in charge of environmental matters, particularly that which is identified with the so-called "Latin American Environmental Thinking" (Ángel, 1997 and Leff, 2009). Sharing or taking into consideration these positions, when deciding on the name of its alliance of university environmental networks, the founders of ARIUSA opted for the term 'sustainability' as opposed to 'sustainable development'." [19] (p. 68)

Finally, it is relevant to highlight that some HEIs, both at global and regional scales, move along two sustainability discourses. IAU, AASHE and COPERNICUS mainly emphasize the "greening" discourse. Still, the documents reviewed also highlight elements from the "alternative" discourse, such as the importance given to having a balanced relationship between nature and people. COPERNICUS, for example, clearly states this issue in its Chart 2.0:

"We pledge that the signatories, all universities and other higher education institutions, are firmly committed to playing the central role they 'noblesse oblige' are obligated to in contributing to our successful transition towards a sustainable society, which is free, just, equal, solidary and tolerant. A society which is characterized by respect for nature and our fellow humans and by shared responsibility." [20] (p. 1)

The sustainability discourses of the global HEIs GUPES and the regional HEIs PROSPER.Net and SDSN are also twofold: "greening" and "resilience." In the case of GUPES, this is shown by two of its objectives that call for a "green" economy and refer to the prevention of risks, respectively:

"To optimize development opportunities provided by ecosystem services in a sustainable manner in line with the principles of "Green Economy" and in the context of sustainable development.

To help prepare the world for the projected impacts of global climate change, disasters and conflicts, harmful substances and hazardous wastes, as well as to assist in reversing and mitigating these and other negative environmental and sustainability trends." [21]

4.2. Main Trends and Gaps in the Promotion of Sustainability Practices by Global and Regional HEIs Networks

This section presents the results of our analysis concerning the characterization of sustainability practices promoted by the selected HEIs networks. We identified a clear pattern followed by all these networks: they mainly focus their efforts on changing the institutions' organizational culture and behavior through the integration of sustainability values and environmental concerns in strategic planning, academic and organizational work. Such focus can be seen throughout a continuum of promoted practices: from actions aimed at the creative development and exchange of best practices (e.g., COPERNICUS, ASHEE, HESI) to the institutionalization or mainstreaming of sustainability concerns within university systems (e.g., GUPES, ARIUSA), and the promotion of HEIs responsiveness to societal needs in order to become active agents of change (e.g., GUNi, IAU, AAU, SDSN, PROSPER.Net). See, for instance, two examples from ARIUSA and SDSN:

"ARIUSA has been constructed as a framework for communication, coordination, cooperation and co-managerial relations between different types of university environmental networks working together to foster the institutionalization of the environmental commitments of universities and other HEIs in Ibero-America." [19] (p. 65)

“Universities are increasingly re-thinking their role in the 21st century and looking to be both more responsive to societal needs and to become agents of change towards solving global challenges. (. . . .) Furthermore, given the critical role universities have in ensuring the success of the SDGs, universities have a moral imperative to embody support for the SDGs as part of their social missions and core functions.” [22] (p. 9)

The last quotation from SDSN points to questioning HEIs purpose and role in society. It emphasizes HEIs public service obligations and ethical imperative to contribute to societal changes fostering transitions toward sustainability, which denotes a shy transition from the stage of organizational transformation to the system building stage [15]. In the same line, other HEIs promote actions aligned with values such as social responsibility, commitment, collaboration, equity and inclusion (e.g., GUNi, COPERNICUS, ASHEE), platforms for multi- and interdisciplinary dialogue (PROSPER.Net), measures aimed at universities’ systemic change (IAU), or efforts oriented toward ensuring the organizational capacity to deliver transformational change (AAU). All these actions are expected to benefit not only society but also HEIs by guaranteeing their own sustainability. Such an opportunity is also directly linked to the implementation of the Agenda 2030 mandate, as pointed out by GUNi:

“There is no doubt that HEIs have realized the importance of integrating sustainability in their strategies, both for the benefit of society and for the benefit that integrating it appears to have on the institution itself—according to SDSN, Universities benefit because they can demonstrate impact, capture more demand for SDG-related education, build new partnerships, access new funding streams, and make comparisons with other institutions via an agreed definition of a responsible university (SDSN, 2017:9). The latter is a very interesting aspect of the relationship between SDGs and HEIs.” [23] (p. 11)

HEIs networks also promote similar practices when looking at the types of collaboration they fostered. The most emphasized types of collaboration are among HEIs and commonly oriented toward academic cooperation for joint-curricula development, interuniversity training and research (e.g., joint research projects, shared capacity building, organization of conferences and meetings in a network, joint publication of journals), and exchange of best practices and resources. Collaborations with external actors are also often expressed through the establishment of partnerships, networking and advocacy. While networks often mention these collaborations in general terms, some HEIs emphasize alliances with specific actors. For instance, government organizations and development institutions (GUNi, HESI, SDSN, AAU, COPERNICUS, GUPES, PROSPER.Net), industry and private sector (SDSN, AAU, PROSPER.Net) or local communities (SDSN, AAU, COPERNICUS, PROSPER.Net). In this regard, the Agenda 2030 is identified by these networks as a strategic framework to fostering partnerships within and beyond the universities, such as in the case of SDSN:

“One of the strengths of the SDG agenda is that it provides a common framework for different sectors and organizations to connect and work together on shared interests. This will give universities opportunities to form new collaborations with government, industry, and the community in both research and education. Equally, the framework can help identify common interests across different areas of the university, helping to drive cross-disciplinary partnerships, collaboration, and innovation.” [22] (p. 9)

Our analysis shows, however, that engagement and critical self-reflection actions with actors beyond the academia aimed to readdress HEIs societal role are only partially mentioned by HEIs networks, or not mentioned at all, such as in the case of GUPES, HESI and ARIUSA. Although seven out of the ten networks explicitly emphasize collaborations with non-academic stakeholders (GUNi, IAU, COPERNICUS, ASHEE, AAU, SDSN, PROSPER.Net), these are often promoted in a relatively unidirectional way (e.g., HEIs as providers of input and knowledge). For instance, the GUNi network refers to the unique opportunity for HEIs, as trusted and educational institutions, to provide the skills and attitudes needed for active citizen participation but does not mention how HEIs can benefit from

citizen engagement [23]. Similarly, the HESI network highlights HEIs contributions at the policy level but not the other way around:

“HESI provides a unique opportunity for higher education institutions to provide input during the United Nations annual High-Level Political Forum on Sustainable Development, where Member States review progress made towards the SDGs.” [24]

Regarding the types of implementation actions proposed by HEIs networks, these include in all cases technical actions. At the same time, we find differences in some of the specific activities related to behavioral and systemic change. Concerning technical actions, all the networks reviewed include actions oriented toward learning and teaching. In this regard, all HEIs encourage curriculum change and innovation, mostly through the integration of sustainability related issues and the teaching of competences, skills and motivation to understand and address sustainability goals. Furthermore, seven out of the ten networks analyzed propose actions around campus operations and/or governance (exceptions are GUPES, AAU, PROSPER.Net). The role of research actions is also emphasized by most HEIs networks (except IAU and HESI) as key to advance knowledge and evidence-based solutions and innovations. Some networks further mention strategic actions in this regard, such as the inclusion of Responsible Research and Innovation (RRI) guidelines in research methods (GUNi).

Also related to research, some HEIs networks go beyond technical actions to promote behavioral initiatives oriented to change HEIs organization, such as the combination of traditional disciplinary approaches and newer interdisciplinary and transdisciplinary ones (SDSN, PROSPER.Net). Within such behavioral approaches, assessment and monitoring of HEIs progress are proposed by six of the analyzed networks (ARIUSA, GUNi, SDSN, IAU, CORPERNICUS, ASHEE). They acknowledge these practices as critical in any strategic action plan that expects to have an impact on the achievement of the SDGs, as ARISUA highlights:

“One of the first steps needs to be the establishment of a baseline or assessment of the initial status of the process of associating higher education institutions to the achievement of the Sustainable Development Goals. Knowledge of this process is even more nascent and differentiated for the different aspects of economic, social and environmental sustainability to which universities contribute. To overcome this situation, there is a need to construct a basic system of indicators to be able to assess the contribution made by HEIs to the goals of the 2030 Agenda.” [19] (p. 72)

Steaming from this need, some networks at both global and regional scales propose specific monitoring systems and research projects. HESI’s online self-evaluation tool (i.e., the Sustainability Test) focuses on sustainability literacy issues and is addressed to individuals, universities and organizations. ASHEE’s self-reporting tool, named STARS, measures sustainability performance of universities. SDSN proposes a monitoring framework with 100 indicators for the SGDs. ARIUSA’s research project, called RISU, develops indicators to assess the implementation of sustainability policies in Latin American universities. Other behavioral actions are oriented toward supporting capacity building to contribute to educators’ development of leadership skills and further abilities required to teach sustainability issues and change HEIs learning environments. This is the case, for instance, of the PROSPER.Net “Leadership Programme,” a training addressed to early career researchers and young professionals from diverse sectors (e.g., local communities, public officials, private sector) to explore together how partnerships can be fostered toward more sustainable practices across a variety of fields. Reviewed HEIs also include behavioral actions related to academic collaborations, such as the development of conferences and seminars for sharing practices and knowledge and to foster debate and collaboration, like the International Conference on Sustainable Development Goals: Actors and Implementation, organized by GUNi, or the National and Latin American Forums of Universities and Sustainability organized by ARIUSA.

Finally, systemic actions are proposed by most reviewed networks (all except ARIUSA) but are less present in emphasis. AAU, HESI, COPERNICUS, IAU, SDSN and PROSPER.Net explicitly include advocacy-related actions, emphasizing the political dimension of SDGs and the interaction with actors beyond academic ones. For instance, advocacy for achieving sustainable outcomes is outlined by AAU as one of the four core elements of its programmatic approach:

“Our programmatic approach consists of a coherent package of service delivery and advocacy activities delivered in partnership at all levels—from community to national, regional and international levels. In the context of AAU, this is based on a critical analysis of HEIs in the specific context of each country and across countries.” [18] (p. 17)

Actions proposed within the systemic approach also include applied research collaborations with private companies and development institutions working on SDGs (AAU, SDSN, GUPES, PROSPER.Net) and the evaluation and follow-up of broader policies (i.e., beyond educational ones) created by policy makers to address SDGs (e.g., GUNi).

All in all, through this diversity of proposed actions (teaching, research, assessment, dissemination, advocacy, etc.), all the reviewed networks go beyond SDG#4, Quality Education, perceiving the Agenda 2030 as a strategic and holistic framework for broad transversal action. Some networks are also emphasizing other SDGs in the reviewed documents. This is the case, for instance, of GUNi that has created a line of strategic work steaming from SDG#17. This line of action aims at sharing and building on expertise to reflect about opportunities and obstacles to foster effective and inclusive multi-stakeholder partnerships as a keystone for the achievement of SDGs within higher education [17]. Similarly, IAU addressed SDG#5 and the mandate of HEIs to bring women into higher levels of institutional leadership worldwide. IAU advocates for the anchoring of gender equity within the whole institution through the implementation of strategies that value diversity and contribute to the opportunities for women to access the highest positions and to move beyond the glass ceiling [16].

Table 2 summarizes the main traits of each network according to the focus of the promoted actions, the types of collaborations fostered and the main actions proposed.

Table 2. Main traits of sustainability practices promoted by selected global and regional HEIs.

HEIs Network	Focus of the Practical Actions Promoted	Types of Collaborations Fostered	Main Actions Proposed
GUNI	Integration of sustainability and social values in HEIs strategies to strengthen their critical role within society and academic diplomacy to achieve partnerships and collaborations	Networks; resources exchange, values promotion, knowledge co-production and capacity building among HEIs and with other stakeholders	Inclusion of the concept of sustainability within HEIs research, education and training; Campus operations & governance; Sustainability assessment and follow-up of policies
IAU	HEIs systemic change to embed SDGs in strategic planning, academic and organizational work	Interdisciplinary research among HEIs and transdisciplinary work with other stakeholders	Curricula development and training; Outreach and networking (women leaders); Assessment and monitoring
GUPIES	Mainstreaming of environment and sustainability concerns into university systems; interaction between UNEP and universities	Networks and resources exchange	Education and training; Applied research; Networking
HESI	Provision of a platform for HEIs to engage and contribute to the SDGs and exchange best practices	Exchange platforms and advocacy	Integrating SDGs within teaching, research and dissemination; Greening campuses; Support local sustainability efforts and explore innovative practices from other sectors; Engage with international networks; Outline an advocacy agenda
COPERNICUS	HEIs improvement by creatively developing and implementing comprehensive and integrated sustainability actions	Networks, joint knowledge production, and active engagement among HEIs and with other stakeholders	Curriculum change and capacity building within HEIs; Change quality assessments and assurance systems; Outreach and dissemination actions; Advocacy for HEIs for SD in Europe
AASHE	Improvement of HEIs practices toward the integration of sustainability	Networks among HEIs, partnerships with other actors	Training to teachers and students; Campus sustainability hub; Outreach and networking; Self-assessment; Partnerships with private, public and civic sectors
ARTUSA	Institutionalization of HEIs engagement toward environmental and sustainability issues and cooperation and coordination of actions between HEIs	Networks, academic cooperation and co-management among HEIs	Outreach events; Development of educational programs and research projects; Diagnosis and assessment
AAU	Capacity building of member institutions to address societal needs and to deliver transformational change	Partnerships with national and international actors in development and engagement with local communities	Training & research; Partnerships with other stakeholders; Community action
SDSN	HEIs responsiveness to societal needs to become agents of change toward solving global challenges	Inter and cross-disciplinary work at universities; partnerships with other actors	Learning and teaching; Research; Organizational governance, culture and operations of the university; External leadership
PROSPER.Net	Contributing to societal transformation for sustainable development, through transforming knowledge institutions and training future leaders	Sharing of resources and expertise among HEIs and similar networks, partnerships with other actors such as public officials, the private sector and local communities	Integration of sustainable development into curricula and research; Promotion of sustainability-oriented experiences between researchers and practitioners; Policy advocacy in higher education

5. Discussion and Conclusions

This research has explored how the sustainability mandate of the Agenda 2030 is being understood and framed in both discourse and proposed practice by HEIs networks at global and regional levels. Our findings show that in most cases HEIs networks' pathways toward sustainability are framed within a "greening" discourse that aims at improving nature and people's wellbeing through relying on less environmentally damaging forms of economic growth, as being in line with the Agenda 2030 goals. In doing this, these networks promote the integration of sustainability values in HEIs strategic planning, academic and organizational work, emphasize the need for partnerships and support actions mainly oriented to learning and teaching. This "greening" discourse is embraced by the four global networks reviewed (GUNi, IAU, HESI, GUPES) and four out of the six analyzed HEIs networks at the regional level (COPERNICUS, ASHEE, SDSN, PROSPER.Net). Our findings also show two minority sustainable pathways that only a couple of HEIs networks are following. On the one hand, the understanding of sustainability by the African network (AAU) relates to a "resilient" discourse that is based on increased control over nature and the use of technological solutions to reach the Agenda 2030 goals. Through promoting HEIs organizational change, this network aims to make them become active agents of change and provide sound responses to societal needs, with community action being one of its main supported activities. On the other hand, the Latin America network (ARIUSA) builds its understanding of sustainability on an "alternative" discourse that calls for prioritizing nature and human well-being over economic growth and, in doing this, questions the sustainable development approach of the Agenda 2030. Differently than the other cases, the main focus of this network is to foster HEIs organizational change through the institutionalization of sustainability concerns within university systems, with academic collaborations being a pivotal action to be enforced.

Before going into the discussion of relevant results on current potentials and gaps in the promotion of sustainability within higher education, we note some methodological limitations of our study. Findings described in the previous section need to be interpreted with caution, and broad generalizations on the identified sustainability discourses and practices among HEIs should be avoided because of two main reasons. First, it was not our intention to provide a single snapshot of the whole community of universities and other HEIs in terms of their approaches and actions toward sustainability and the SDGs. Other literature is already taking care of some of these issues [14]. Instead, we aimed at identifying commonalities and divergences across sustainability understandings and practices within the higher education system at both global and regional levels, as well as finding out the main gaps in this endeavor. To do that, we focused on HEIs networks as accelerators in the dissemination of discourses and practices, analyzing only those identified as actively working in promoting sustainability among universities and other HEIs worldwide or regionally. Therefore, our findings on identified HEIs efforts and gaps in navigating sustainability should be confined to these cases. Second, in general, we have found limited data on HEIs conceptual approaches to sustainability and the Agenda 2030. Our analysis has been based on the information and documents available at HEIs websites, so we may have missed other approaches to sustainability that are not public, are uploaded at other platforms or are still a work in progress. In this last regard, it is also possible that the reviewed HEIs are currently modifying their discourses or adopting new practices in the way they are embracing the different SDGs, which go beyond our analysis.

This said, our findings are valuable for both addressing the aim of the study and reflecting on the main points of discussion derived from relevant insights. On the one side, as mentioned above, results show that the sustainability discourses of the global HEIs networks are mainly placed within the "greening" discourse. In contrast, there is more diversity at the continental scale. It seems that the analyzed regional HEIs networks move along a gradient of acceptance of the sustainable development paradigm, being AAU in Africa and ARIUSA in Latin America and the Caribbean in the two opposite poles by embracing "resilient" and "alternative" discourses, respectively. While AAU supports technocratic decision-making processes to increase the effectiveness of current development approaches, ARIUSA poses alternative views to economic growth and the global economic system.

Differences in approaching sustainability between these regional HEIs could be related to the historical development of the field within each context. Differently than in Africa, in Latin America and the Caribbean the integration of sustainability within the higher education system is a result of an active tradition in environmental education that began with universities offering technical and vocational training on natural resource use and conservation in the 1950s [25]. Besides, there is another tradition in this field, that of questioning the term “sustainable development.” It is argued that sustainable development is directly related to continuous growth that implies the accumulation of wealth by the rich in detriment of the poor in a context of limited natural resources, increasing social inequalities between the Global North and South. It is also argued that the concept of sustainable development omits the historical dominance and exploitation of both natural resources and human labor suffered by Latin America, and the Global South in general. Consequently, this concept cannot be transferred to new generations without a critical approach [26]. As our findings suggest, this might have implications for the adoption of the Agenda 2030 and the SDGs. Taking into account the links between environmental degradation and political and socio-economic backgrounds, as well as relevant socio-cultural issues in each region when promoting HEIs efforts toward sustainability, this could be one of the steps to resolve such a deadlock. This has been, so far, often neglected by universities [12] and it also seems to be omitted in the analyzed global HEIs discourses.

On the other side, and similarly to discourses, actions promoted by HEIs also follow a gradient of practice traits. Our findings suggest that all reviewed networks commonly assume technical solutions and compliance with the law. Moreover, there seems to be an emphasis in the promotion of actions aimed at changing the values, behaviors and attitudes of the organizations to create a sustainability culture within HEIs (e.g., organizational transformation stage). Many of the reviewed HEIs networks also propose collaborations beyond the educational sector to shift change to the whole system, in line with systems building, which is the last stage of the continuum of sustainability transition stages [15]. This emphasis on changing values and fostering non-academic collaborations highlighted by HEIs networks suggest certain progress in comparison to previous reviews in which operational efficiency was promoted in detriment of an organizational change [6]. Further research should analyze and assess the impact of HEIs actions in terms of operational transformation and systems building during the mandate of the Agenda 2030.

Moreover, to what extent these projected actions are being implemented remains an issue to be explored in further research. However, our findings already suggest tensions in this regard. As prior research points to, despite years of international agreements, calls for action and guides for good practices, the implementation of sustainability is still not mainstream within academia [27,28]. Indeed, transforming HEIs toward sustainability has encountered resistance to change pre-established systems due to universities’ complex bureaucracy and rigid structures, among others [28]. Furthermore, the dominance of competition and disciplinary based culture within academia limits and slows efforts in this direction [27,29]. It is argued that HEIs should question these constraints to be able to transform their value systems and worldviews. Such questioning should be done within the institutions by reflecting on the values that are deterring academics from redesigning their disciplines and appreciating the epistemology and multicultural vision of sustainability [7]. In this regard, being aware of the institution’s cultural predispositions and willingness to transform is critical for enhancing HEIs sustainability governance [30]. These studies already point to the crucial action of the human factor and the underlying worldviews and value systems within HEIs as barriers to change in some cases, or drivers of change in others [7,30]. Further research is needed to better understand the relation between HEIs institutional cultures and sustainability transformations. As the Rio+20 Treaty on Higher Education (2014) highlights, “to be transformative, higher education must transform itself” [31].

In this context, the efforts to embrace change posed by the reviewed HEIs networks should be interpreted positively as a step required for transformation. At the same time, it calls for caution as, to have a real impact, this change should be accompanied with an aligned practical implementation aimed at truly transforming HEIs organizational values by adopting a whole-institution approach [8].

Some of our findings point to gaps in this regard. First, although almost all HEIs networks mentioned collaborations with external actors, these collaborations are expressed mostly through providing input to change other sectors (e.g., advocacy, partnerships with private companies, or assessment of public policies). By contrast, allowing different actors' practices to permeate universities and engage in collaborations to actively rethink their role in society are actions poorly endorsed in the documents reviewed. This absence might also reveal a lack of reflective practices to go further in the transformation of HEIs themselves. Second, and connected to this, our findings show that most of the external collaborations are called to take place with institutional and governmental actors. Among other reasons, this trend might be due to the prominent role that governmental support has in encouraging the integration of sustainable practices within HEIs [28]. Such a focus contrasts, however, with the recognition for local partnerships as a prime way to tackle the need of interconnected governance responses demanded by the Agenda 2030 multidisciplinary approach [32,33]. Many universities have been compelled for more than 25 years now to develop community engagement work toward sustainable development (see for instance the COPERNICUS Charter, signed by more than 300 HEIs in Europe) [34]. Yet, our findings show that partnerships with local actors still represent a gap in HEIs external collaborations. Given that HEIs work and decisions may affect the economic, social and environmental aspects of local communities and regions [35], it should be highlighted the urgency of boosting the inclusion of local actors in HEIs actions. By establishing bidirectional communication channels and mechanisms for mutual learning, HEIs could also benefit from local actors' knowledge and ideas to navigate sustainability locally.

To conclude, our findings suggest that linking values and ontologies behind HEIs networks' sustainability discourses with their promoted actions might not always be taking place, although it is a required exercise for guaranteeing coherence. The development of robust and reflective assessment approaches, which is a line of action already promoted by several of the HEIs networks reviewed, seems an opportunity to work in this direction. The inclusion of external actors, and especially local communities, in processes of critical self-reflection could bring the chance to assess whether discourses and actions are aligned or not and how to improve progress in this regard. There is a perceived need to foster more integrative forms of societal and academic collaboration in the approach of HEIs to sustainability, whereby the combination of inputs from diverse fields may contribute to a better understanding of what sustainability is and means to people [27,32]. This progress might imply a turn of the dominant sustainability paradigm (i.e., "greening") toward a more humanistic approach, which is framed around convivial relationships between nature and humans and sees sustainability as a process rather than just an outcome [36]. Such an alignment will not be possible without a deep and critical reflection of the worldviews, contradictions and tensions in the discourses and practices proposed by HEIs networks at global and regional scales so to build common pathways. Further efforts in higher education research and policy development could take these elements into account to boost the envisioned societal transformations.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

This appendix includes a table compiling the reviewed online documentation of each selected HEIs network for the analysis.

HEIs Network	Reviewed documents
GUNi	Website http://www.guninetwork.org/mission-and-objectives (Vision/Mission) Implementing the 2030 Agenda at Higher Education Institutions: Challenges and Responses. 2019. http://www.guninetwork.org/publication/implementing-2030-agenda-higher-education-institutions-challenges-and-responses Approaches to SDG17: Partnerships for the Sustainable Development Goals (SDGs) http://www.guninetwork.org/publication/approaches-sdg-17-partnerships-sustainable-development-goals-sdgs Sustainable Development Goals: Actors and Implementation. A Report from the International Conference http://www.guninetwork.org/files/guni_sdgs_report_0.pdf
IAU	Website http://www.iau-hesd.net/en/contenu/139-iau-action.html (Mission and HESD strategy) IAU Horizons, 24(1), April 2019. In focus: Universities and Agenda 2030: Engaging with the SDGs https://iau-aiu.net/IMG/pdf/iau_horizons_vol.24.1_en_light_.pdf
GUPES	Website http://gupes.org/index.php?classid=3244 (Overall goal & objectives, pillars)
HESI	Website https://sustainabledevelopment.un.org/sdinaction/hesi Brochure https://sustainabledevelopment.un.org/content/documents/16065HESI_info_July3_v2.pdf
COPERNICUS	Website, Charts, Action Plan https://www.copernicus-alliance.org/about
AASHE	Website and Annual reports 2018, 2017, 2016, 2015 https://www.aashe.org/
ARIUSA	Website https://ariusa.net/es/ariusa Primera década de la Alianza de Redes Iberoamericanas de Universidades por la Sustentabilidad y el Ambiente (ARIUSA 2017) https://ariusa.net/es/primera-decada-de-la-alianza-de-redes-iberoamericanas-de-universidades-por-la-sustentabilidad-y-el-ambiente-ariusa-2 Alliance of Networks for the Environmental Sustainability of Higher Education Institutions in Ibero-America (2018, pp. 60–74) http://www.guninetwork.org/publication/approaches-sdg-17-partnerships-sustainable-development-goals-sdgs
AAU	Website and AAU Strategic Plan 2016–2020 https://www.aau.org/about/
SDSN	Website Regional Network Australia, New Zealand and the Pacific https://www.unsdsn.org/newpageca2aed64 Getting started with the SDGs in universities: A guide for universities, higher education institutions, and the academic sector http://ap-unsdsn.org/about/
PROSPER.Net	Website https://prospernet.ias.unu.edu/ ProSPER.Net Strategies and Roadmap https://prospernet.ias.unu.edu/wp-content/uploads/2016/02/ProSPER.Net-Strategies-and-Roadmap_revised.pdf

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Article

Alliances of Change Pushing Organizational Transformation Towards Sustainability across 13 Universities

Lisa Bohunovsky ¹, Verena Radinger-Peer ^{2,*} and Marianne Penker ²

¹ Center for Global Change and Sustainability, BOKU University of Natural Resources and Life Science, 1180 Vienna, Austria; lisa.bohunovsky@boku.ac.at

² Institute for Sustainable Economic Development, BOKU University of Natural Resources and Life Science, 1180 Vienna, Austria; marianne.penker@boku.ac.at

* Correspondence: verena.radinger-peer@boku.ac.at

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Abstract: Universities are expected to play a leading role in developing and maintaining sustainability. To contribute to a systemic and dynamic understanding of organizational change that is necessary in order to play such a role, we comparatively analyzed processes of organizational changes towards sustainability across thirteen universities in Austria. This comparative analysis is based on data from guided interviews and document analysis and on validation of preliminary results via group discussion and individual comments. The results show that all universities embedded sustainability in most of their areas of activity (research, teaching, operations, organizational culture, societal engagement), but the depth of integration and the type of structural embedding varies. Especially for early changes dating back to the 1990s, academics working in the broader field of sustainability studies were those agents of change, who—without formal mandate—skillfully and proactively initiated and drove organizational transformations following an idealistic and intrinsic motivation. A timeline analysis illustrates peaks of sustainability-related changes in the years of the foundation of inter-university networks in 2011 and 2017, which acted as alliances of change. Ministry intervention in 2015 helped to bring sustainability on the agenda of those universities with less change agency. In summary, sustainability transformations across the fields of teaching, research, operations, organizational culture, and societal engagement were driven by a fruitful interplay of change agency and change alliances and to a minor degree by top-down interventions.

Keywords: universities; organizational change; higher education for sustainable development (HESD); sustainability transitions; SD; alliances

1. Introduction

The important role of universities as active stakeholders to support a paradigm shift towards sustainable development (SD) has been stressed both on the policy level and in the scientific discourse (e.g., [1]).

The contribution of universities to sustainable development is seen, for example, in developing strategic long-term visions and goals [2], in bridging different types of knowledge through inter- and transdisciplinary approaches [3,4], as well as assuming a boundary spanning role between science and society [5]. The role as ‘change agent’ [6,7] comes not without challenges. In order to fulfil this role, universities need to rethink their current organizational structures and societal purposes, leading to a structural transformation towards sustainability [8,9]. These processes of organizational change are expected to contribute to overarching political agendas (e.g., Education for Sustainable Development,

Sustainable Development Goals) and involve all areas of activity: learning and teaching, operations, external societal engagement, and research.

Much research has been undertaken regarding the *what* of organizational transformation, including (1) the integration of sustainability in university management practices [10,11]; (2) corporate social responsibility, sustainability reporting, and accounting [12–14]; (3) teaching and education for sustainable development [15–17]; (4) generation and advancement of scientific knowledge and other forms of knowledge [18,19]; (5) boundary spanning, participation in regional sustainability initiatives, and networking [2,5,20]; and (6) applying sustainability as an overall concept for universities as in, for example, the ‘sustainable university’ [4,9].

At the same time relatively little is known about *how* processes of organizational change towards SD take place [21,22]. Insights into the *how* of organizational change towards SD support the understanding on how to orchestrate, push, and/or support organizational change processes in universities. Furthermore, it supports the understanding on how, why, and when diverse internal and external factors influence these change processes towards SD. Understanding the *how* of organizational change means taking into account the deep structure and inter-personality of a university, its sub-systems, facilities, units, and departments, including their interdependencies in a systemic and dynamic understanding [23] as well as the universities’ cultural orientations [24].

This makes the process of transformation particularly complex, and those who have researched or engaged in sustainability initiatives or change processes often characterize these as long, progressive, and challenging, and characterized by resistance, barriers, and contradictions [11,25,26].

The subsequent aspects have been derived from the literature to enlighten the *how* of universities’ organizational change towards SD [8,9,21,22,26–28]:

- Structural transformation and entrance of SD into universities organizational structures;
- Decision making processes, leadership strategies, and strategic planning dynamics;
- Role of internal factors (e.g., institutional culture, strategic agency, relationships and power on campus);
- Role of external factors (e.g., funding/regulative bodies, networks, other higher education institutions);
- Focus on organizational learning, to explicitly investigate the process of change.

Apart from these content wise perspectives, there is a need to investigate organizational change from a systemic and dynamic perspective [23]. Thus far, only few scholars have looked at all fields of activity from an integrative perspective and on *how* questions of university change processes towards SD (e.g., [27,28]) besides more theoretical work to conceptualize organizational change (e.g., [21,29]). These seminal works enfold that there is no common path for universities towards SD, but different paths driven by diverging factors. Whereby some attention has been paid to internal and external drivers of change, there is yet a lack of (a) understanding how SD entered the respective universities and what are the influencing factors behind, (b) a detailed conceptualization of what is meant by organizational change in the context of universities (an exception states [28]), and (c) a dynamic perspective on organizational change.

The present paper aims to contribute to these research gaps by investigating the *how* question of organizational change processes towards sustainability by scrutinizing the organizational change process of 13 Austrian public universities since the 1990s. In doing so, we explicitly focus on processes of structural transformation and embedding. The authors take a dynamic perspective to address two research questions: (a) How have the 13 universities implemented SD into the universities’ organizational structures? (b) How have these changes been driven by internal and external factors? The paper is empirically based on in-depth interviews with selected stakeholders from each university as well as a complementary analysis of strategic papers, visions, and guidelines. We present long-term cross-organizational evidence from 13 universities in Austria and operationalize organizational change as the depth of integration as well as the type of structural embedding. We further enlighten the question

on internal and external factors spurring organizational change processes. In doing so, the valuable contribution of the present paper is to (a) clearly define and operationalize organizational change in the context of universities and sustainable development, (b) take a dynamic perspective which enlightens change processes over the last decades, and (c) present data from multiple case studies which offer potential for generalization.

Section 2 presents the main elements of the analytical framework. Section 3 focuses on the methodology and the research context. Section 4 presents the results structured along the analytical framework outlined in Section 2. Section 5 discusses the results in light of the current academic debate and leads to the conclusions in Section 6.

2. Analytical Framework

The process of embedding sustainability into universities is discussed as a multi-faceted process of organizational learning and change, which leads to a structural transformation towards sustainability and asks for a whole-institution approach [8,29,30]. To ensure consistency and credibility, this structural change must involve all the areas of a university including research, teaching and learning, societal engagement, campus estates, and operations [28,31]. Our analytic framework—in line with the two research questions of the paper—provides (a) an operationalization and definition of organizational change, taking into account the depth of integration and types of change and (b) a conceptualization of the internal and external factors for spurring these organizational change processes.

2.1. Organizational Changes—Depth of Integration and Types of Change

When talking about organizational change, we focus on structural change, i.e., change that is embedded in universities' practices and institutions. By doing so, we set aside projects or activities that are run by an individual or a very limited number of persons and have no major organizational impact after their end. According to Ferrer-Balas et al. [28], the question of how far reaching an organizational change is, can be seen as a question

- (a) of how many different persons (groups) carry or are involved in the change process and
- (b) if the change is an optimization, improvement, or a real renewal of the system and
- (c) if changes are only initiated or also mainstreamed within the organization.

We refer to these aspects as depth of integration and operationalize them as outlined in Table 1. The scales of the depth of organizational change thus reflect the number of persons or groups that are involved in the processes described and their distribution within the universities, but also signs of mainstreaming or system-improvement/renewal, such as e.g., university-wide integration, uptake in strategic papers, setting of new standards. Thus, changes by single actors that only affect a small group of persons are ranked lower than changes carried by a variety of actors in different entities of the university or even changes mainstreamed within universities and thus affecting all its members. Moreover, the size of the 'target groups' was taken into account, e.g., changes that affect all students were ranked higher than changes that affect only a particular group of students.

Table 1. Operationalization and definition of organizational change (own illustration).

Area of Activity	Depth of Integration	Type of Structural Embedding
Teaching	0 = no SD relevant classes, 1 = single SD related courses for students, 2 = SD relevant study programs, 3 = SD relevant programs plus obligatory SD relevant classes for several/all study programs	1. Institutional changes (change of values, norms, formal regulation, voluntary standards)
Research	0 = no SD-specific research activities 1 = single SD research activities 2 = various, but isolated activities 3 = broad integration and/or strategic focus on SD in research activities	2. Membership 3. New organizational units 4. Working groups
Operations	0 = no/hardly any activities 1 = single activities 2 = activities plus some kind of certification 3 = EMAS certification plus other activities	5. Project/temporary events (e.g., SD days)
Organizational culture	1 = low (1 of 4 types) 2 = middle (2–3 of 4 types) 3 = high (all 4 types) Types: (a) integration of SD into the scope of functions of the rectorate or strong support from university management, (b) integration of SD into strategic papers, (c) establishment of a SD board or center, (d) implementation of a broad, participatory SD process * Student activities as a specific form of cultural embedding are analyzed separately	
Societal engagement	0 = no focus on SD related societal engagement 1 = SD-service-learning projects in cooperation with government, public administration, schools 2 = specific SD-related activities such as SD day, SD report, SD public event series	

A further aspect which has to be considered under the frame of organizational change within universities is the type of structural embedding. In our work, we differentiate five sub-categories of structural embedding (adapted and extended from Pflitsch and Radinger-Peer [32]) that also relate to the question of how far reaching the change is:

1. Changes in the institutional framework, which reflect changes in rules, norms, and cognition related to SD, such as the implementation of a new formal regulation or the official announcement of new voluntary standards, which legitimize new social practices in favor of sustainability or delegitimize unsustainable behavior.
2. Memberships in a (new) organization mean the commitment and support of a network or organization and its goals. The membership in an organization does not necessarily mean structural changes within a university, but in its best sense can lead to learning processes initiated by this membership.
3. New organizations understood as establishment of new independent organizations, new study programs, or departments within a university. They are characterized by assigned responsibilities, competencies, and/or rule systems and have their own administration, technical, and/or financial resources. Thus, they are seen as relatively stable and deeply embedded in universities' structures.
4. Working groups, which are loosely coupled groups of independent actors with a common interest, usually have a non-hierarchical form and no own resources. They are thus more fluid than formal organizations, but can initiate learning processes, especially if their members come from different parts of the university who spread the ideas.

5. Projects are institutionalized temporary events, which follow a specific purpose over a limited time, but might lead to a new structure (organization/working group). Due to the large number of SD-related activities and actors, the study does not claim to give a comprehensive overview but focusses on those activities that were reported as having led to structural changes. Especially, it does not include single classes, single research projects, or other projects that were started and ended without a structural effect.

In order to understand how these changes are initiated, the likewise influence of internal as well as external factors has to be taken into account [27,29]. Among the university-internal factors, leadership [27,33] and champions as agents of change [28,34] are ranked first in various studies. Regarding external factors, the influence of funding and regulatory organizations but also inter-organizational networks for initiating organizational change of universities towards SD are pointed out.

2.2. Internal Factors—Institutional Agency and Leadership

Institutional agency defines an actor's ability to make an impact on the social order, changing the rules, relational ties, or allocation of capital within an organization. Such actors serve as agents of legitimacy who support the creation of new institutions and reform existing institutions in ways that they deem to be appropriate and aligned with their interests. So-called 'champions' and 'frontrunners' are deemed essential for any transition to sustainability [35]. They are often characterized by holding key positions at the university (e.g., rector, study program manager, head of institute) which allow them to take agency and precipitate organizational and institutional change within the university [32,36]). Commitment, leadership, and support by those 'higher-up' in universities are crucial to progress and embed sustainability [37] because it means that new structures, incentives, and funding are put in place [38]. The role of leadership is seen in guaranteeing the mainstreaming of SD-related organizational changes in contrast to mere 'cosmetic reforms' [27].

At the same time, literature on leadership argues that leadership is not just centralized but is also dispersed in the sense that leadership opportunities are available to any member of an organization, no matter what the rank [39]. Thus, leadership can come from any corner of an organization, from senior officials to students, from academia to administrative staff [22,40]. Thereby top-down and bottom-up activities interact with and reinforce each other [22]. Hoover and Harder [26] detect in their cross case synthesis that especially in sustainability initiatives 'pointing at power' is a frequent phenomenon, that means, people tend to perceive sustainability work as someone else's responsibility. "Opportunities for leadership and possibilities for change have more to do with how one sees oneself within an institution and in relation to others there than the position one holds" [25] (page 5). Therewith, the presence and the perception of power has an important role in constructing how change takes place, and who gets involved. For analyzing the university internal factors, each organizational change reported in the interviews is attributed to agency and/or leadership of one of four groups of actors in the analysis: academia, administration, management, or students, as shown in Table 1.

2.3. External Factors—The Universities' Environment

Modern universities may be referred to as open systems, where complex and dynamic reactions between the organization and its environment mediate through its structural operations [41]. For universities, the following elements are part of their environment: (a) government as funding/subsidizing organization, (b) other higher education institutions (and the cooperation or concurrence with them as well as a role model effect) [41,42], as well as inter-organizational networks.

Universities' activities are often driven by their sources of funding [28], therefore the government as the main funding organization but also the focus of third-party funds exerts influence on universities' organizational change processes, especially also with regard to SD.

Apart from dependence-relations, which exist between university and their funding organizations, relationships and networks are highlighted rather often in the literature as having an influence on

organizational change processes of the university towards SD [26]. Interpersonal relationships and networks both appear to have a strong influence on the nature and development of initiatives on campus [43]. Networks fulfil different functions: they transmit data, information, and knowledge, facilitate the coordination of decisions [44], they support innovation [45], and can contribute to meta-effects through steering and self-organizing processes [46]. Networks can furthermore enable individuals without specific interpersonal connections to get involved, and bridge boundaries within and between institutions. On the other hand, they also have the potential to exclude people or groups and therewith influence who has access to power in the change process [26]. Based on their international study, Ruiz-Mallen and Heras [47] point out that university networks influence the sustainability discourse as well as practice at universities. In our analysis of external factors, we focus on incentives or pressures from government/funding organizations on the one hand and other universities and networks.

The presented analytical framework comprising organizational changes as well as internal and external factors of change built the basis for the further analysis of the empirical findings.

3. Methods and the Research Context

The study follows a case study approach which is recommended if the research focusses on *why* and *how* questions, if the researcher has only little control over participants' behavior, if the focused phenomenon is relevant to present time and if there is only a poorly developed data basis available [48–50]. They provide answers to *how* and *why* questions by conducting a detailed contextual analysis of underlying conditions, behavior patterns of individuals, and their relationships [51]. As single-case studies are often criticized regarding their unique conditions surrounding the specific case, multiple case studies are considered to provide more compelling and more robust evidence and more substantial analytic results, particularly if they are based on the triangulation of evidence from different sources [48] (pp. 103–119). Therefore, we opted for a multiple case and mixed methods design combining the analysis of documents, transcripts of semi-structured interviews with feedback loops of interviewees, and additional key-informants.

The case study covers 13 of 22 Austrian public universities, all of them members of the Alliance of Sustainable Universities in Austria ('Alliance'). By February 2020, 16 universities are members of the Alliance. The case study covers 13 of the 14 universities that were members in 2018. The 14th university did not respond to our request for interview. The Alliance is an informal network of universities that was founded in the beginning of 2012 and aims at promoting sustainability issues in Austrian universities. The member universities cover a spectrum of different types of universities. Table 2 gives an overview and lists the short names used in the following text. BOKU university hosts a coordination position for the Alliance, which is held by the first author. The main body of exchange and collaboration is the so-called expert group, which consists of persons who are nominated by the rectorates and usually have a major role in SD activities in their universities. The lead for joint activities and working groups is distributed among the members.

All case universities are subject to the Austrian university law of 2002 and are publicly funded. A slightly modified legal situation applies to DUK as a university of continuing education with an additional legal basis, the state of Lower Austria as a co-owner, and fee-based study programs. Studying at all other Austrian public universities is largely free of charge and for most study programs without restrictions to admission. The budget for universities is negotiated with the Austrian Federal Ministry of Education, Science and Research (BWF) every three years and is based on the so-called performance agreements. Public funding covers on average across the 22 public universities about 74% of the total budget [52], the largest part of the rest comes from external project funds.

Table 2. Universities covered by the study, background of interview partners.

ID	English Name	Short Names	Characteristics	Alliance Member Since	Interview with Member of ¹
1	University of Klagenfurt	AAU	4 faculties: technical, economics, humanities, interdisciplinary faculty (IFF)	2012	academia
2	University of Natural Resources and Life Sciences	BOKU	life science university	2012	academia
3	Danube University Krems	DUK	university for continuing education	2017	management *
4	Johannes Kepler University Linz	JKU	4 faculties: engineering & natural sci., business & social, law, medicine	2018	academia (2 IP)
5	University of Graz	KFU	full university	2012	management
6	University of Music and Performing Arts Graz	KUG	art university	2012	management
7	University of Music and Performing Arts Vienna	MDW	art university	2017	non-scientific
8	Mozarteum University	MOZ	art university	2018	management
9	Montanuniversität Leoben	MUL	university of mining	2018	management *
10	University of Salzburg	PLUS	4 faculties: catholic theology, cultural/social, natural sciences, law	2012	academia
11	Graz University of Technology	TUG	technical university	2012	academia (2 IP)
12	University of Innsbruck	UIBK	full university	2012	academia
13	Vienna University of economics and business	WU	economics	2012	academia ²

¹ Academia = scientific staff; management = (vice-) rectors and staff in university management; non-scientific = persons working within administration or other non-scientific position; all interview partners except those marked with * are member of the Alliance's expert group; (2 IP) = interview with 2 persons in parallel; ² the interview partner has in the meantime left WU.

Guided interviews with at least one representative of each of the above-mentioned universities were held between March and September 2018, with a duration of 50 to 90 min each. The interview partners were mainly members of the Alliance's expert group and were thus supposed to have a good overview over SD activities as well as the SD history of their university.

The interviews were led by the first author, partly together with the second author. The former, as coordinator of the Alliance, has good insights into the activities of each university and good relations to most of the interview partners, thus the interviews could build on a certain basis of trust and mutual knowledge and understanding. The interviews focused on the process of each university (and not the Alliance), which allowed the interviewer to remain in a neutral position, as she was not involved in these internal processes. BOKU university is an exception, as all three authors are affiliated there and are to different extents also involved in SD activities. Nevertheless, it is not possible to rule out the possibility that Alliance-related activities were mentioned to a higher extent as they represented the common point of reference for both the interviewer and the interviewees.

The interviews focused on the causes, processes, and main actors behind SD at the university and the question of how it was (historically) integrated at the university.

The interviews were recorded, transcribed, and analyzed with Atlas.ti, as shown in Figure 1) (data analysis). The aim of the qualitative content analysis [53] was to extract organizational changes along the categories operationalized in the analytic framework, as shown in Table 1, and list them according to the

- Area of activity;

- Year of implementation;
- Actors driving these changes.

As the background and institutional position of the interviewees differed, a certain bias regarding the change process reported cannot be precluded. Validation of preliminary results was sought by (a) presenting and discussing them in one of the Alliance’s expert group meetings; (b) sending them for comments to the interview partners; (c) sending them to the student unions of each university. Moreover, the results were triangulated with information from documents and online resources. The last step of data analysis included the attribution of each change to one of the areas of activity, the year of implementation, and the persons or groups that were involved.

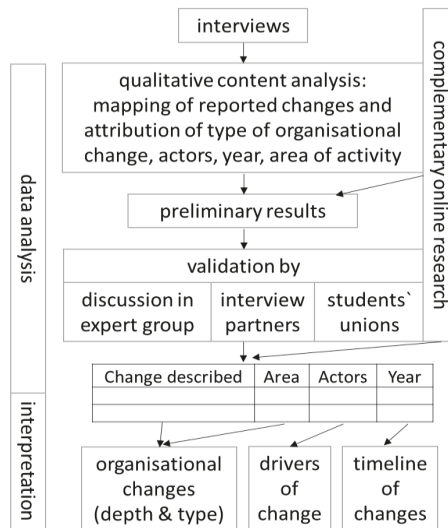


Figure 1. Process of data collection, analysis, and interpretation.

The interpretation of the empirical findings focused on comparatively analyzing the depth of integration and the type of structural embedding according to the analytic framework, as shown in Table 1. Addressing the second research question on factors of change, each organizational change reported in the interviews was attributed to agency and/or leadership of one of four university-internal groups of actors (academia, administration, management, students) and the timeline of changes is interpreted against events in the organizational field (external factors), as shown in Table 1.

4. Results

The first part of the results, Section 4.1, presents results on the how questions, i.e., we present evidence showing that all 13 universities embedded sustainability in research, teaching, operations, organizational culture, and/or societal engagement, and we interpret these changes in regard to their depth (Section 4.1.1), as well as in regard to types and structural effects of these changes (Section 4.1.2). The second part (Section 4.2) analyzes the second research question on internal and external factors. Moreover, the timeline of changes is interpreted along the appearance of influencing factors.

4.1. Organizational Changes in the Case Study Universities

The results show that universities made changes towards SD in at least three out of five areas of activities, thus SD is embedded in the whole institution. Nevertheless, changes vary in regard to the question of how deep these changes are structurally embedded. About half of the universities

show deep or quite deep integration in all areas (AAU, BOKU, KFU, WU, PLUS, TUG, UIBK – short names according to Table 2), i.e., changes that are built on a broad basis of involved or affected persons. Others show lower levels of integration, often combined with one or two areas of activities with no integration—usually universities that only recently became members of the Alliance or also art universities. Furthermore, in regard to types of change, i.e., changes in the institutional framework, memberships, new organizations, working groups or projects, it can be observed that most of them play a role in the universities, but their relevance in regard to structural embedding varies.

4.1.1. Depth of Integration

The analysis addressed the question on how and how deeply the 13 universities have organizationally embedded SD into their five areas of activity, i.e., research, teaching, operations, and also activities in regard to organizational culture and societal engagement. Many case universities embed SD in most of these areas and therewith follow integral approaches. Nevertheless, these organizational changes differ in regard to the depth of structural embedding. Aggregated results according the 0–3 scale of the analytical framework, as shown in Table 1, are shown in Table 3. In the following, we argue the results by giving evidence on integration within the 13 universities.

Table 3. Embedding of sustainable development (SD) in different areas of activity of the case universities. The numbers represent the depth of integration—for details see Table 1.

ID	University	Teaching	Research	Operations	Organizational Culture ¹	Societal Engagement
1	AAU	2	3	3	2 + s	1
2	BOKU	3 *	3	3	3 + s	2
3	DUK	2	2	0	2	1
4	JKU	2	3	0	1	0
5	KFU	2	3	3	2 + s	2
6	KUG	1	1	2	2	0
7	MDW	0	1	2	2	0
8	MOZ	0	1	1	2	0
9	MUL	2	2	0	2	0
10	PLUS	1	2	3	2 + s	1
11	TUG	1	2	2	2 + s	2
12	UIBK	2	2	1	2 + s	1
13	WU	3	2	3	3	2

* BOKU moreover has an ESD working group, ¹ 's' means additional student activities.

The results in the area of teaching show that only two universities (BOKU, WU) deeply integrated changes towards SD in their teaching area, whereas other universities show only limited changes in this field.

By deep integration, we mean e.g., that WU established a SD class which is obligatory for (almost) all students in their first years ('Sustainable Economics'). Thus, students are at least confronted once in their studies with SD. Or BOKU, that has SD inputs in obligatory introductory classes for three study programs and established a working group on Education for Sustainable Development (ESD) in order to promote sustainability issues in teaching. Therewith, these two universities have undergone the deepest structural change, although the depicted changes are to a large extent on a project or working group level only and therefore can be considered as improvement of the current system rather than a renewal. Although a single course during a study program cannot come up to profound education for sustainable development (ESD), it can be considered as an important step in addressing

all students regardless of their program. Both universities also offer SD study programs (e.g., WU on Socio-Ecological Economics and Policy, BOKU on Environment and Bio-Resources Management), as well as single SD-relevant learning opportunities for students. Less deep forms of change are voluntary extension curricula on sustainability or student-organized classes for students of all study programs (e.g., AAU) or study programs for a limited number of students. The latter can be differentiated in study programs with a system approach on SD (AAU, KFU, and UIBK) and more focused study programs with an SD relation (DUK on sustainable buildings, JKU and MUL on energy). As these changes affect only a small part of the students, they are assigned a lower depth of organizational integration.

Changes in the area of research (such as the establishment of SD-relevant institutes, departments, or professorial chairs, internal sustainability research networks, research activities related to SD) exist in all research-oriented universities but they remain isolated in most universities, i.e., they are based on the commitment of few actors and have no specific support from university management. Art universities form an exception, as they participate in the UniNETZ project (see below), but have no further research activities in regard to SD. Only four universities (BOKU, KFU, AAU, JKU) have a broader and more strategic SD focus in this area of activity. They name sustainability as one of their research priorities in their strategic papers—reflected by a higher rating in regard to the depth of integration. At BOKU, KFU, and AAU this strategic focus is moreover reflected in internal networks and cross-sectoral organizational entities covering various disciplines and approaches, which might be seen as another sign of relatively deep integration, but a fundamental change in structures and cultures still has to be proven.

One research activity that unites all except one university is the participation in the UniNETZ project [54], a joint project of the Alliance universities, which officially started in 2019, but intensive preparatory work dates back to 2017. All case study universities except WU participate in this project. The project's aim is to elaborate an option report which supports the Austrian government to implement and reach the sustainable development goals. Although started as an informal activity of some Alliance universities, it quickly gained momentum and (a) led to the integration of 16 universities and more than 200 researchers, (b) achieved the embedding of SD into the performance agreements of all participating universities with the ministry, and (c) encouraged many universities to join the Alliance. The global initiative of the Sustainable Development Goals (SDGs) and the corresponding UniNETZ project led to changes in the universities' environment. At the same time, it also has the potential to lead to system renewal as the project follows a fundamental shift towards "research guided to the 2030 Agenda" [55] (p. 113) and includes a great number of researchers who have the potential to spread this shift in their universities.

Changes in 'operations' refer to activities with regard to operational management, such as procurement, mobility, organization of meetings, etc. Changes in operations are not necessarily linked to teaching and research but are often seen as important in order to achieve consistency between universities' fields of action. In regard to the depth of integration, the existence of some kind of certification was considered as an important indicator. This contributes to a deeper structural effect as it is based on official standards and monitoring and thus affects the university's everyday life and therewith all university members. If taken seriously, implementing such schemes requires revision and redesign of routines, leading to substantial change towards SD. Moreover, it was found that changes in this area can either be the entrance point for a wider orientation towards sustainability (e.g., KUG and MDW) or are the logical consequence of changes in other areas, like research or teaching. The latter holds true for five universities that reported no or very little focus on sustainable operations before their membership in the Alliance but are strengthening such initiatives in the meantime.

In detail, five universities (AAU, BOKU, KFU, PLUS, and WU) undergo external certification of activities in this field according to the European Eco-Management and Audit Scheme (EMAS). Although usually focusing on operational issues, e.g., AAU and KFU also report on their SD research and teaching activities within EMAS, which gives the certification an even wider scope. EMAS and its international counterpart ISO 14001 are interpreted as the deepest form of integration as they require

reporting on and improvements in a wide range of topics covering energy, material resources, etc. Other universities follow more regional schemes like Ökoprofit (KUG) or the Viennese Eco-Business Plan (MDW), or schemes on a specific topic (e.g., TUG with ISO 50001 on energy management).

Changes within ‘organizational culture’ were categorized in four types, as shown in Table 1. As it is difficult to rank these different types of changes, the 4-degree scale reflects the assumption that the depth of integration depends on the amount of cultural changes. The more forms were observed in a university, the higher the depth of integration as well as the effect on university members. Again, BOKU and WU show the deepest integration of SD in their organizational culture as they implemented all types of organizational change in this area. Most other universities show at least two different types of changes and were ranked in the middle scale. Students’ initiatives were analyzed separately, as they are often limited in time and it is difficult to say whether they have a long-lasting effect, although they definitely have a huge potential for inducing change. At about half of the universities, SD-related student initiatives were established.

In particular, one change that applies to almost all universities is the integration of SD into the scope of functions of the rectorate or strong support from university management (type a). This underlines the finding that support from actors of the university management is important at some point of the process (see below, Section 4.2.1). By integration of SD in strategic papers (type b), we mean e.g., the formulation of SD research priorities or stressing SD in the development plan (e.g., AAU, DUK, JKU, KFU, MDW). Type c covers the establishment of SD centers (i.e., new organizations with financial and personnel resources, with the explicit task to strengthen SD in the university, applicable for BOKU and WU) or SD boards (i.e., persons from different university entities are assigned to these boards, but no special financial and personnel resources, applicable for KFU, MOZ, PLUS, TUG). The latter is a more decentralized form of organizational change in this field. BOKU and WU also initiated a broad participatory SD process (type d), which was as well interpreted as a change of the organizational culture, as these lead to a stronger perception and acceptance of SD in the whole university. At JKU, it is mainly the research strategy with SD as one of three research priorities that gives a hint to a change in the organizational culture.

The area of ‘societal engagement’ includes changes that promote the interaction with society in regard to SD. Within the expert interviews, this area of activity was reported only fragmentary and these activities are difficult to research online, as societal engagement often is a side-product of other activities and thus difficult to differentiate from societal engagement without relation to SD. Therefore, the results in this area are least comprehensive and a simple scale to capture the depth of integration was applied.

Based on this limited information, four universities were ranked relatively high (‘2’) as they have specific SD-related communication formats that address a larger target group—mainly annual SD days, where students, staff, and the public are invited to learn about and celebrate SD at the universities; but also SD reporting and several public SD events were reported. Another four universities were ranked with ‘1’, as they gave accounts of projects that are conducted by single research groups with a limited range within the universities, e.g., SD service projects, i.e., projects in cooperation with the government, public administration (ministry, country administration), or schools with a strong service component for these partners. Moreover, DUK was subsumed in this category where societal engagement is a central element of their work as their students usually are in employment and directly apply their knowledge at work—but a specific SD focus is missing.

4.1.2. Types and Structural Effects of Changes

Five types of change were differentiated in the analysis (see conceptual framework) to better understand the how-question of organizational change towards sustainability. In the following, we present examples for each of these types and draw conclusions on their relevance in regard to structural embedding of SD.

Changes in the institutional framework, such as the integration of sustainability in strategic papers, can be observed in all universities. They are either implemented top-down from the university management, or they are a consequence of bottom-up engagement. Especially if implemented top-down, they might, but do not necessarily lead to changes in real-life [56]. This can, for example, be observed in the case of DUK, where SD is a focus of strategic papers, but a broad integration into the university's structures and university-members' activities is still missing. Nevertheless, these changes in the institutional framework can be the starting point for further changes and are important steps towards deep and lasting institutionalization of bottom-up initiatives.

Like changes in the institutional framework, memberships in organizations do not necessarily result in real-life changes, but in some cases they did. Especially the membership in the Alliance of Sustainable Universities and the participation in its UniNETZ project often were reported as a starting point for further organizational changes. Besides the Alliance membership, the Graz-wide network 'Sustainability4U' and the Climate Change Centre Austria (CCCA) play important roles. The latter is a research network that promotes climate research and climate impact research and fosters collaboration in and among these fields, as well as provides society and policymakers with scientifically sound information and advice on climate-relevant topics. Furthermore, the universities take part in more specific networks like the 'Responsible Science initiative' or the 'Principles for Responsible Management Education' network. As SD-relevant memberships were not systematically researched, the list is not comprehensive and only relies on these memberships reported by interviewees during the interview.

The foundation of new organizations usually is reflected in formal documents, i.e., the institutional framework. Moreover, they are mostly equipped with financial and/or personnel resources. New organizations comprise the foundation of research institutes or departments, study programs, EMAS, but also students' organizations. All universities, except two art universities, have founded some kind of new organization. TU Graz has founded a new SD organization recently. In two cases, special organizational SD entities at the university, i.e., SD competence centers, were founded to deal with SD at and beyond the university. Such competence centers play a specific role in embedding SD in universities. The two competence centers of the case study (BOKU and WU) started broad sustainability processes and took a leading and coordinating role. Therefore, they are perceived as role models by other universities.

Despite the fact, that organizations are usually equipped with financial and personnel resources and are usually reflected in the institutional framework, changes in strategic orientations of the university management can also destabilize such structures. In one case (AAU) institutes of an interdisciplinary, SD-oriented faculty were transferred to other universities following a decision from the rectorate. Due to the same reason, AAU left the Climate Change Centre Austria. Furthermore, due to changes in strategic decisions of the rectorate, the competence center for sustainability at WU shifted the focus of the center to sustainability-related research.

In contrast to new organizations, working groups and/or projects, as more short-term and informal forms of SD integration, can also be found at all universities. Interestingly, there are no SD-related working groups at those three universities (DUK, JKU, MUL) that only recently started with their SD activities and where this process was initiated rather top-down.

4.2. Internal and External Factors of Organizational Change

In order to answer the second research question on internal and external factors, (1) each organizational change was attributed to agency and/or leadership of one of four groups of actors in the analysis: academia, administration, management, and students, and (2) the timeline of changes is interpreted against changes in the organizational environment and the therewith presumed influences. Here, we show that academics working in the broader field of sustainability studies often were agents of change, who skillfully initiated and drove organizational changes. They mainly acted proactively without formal mandate, but out of personal interest and conviction. Furthermore, a timeline analysis (in Section 4.2.2) illustrates peaks of sustainability-related changes in the years of the foundation of

inter-university networks, which acted as alliances of change, and ministry intervention, which helped to bring sustainability on the agenda of those universities with less change agency.

4.2.1. Internal Factors—Agency and Leadership by Various Actor Groups

The results show that all four actor groups play a decisive role for organizational change processes at universities, although their power and agency differ. The most prominent group in all but art universities is academic actors—numerous individual, fragmented activities from scientists in the area of environmental science and sustainability in teaching and research date back to the early 1990s and form the nucleus for later changes. The key academic institutional actors are professors, department heads, or study program managers who work in disciplines that have a proximity to SD (e.g., geography, meteorology, biology, system science) and seem to have the necessary agency and leadership abilities to initiate the alignment towards sustainability via the foundation of new institutes (e.g., AAU, JKU, UIBK), the foundation of competence centers (BOKU, WU), as well as new study programs or new specialization areas (KFU, TUG, UIBK). Based on the empirical material, the motivation of these academic actors seems to be a mixture of personal motivation and conviction, as well as their understanding of their position and power.

Nevertheless, at some point bottom-up initiatives from researchers need the support from management. At two universities (BOKU, WU), the interplay and reinforcing of academia and management was key to the initiation of comprehensive organizational change processes. Highly motivated and engaged academics, as well as a rectorate that fully supported these initiatives via new structures and additional funding, characterize these processes. Although the management's commitment and support are needed in order to successfully embed SD structures in universities, it shows that only few changes can directly be attributed to this actor group (KUG, MOZ, DUK).

The art universities show a different pattern. There, actors from management and administration have taken the lead. As there are no faculty members with a disciplinary proximity to SD at art universities, members of administration who have a strong personal connection to SD issues either take the lead and motivate the management (MDW) or they closely collaborate with—also personally motivated—members of the management.

Differences can also be detected in regard to students as a further internal actor group. At BOKU, KFU, AAU, and UIBK, they form a kind of sparring partner for institutional change agents from academia, by mutually supporting activities and by collaborating for change. On the contrary, art universities, the DUK as a continuing education university, as well as MUL and JKU, do not show strong student engagement—which might be due to a tighter timeframe of studying and/or less affinity to the topic. The lack of student support reported for MUL and JKU might be a bias from interviewees selected from faculty and management. However, students' unions were also asked for feedback to the results and only took the opportunity in a few cases (AAU, KFU, TUG, UIBK)—which might be another indicator for less engagement.

4.2.2. External Driving Factors and Their Influence on the Timeline of Changes

The analysis of the coincidence of organization change and external factors shows interesting patterns when looking at the timeline of changes, as shown in Figure 2. Changes were only singular and few until the mid-2000s. Then, a steady increase of changes can be observed until 2011, when a first peak of activities can be detected for a period of 2 years (2011–2012). This peak of changes is due to activities of seven of the universities and correlates with the foundation of the Climate Change Centre Austria (CCCA) in 2011 and the foundation of the Alliance of Sustainable Universities in Austria in the beginning of 2012—going hand-in-hand with the raising importance of SD topics in the context of universities. Especially, the Alliance was often reported as a driver of change. One of the main purposes of this network is to exchange good and best practice experiences and to support SD-related changes in its member universities.

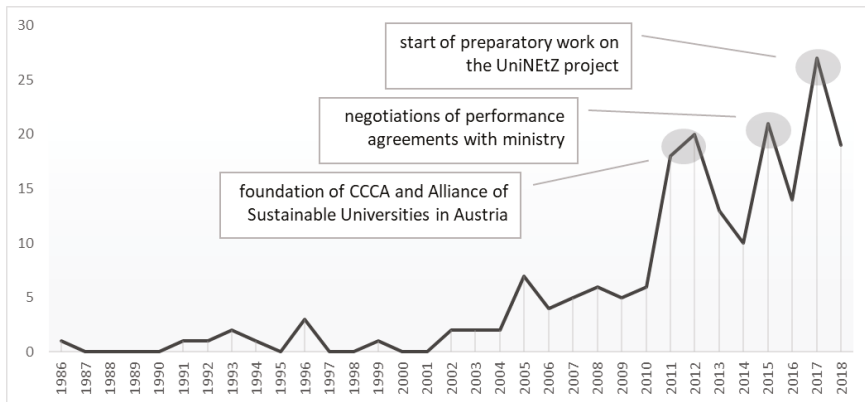


Figure 2. Number of reported changes per year excluding memberships in Alliance and Climate Change Centre Austria (CCCA), and contributions to UniNetZ; total for all case universities.

A second peak of organizational changes towards SD in the investigated universities occurs in 2015. It correlates with the timeframe for the negotiations of the performance agreements with the ministry. The therewith template prepared by the ministry included a new aspect of the universities' contributions towards SD. Although the ministry cannot directly impose SD on a university, it can stress the topic's importance by including it in the reporting forms that universities use. This happened in 2015, and although not explicitly mentioned in the interviews, the increasing number of changes from 2015 on might be attributed to this.

A further external driver for changes was the Agenda 2030, published and agreed on by all UN member states in 2015. By signing the Agenda, Austria obliged itself to accomplish the Sustainable Development Goals and called on its institutions to support this endeavor. The call was taken up by scientists from the Alliance. They started the UniNetZ project, which again boosted many SD-relevant changes at the universities and led to the accession of four further universities to the Alliance.

5. Discussion

Based on the detected research gaps, the present paper aims to investigate how universities implemented organizational change towards sustainability and how these organizational changes have been driven by external and internal factors. The scientific insights gained are compared with the scientific state-of-the-art in this section.

The results show that all 13 analyzed universities have implemented SD in most or even all areas of activities, i.e., research, teaching, operations, organizational culture, and societal engagement, and thus come up to the call for an integrative approach (e.g., [21,27,28,31]), although the depth of integration varies. While Lozano [57] stated in 2015 that "in general, the implementation of SD in HEIs [Higher Education Institutions] has been compartmentalized and not holistically integrated throughout the institutions" (p. 14), most of the analyzed universities follow an integrative approach. Some of the reported changes only affect small aspects of a university, but the fact that the universities show efforts in most areas of activity indicate that the ideas are integrated holistically. Moreover, the depth of integration was taken into account—operationalized by the number of persons involved, signs of mainstreaming, or system renewal—building on Ferrer-Balas [28]. Some universities show deep changes in all areas of activity, such as AAU, BOKU, KFU, UIBK, and WU. Those universities that show lower levels of intensity and a stronger focus on single areas are, on the one hand, art universities that lack research with a proximity to the topic, or on the other hand, universities that have started the process recently and rather top-down from the university management. Nevertheless, all universities show structural embedding in at least three of the five analyzed areas of activity.

The driving forces behind these changes can be observed in many internal and external factors. Our study reveals academic staff as a major driver for change in about half of the cases—single actors who initiated changes based on their personal motivation and engagement. This adds an important aspect to Barth [27], who differentiated between student-, operations-, and unique selling-point-driven implementation processes of SD and saw the role of academic staff rather as transmitters than as factors of change. Through the intrinsic personal motivation of single researchers, in combination with their position and decision-making power, processes of structural embedding were initiated—not only in the area of research. Thus, they acted as institutional change agents [36] who make the university management support their endeavors and not vice versa [26,32]. In many cases, a certain awareness for environmental and sustainability issues was already established, though fragmented, which formed the seedbed for organizational change (foundation of new institutes, centers, new university courses or study programs).

Nevertheless, it needs a good interplay between bottom-up engagement and the university management—at least at some point of the process. Ideally, the management’s endeavors are backed and supported by incentives from funding organizations. On the downside, missing or withdrawn support can end changes quickly. In this sense, our results support the findings of Heck [40] and Lozano [11] that a strong interplay of bottom-up engagement with top-down support leads to a broad embedding in various areas of activity of the university. Within all universities the university management and rectorate played a decisive role to bring SD on the agenda at some point of the process. We interpret these developments in the Austrian case as consequences of the organizations’ environmental influence—in 2015 the ministry included SD into the template of the performance agreement and from 2017 reinforced its intention to extend universities’ participation in the Alliance and the UniNEtZ project. This gentle pressure changed the regulative framework and induced organizational change processes in the mentioned cases. The support of the rectorate/leadership is essential to ensure continued existence of new organizational structures. Several times new developments (towards or away from) SD go hand in hand with changes of leadership on the top-management level. On the contrary, the loss of leadership support or changing strategic orientation in the university management also led to a weakening of established structures (see the example of the AAU SD faculty).

Students have a very specific role in SD processes [22,58]. First, they as a main ‘target/stakeholder group’ of universities have the legitimacy to call for changes towards sustainability. It is their generation that will be affected most by an un-sustainable development, which adds another form of legitimacy and an intrinsic motivation to call for changes. Nevertheless, not all students seem to have a personal motivation and interest in the topic, which seems also to depend on the study program in which they are enrolled. Second, they are very fluent groups as they usually only stay for a couple of years, which makes it difficult to provide continuity to their actions. Third, they are “easy to motivate, but difficult to organize” [58] (page 112), as their calendars and time management differs from university staff. These differences can also be seen in the results—universities with study programs related to SD tend to have more active students. In the case of PLUS, it was even them who initiated changes by proposing them to the rectorate—but then the group of students dispersed quickly.

Usually, universities started their process from one area of activity—with a further diffusion to other areas. Although it is difficult to attribute these broadening patterns simply to the membership in the Alliance, the exchange between actors from different universities, continuous confrontation with new ideas, and a certain normative pressure from within the network seem to have supported these developments. Those universities that started from engagement in operations, show similar patterns as observed by Barth [27], by focusing on changing daily routines. The initial factor varies, from single actors with or without a leading position to isomorphism [59], trying to copy a path that was taken by similar universities before. The latter holds true for art universities. Nevertheless, these universities broadened their activities incrementally (broader embedding of SD in strategic papers or in research activities, etc.). Universities starting from research activities also show a pattern towards broadening,

as they usually started with single actors, lectures, research topics, and later started with activities in operations, teaching, etc.

Apart from institutional agents and leadership, we further detect the following influencing factors in the universities' environment, which initiated structural changes towards SD: networks and alliances, and the ministry (regulative environment). The reported and observed effects (increase in changes towards SD) support the assumption that the Alliance and similar networks strengthen institutional change agents by making SD a relevant topic at the university and by enabling the learning from others of how to initiate, accelerate, and mainstream change. These findings are in line with Ruiz-Mallen and Heras [47] who emphasize that these type of (university) networks influence the sustainability discourse as well as practice at universities. Accordingly, our results reveal a correlation between the foundation of the Alliance, the CCCA, and the start of the UniNetZ project and the number of SD-related changes at the member universities (see also Section 4.2.2). The functions of networks in transmitting information, knowledge, support of innovation, and steering processes described in the literature [44–46] is in accordance with the observed reasons for universities to join the Alliance—interest to support this topic combined with a search for support and guidance. For some universities, the membership in the Alliance stood in the beginning of their endeavors (like the participation in the UniNetZ project), for other universities it was a logical consequence of already ongoing SD activities—but still seeking to increase effectiveness through networking.

The UniNetZ project functioned as another re-enforcing mechanism. Initiated by the Alliance, it soon gained strong support from the ministry, which then called on other universities to join the project before and during negotiations of the performance agreements. The participation in the project made many universities also join the Alliance.

While the network of the Alliance exerts mimetic and normative influence [59] on universities, the Austrian Federal Ministry of Education, Science and Research exerts coercive power via the performance agreements, which are the basis for the negotiations between the university and the ministry. Other influencing factors with a normative effect are international/global developments such as Agenda 2030. Via this international discourse, the topic of SD got extra attention and momentum.

Before summarizing the general implications of our research, the following limitations have to be taken into account. The study focuses on public universities in Austria, as the Alliance network until now is limited to this type of higher education institution. Furthermore, the background and institutional position of the interviewees differed, therewith a certain bias regarding the change process reported cannot be precluded. Although our investigations have a dynamic perspective, even more in-depth interviews with actors from various backgrounds, inside and outside the university would be necessary to explore the processes of change in detail at each university.

Nevertheless, the following findings can be generalized to other (semi-)autonomous public universities. First, organizational change processes towards SD in universities are complex and characterized by numerous parallel developments, a diverse range of actors involved, and are influenced differently by internal and external factors. It became also evident that various development paths can be taken leading to organizational transformations towards SD. Second, the important role of individual (often, but not only academic) actors, which due to their motivation and position, enact change towards SD has to be pointed out. If single actors or single actor groups manage to act skillfully within the opportunities given by networks, university management, and, ideally, funding organizations, they can exert a huge changing power. Third, the university management and rectorate have an important enabling role, providing windows of opportunity, funding, or other types of support (e.g., foundation of new organizational units, personnel, or financial resources, incorporation into university strategies). The universities with the most comprehensive and advanced organizational transformations towards SD are those where a fruitful interplay between the rectorate and the individual (academic) actor has taken place. Fourth, the role of inter-university networks is crucial to start the dialogue on certain (SD) topics, to provide room for discussion, as well as joint-action. These SD-focused networks initiate mimetic and normative influence and state important

platforms for change agents. We hope that our findings inspire more scientific investigations on whole-institution organizational change processes towards SD, especially focusing on other national and international settings. While we operationalized organizational change as depth of integration and type of structural embedding, further research could pay more attention to how these changes are legitimized and institutionalized. Moreover, experiences from other countries and also diverse higher education institutions could further enrich the current academic discourse.

6. Conclusions

The comparative analysis illustrates thirteen Austrian universities' organizational change processes towards sustainability in the areas of teaching, research, operations, organizational culture, and societal engagement. Academics working in the broader field of sustainable studies were change agents, who skillfully and proactively initiated and drove organizational change. A timeline analysis illustrates peaks of sustainability-related changes related to the years of the foundation of three inter-university networks. These alliances of change, in a fruitful interplay with academic change agents, have further pushed organizational change towards sustainability. Management and rectorates, as well as ministry, played an important role in bringing sustainability on the agenda of those universities following later. In a nutshell, the thirteen universities have implemented organizational change towards sustainability by an interplay of intra-university change agency and inter-university change alliances, complemented by more coercive management and ministry interventions pushing sustainability transformations in the group of late followers.

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Article

Cross-Sector Collaboration in Higher Education Institutions (HEIs): A Critical Analysis of an Urban Sustainability Development Program

Sebastian Mehling and Nina Kolleck *

Department of Education and Psychology, Freie Universität Berlin, 14195 Berlin, Germany; sebastian.mehling@gmx.de

* Correspondence: n.kolleck@fu-berlin.de

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Abstract: In the last years, a shift in the promotion of sustainable development in Higher Education from a focus on universities' core areas of teaching and research to "whole institution approaches" with an emphasis on the operational management of Higher Education Institutions (HEIs) can be observed in different countries. With the aim to foster sustainability, HEIs have increasingly built cross-sectoral networks, involving not only academics but also practitioners in order to relate sustainability not only to research but also to outreach activities. Although there is an increasing body of literature evaluating such initiatives according to supposedly objective management criteria and indicators, there is still a lack of studies that investigate how the social meaning of knowledge production is (re-)negotiated in and through these partnerships. In this article, we analyze how individuals engaged in a cross-sector partnership make sense of the organizational dilemmas and ambiguities that stem from the complexity of working together across sectors in pursuit of an integrative approach to knowledge production. With the term "sector" we refer to the professional affiliations of the individuals involved in the partnerships, e.g., higher education, administration, formal education or non-governmental organizations. We focus on an illustrative cross-sectoral partnership: The Institute for Sustainable Urban Development (ISU), a collaborative project between Malmö University and Malmö's city administration to facilitate research and planning collaborations between both organizations in respect to furthering sustainable urban (re-)development and higher education in Malmö, Sweden. By employing a constant comparative approach based on Grounded Theory to analyze data collected with focus groups, semi-structured qualitative interviews and document analysis, we claim that rather than entering a partnership with predefined identities, values and sectoral or professional preferences, individuals engage in a narrative struggle about the organizational character of their partnership. Accordingly, an important avenue for investigating cross-sector partnerships is to explore the constructive dilemma of different organizing principles in a cross-sector partnership, and the way people negotiate the boundaries between them. For the cross-sector partnership studied the constructive dilemma for those engaging in it was to separate and link project, organizational and network organizing principles in their work. Implementing whole institutions approaches in order to promote sustainable development in and through HEIs, would accordingly profit much from a deeper analytical investigation of the process of navigating professional identities and organizational narrative(s) in boundary-spanning, cross-sector partnerships.

Keywords: higher education institutions (HEIs); cross-sector collaboration; multi-professional collaboration; transdisciplinary research; narrative analysis; sensemaking; whole institution approach; organizational networks; constant comparative analysis

1. Introduction

Cross-sector partnerships of Higher Education Institutions (HEIs) are in high demand. They promise to produce more excellent and relevant scientific knowledge (e.g., [1], (p. 11); [2], (p. 12)), higher rates and quality of technological innovation in service provision and product development (e.g., [3–7]), more efficient use of resources through collaboration (e.g., [8–11]) and the implementation and diffusion of innovations in Higher Education such as Education for Sustainable Development (ESD) (Authors), to name just a few of the anticipated benefits. Cross-sector partnerships are based on a whole institution approach, which considers that universities operate within complex environments and that all parts of this environment need to be considered when implementing sustainability strategies [12]. Hence, when realizing cross-sector partnerships or collaboration initiatives related to sustainability issues, a great variety of actors need to be involved.

While, however, an increasing body of literature evaluates such partnerships according to supposedly objective management criteria and indicators (e.g., [13,14]), there is still a lack of studies that investigate how the social value or meaning of organizing research and education is (re-)negotiated by people engaging in these partnerships. In this article, we seek to address this gap of research by searching for answers to the question: How do individuals engaged in a cross-sector partnership make sense of the organizational dilemmas and ambiguities that stem from the complexity of working together across sectors in pursuit of an integrative approach to knowledge production?

We do so by collecting data through semi-structured qualitative interviews, focus groups as well as documents (i.e., program documents, partner program documents and literature about the immediate context of the cross-sector partnership) and applying an analytical perspective adapted from sensemaking studies into organization. Techniques of open coding and focused coding following Grounded Theory (GT) are used to analyze the data. With GT we apply a qualitative methodological technique which aims at developing theoretical approaches through analyzing qualitative data. The data analysis is conducted in different coding steps and results in the identification of overall theoretical dimensions.

We define cross-sector partnerships as initiatives that aim at improving knowledge production through the facilitation of exchange relationships and processes between actors associated with different sectors. In doing so, we focus specifically on a cross-sector partnership which involves higher education actors and which follows the overall aim to foster sustainability in higher education and urban development in Malmö, in Sweden. Hence, this study is also important for research in the field of Education for Sustainable Development (ESD). In the last years, ESD has become an important field for HEIs, not least because it plays a fundamental role in achieving the 2030 Development Agenda and related Sustainable Development Goals (SDGs), but also because the concept promises an integration of sustainability into teaching and learning in educational institutions and curricula with the overall aim to empower people to “foresee, face up to and solve the problems that threaten life on our planet” (Authors). As an interdisciplinary approach, ESD supports the skills and knowledge to contribute to sustainable and ethically responsible society. Implementing ESD in HEIs involves pursuing a whole institutions approach which promotes interdisciplinary knowledge and the development of knowledge of local issues and its interrelatedness with global issues. However, our research shows that implementing sustainable development in HEIs not only requires a whole institutions approach, but that such an approach itself should more specifically focus on exploring the dynamic process of negotiating professional and organizational identities within boundary-spanning, cross-sector partnerships.

2. Background: Cross-Sector Partnerships at the Heart of Normative Debates about University Reform in the Context of Education for Sustainable Development

Today, big data, digitalization, climate change, socio-economic globalization and the fragmentation of public spheres have challenged the university’s central position in research and (higher) education and its privileged position as an autonomous “republic of science” [15]. Universities are facing

institutional change and instability, which have forced them to re-examine their identity, rules and norms [16] (p. 7). Universities must defend themselves within public debates about their role in society, how they are to be justified and made accountable, how they are legitimized as sustainable actors in society and what kind of relationship they should have with other types of institutions [16]. Cross-sector partnerships are an important arena for these debates about sense and purpose of the university as a central institution for knowledge production in late-modern societies. This is because what emerges in the discourse of cross-sector partnership or collaboration proponents is often an argument about universities needing to engage in cross-sector partnerships with other societal actors in order to become socially, politically and economically more relevant cf. [17,18]. From this perspective, cross-sector partnerships are considered as a new modus of organizing knowledge beyond the university, to co-design their research and training together with social stakeholders, in order to connect research and teaching to “real-life” experiences cf. [19] and to jointly address common societal challenges or solve current problems such as those related to sustainability. When studying cross-sector partnerships and the way they organize research and education, one has to take into consideration debates around organizing and reforming knowledge production in late-modern societies. According to an influential strand in these debates, it is crucial that the university or academy, is modernized, leading it out of the ivory tower and into the center of a vibrant, innovative ‘knowledge society’ [4,20–22].

While HEIs have become more and more important in the search for a more sustainable future in the last years, many universities are still tackling ESD in a compartmentalized manner, i.e., confining it to specific courses or teaching practices and treating the topic as isolated from research and practice beyond its own institution. From a whole institution approach, instead, HEIs can optimize their ESD practice and their role as agents of change by involving actors from different fields of activity and building collaborative spaces with students, academics, managers and actors from practice to critically reflect sustainability and the implementation of ESD. This is because the whole institutions approach according to D’Andrea and Gosling is an organization-based approach (as opposed to individual or cultural approaches) towards understanding and inducing change in knowledge production and allows therefore to explore research and teaching as part of a complex, inter-disciplinary institution [23]. Instead of focusing on one discipline or another, it takes the whole HEI as the unit of analysis and allows therefore for an “interdisciplinary critical enquiry” (Ibid.), which highlights not only the interaction between disciplines but also between knowledge and the social context of its production and application in an attempt to conceptualize the ongoing transformation and reform of HEIs as a complex process. At the center of this process are questions about the (re-organization) of internal boundaries between disciplines, as much as external boundaries between the HEI and its organizational environment, both of which are at stake when cross sector partnerships between university and non-academic partners are organized.

In this context, the necessity for university reform in general and organizing research and education through cross-sector partnerships in particular is derived from ideas of grassroots democracy, inclusive ways of knowing and more just and liberating modes of organizing knowledge [24–28]. These reforms imply a re-evaluation of practical knowledge, non-scientific expertise and alternative, collaborative and less formalized ways of knowing and learning [29,30]. Trans-disciplinarity, as a principle for cross-sectoral knowledge partnerships, with a broad inclusion of stakeholders from different disciplines, sectors, classes, communities and cultures is often seen as a welcome strategy to answer current calls for more direct citizen involvement in knowledge production in HEIs [22,31,32].

However, there is also a critical stance towards cross-sector partnerships that argues that through engaging more in so-called collaborative projects across sectors, formerly public organizations such as universities would face the danger of being undermined and colonized by certain social interests and economic or political power [33,34]. From this perspective, cross-sector ‘stakeholder participation’ are further regarded as a euphemism for clientelist and exclusionary coalitions between elite fractions of society, who marginalize lower-class stakeholders and lack public accountability and democratic representation [35–37]. For these critical voices the normative discourse on cross-sector partnerships

provide a tool for transforming political societies and class conflicts into a pacified, collaborative knowledge economy where everything is governed by dictates of growth and innovation, and which is accordingly also linked to technocratic ideas of developing administrative and market-based solutions to fundamentally political problems [38,39].

In this article, we investigate how these different repertoires of meaning within the broader debate about cross-sector partnerships are used, understood and acted upon by the main stakeholders involved in cross-sector partnerships, or more specifically, how the conflicts, tensions and dilemmas between the several strands in the debate allow them to intersubjectively construct and negotiate a tentative yet workable common ground. Thus, our aim is to better understand how a set of heterogeneous partners create shared meaning through organizing scientific and educational work. Instead of adding to the many studies of cross-sector partnerships that evaluate them according to predefined and supposedly objective evaluative criteria, this study addresses the need for a more specific understanding of how social value gets defined in and through cross-sector partnerships [40]. More specifically, we research cross-sector partnerships as process-in-formation, drawing attention to the narrative dimension of organizing in which actors make sense of the organizational dilemmas and ambiguities that stem from the complexity of working together across sectors. In this way we contribute to a better understanding of how professional identities and organizational narratives interconnect within a complex institution such as a HEI, especially when it engages in cross-sector partnerships beyond its institutional boundaries for the sake of promoting an institutional as well as social transformation towards more sustainable futures. Doing so we supply a more precise application of the whole institutions approach in empirical research, as well as we contribute to a better understanding of the institutional change happening in HEIs under the banner of sustainable development.

3. Theoretical and Methodological Orientation

3.1. Constant Comparative Approach Based on Grounded Theorizing

In order to contribute to a better understanding of how individuals engaged in cross-sector partnerships make sense of the organizational dilemmas and ambiguities that stem from the complexity of working together across sectors in pursuit of an integrative approach to knowledge production, this study uses a comparative approach based on Grounded Theory. More specifically, it builds upon a further development of Glaser and Strauss' ideas provided by Goldkuhl and Cronholm, who adapted grounded theorizing and their focus on continuous and mutual refinement of research interest, empirical data and existing theories, in order to arrive at a conceptual treatment of the social phenomenon of interest that is context-sensitive (or has a close fit to the data), but still relates its substantive account to the more abstract and general dimensions of formal theory ([41], p. 194).

In the constant comparative approach to grounded theorizing substantive and formal theoretical concepts are related to each other in mutually constitutive ways, so as to form what Glaser and Strauss have called a middle-range theory [42] (p. 33). The notion of middle-range theory is derived from earlier work by Karl Merton [43], who developed his concept of a theoretical middle-range to argue in favor of special theories with limited conceptual range to deal with delimited aspects of social phenomena, because they would provide fruitful hypotheses that guide further cycles of empirical investigation and theorizing, rather than suggesting theoretical closure ([43], p. 448, p. 457; cf.; [44], (p. 628)). In this way middle-range theories would contribute to an evolving body of theorizing that is grounded in empirical investigations as well as incorporating aspects of formal theory so as to formulate hypotheses and analytical frameworks in close dialogue with established theory to contribute to further cycles of observing, analyzing and theorizing (Ibid. p. 448; [45], (p. 8)).

Following this line of research, this article aims to scrutinize the meaning of important concepts related to cross-sector partnerships, such as knowledge, actors/sectors and partnership from a bottom-up or emic-to-etic (context-sensitive to general) approach to theorizing. However, in opposition to classic, inductive grounded theorizing and more in accordance with later refinement of the research approach

by Corbin and Strauss [46], as well as Fram [47], Charmaz [48] and Goldkuhl and Cronholm [41], we do not develop central theoretical concepts in isolation from prior work, but include them as frame of reference [41].

3.2. Sensemaking

We combine the methodological approach outlined above with the analytical approach called ‘sensemaking’ developed by Weick [49] and others. More specifically, we apply Taylor and van Every’s analytical framework to study cross-sector partnerships in the context of people trying to make sense of their organization by narrating to each other their respective roles, their relationship and modes of exchange around a joint object of value ([50], p. 46).

It is of particular interest how actors use social background knowledge (and the normative weight they carry) to narratively frame and script their communication concerning the organization of their cross-sector collaboration. In order to investigate how actors’ personal identities, group relationships and broader social affiliations are linked through communicative sensemaking, we draw on Strauss’s [51] conception of organizations as arenas in which actors interact with each other through referencing (and constructing) the broader social worlds they identify with. For the purpose of this study, arenas and social worlds are used as concepts to approach the cross-sector collaboration as an arena in which actors engage each other and make sense of their interaction while linking their activities to a broader social world beyond their immediate situation. However, the broader social world beyond their situation is not understood here as something that exists independently from the situated arena, but is (re-)constructed in and through the interaction and communication taking place within it ([52], p. 207)

Bringing the approach of sensemaking together with Strauss’s concepts of arenas and social worlds, a cross-sector partnership can thus be perceived as an arena in which differences and similarities are affirmed, negotiated, contested and/or transformed. This is done by way of actors in the arena interactively, or communicatively negotiating the social meaning of their central objects of value, the modes in which they exchange them, the roles they take or are ascribed within this exchange and the organizational relationships that are constructed to facilitate their interaction and communication.

This meaning-making or sensemaking aspect of organizing a cross-sector partnership is approached within this study as “boundary-making”. The very act of organizing a cross-sector partnership helps those involved to define what separates and links the various, conflicting dimensions of their identities (personal, interactional, collective) as part of a broader, normative social story about what separates and links us. Latour [53] called it the story of progress about that “which holds us all together” ([53]). A cross-sector partnership can then be investigated as linked to negotiating the meaning of knowledge (and related objects and concepts) within normative, as well as strategic story-telling about social progress, and the way it aims at affirming and transforming certain conceptual as much as normative boundaries between objects, subjects, modes of exchange, roles and social positions, as well as forms of organizing. In doing so, we consider boundaries as an essential part of keeping the struggle between actors ongoing, so they can keep searching for answers about that which separates and links them in organizing the cross-sector partnership and keeping on organizing it cf. [53]. This struggle about how to define the boundary and communicate about its canonicity as well as their permeability or breakability [54], is what empowers them to think and act socially, as well as to organize. This means to focus the analytical exploration on how organizing a cross-sector partnership enables those involved to draw on conceptual boundaries in and through their interaction and communication about the meaning of their partnership.

4. Methods

4.1. Case Selection

The Institute for Sustainable Urban Development (ISU) in Malmö (Sweden) was selected to answer the research question because it presents a cooperative project between university and city administration to facilitate collaboration between both parent organizations in respect to sustainable urban development. Based on these general objectives ISU engages in various annual activities, most notably organizing networking events, international conferences, and a thesis matchmaking program in which the university students pick a topic relevant for the Malmö administration for their bachelor or master thesis. The results from these theses are then presented at a so-called Urban Strategic Forum between academics and administrators with the hope to spawn more comprehensive collaborative efforts between research, education and urban planning. Altogether, ISU appears to be an illustrative and typical case study to analyze the way, individuals engaged in cross-sector partnerships make sense of the organizational dilemmas and ambiguities that stem from the complexity of working together across sectors in pursuit of an integrative approach to knowledge production.

4.2. Data Collection

Empirical data was collected through 15 interviews with cross-sector partnership core members and their partners to observe the cross-sector partnerships as a collection of individuals and their accounts of the social reality of the cross-sector partnership. We use references to the interviews throughout the analysis and refer to the different interviewees by using an anonymized acronym for each different respondent followed by a number of the paragraph of the interview transcript we are referencing (e.g., BM P46). Furthermore, two focus groups with all the employees of the cross-sector partnership were conducted with the aim to observe the cross-sector partnership as an organizational community. Focus groups are particularly suited to “explore group characteristics and dynamics as relevant constitutive forces in the construction of meaning and the practice of social life” ([55], (p. 902); cf. [56], (p. 315)). The biggest advantage of focus groups is to enable the researcher to observe collective orientations in the process of formation, because in the group conversation individuals are forced to take positions and defend them vis-a-vis others, which allows the dynamic and interactive character of sensemaking to unfold and become visible to the researcher (cf. [57], (p. 582); cf. [58] (p. 197); [59] (p. 294)).

With respect to the data obtained from individual interviews, focus groups also serve to refine and cross-validate (or contextualize) the preliminary analysis derived from these interviews ([60], (p. 31); [61]). Thus, they address the requirement of inductive, comparative theorizing to gradually build theoretical concepts and categories from continuous iterations between data collection, analysis, validation of preliminary concepts and identification of additional data and collection sites necessary for continuing the research cycle until sufficient plausibility (or saturation) of emerging concepts is reached (cf. [48], (p. 89); [62], (p. 189)). However, the focus groups are not referenced directly within the analysis below (as opposed to the interviews), as they have been used more generally to inform the direction of the research and for validation.

Finally, document analysis was conducted of cross-sector partnership program documents, partner program documents and literature about the immediate context of the cross-sector partnership to observe the cross-sector partnership as an organizational text for internal use and outside audiences and to better understand the cross-sector partnership within its immediate spatial, organizational and temporal context. Some of the program documents have been used below in the analytical section as e.g. [63,64], which are program documents and meeting notes as we also specified in the bibliography more clearly. The document analysis of program documents was coded alongside the interviews according to the coding procedure outlined below. It served the purpose of gaining deeper insights and to validate the empirical results gained with focus groups and interview analyses.

4.3. Data Analysis: Open Coding and Focused Coding

The coding procedure involves two coding cycles, which build on each other. These cycles are: initial or open coding and focused coding.

During the initial coding, Ryan and Bernard's technique for identifying themes ([65], (pp. 89–93); [66], (p. 139) is applied. Identifying themes and applying more descriptive (than analytical) coding can be regarded as a good starting point for theorizing, because it allows for thinking in more coherent story lines together and getting a feel for the patterns in language use [66]. Concretely this means that during the open coding cycle we look for repetitions, indigenous concepts, exogenous concepts, metaphors, analogies, transitions, linguistic connectors, dilemmas, establishment of similarity and difference, as well as silences, or the de-emphasize of certain issues. The thematic coding strategy after Ryan and Bernard are thereby used as lenses, meaning they informed where to look and what to look for, rather than resulting in direct coding [65]. For the actual coding in this initial open coding cycle, action-oriented and descriptive codes are used that are closer to the text and preferably derived from the text *in vivo*, so as preserve the narrative meaning of the coded fragments as much as possible, cf. [48], (p. 120). This process generated initial, descriptive codes of relatively large and coherent segments of the texts, which then were further developed conceptually within memos attached to the coded text passages.

Focused coding is as a more systematical approach to gradually build abstract categories out of the initial descriptive or open codes through constant comparison of sections of the data, codes and memos (and emerging concepts therein) with each other and across texts from interviews, focus groups and documents (cf. [67], (p. 96); [66], (p. 159)). This process especially involves assessing codes according to their conceptual value, i.e., their ability to reveal larger patterns in between statements, and to select and consolidate those that are more promising for further analysis and development in memos [48], (p. 144). It also involves consolidation of codes into groupings of codes (or categories) so as to gain deeper insight into their specific properties, as well as their relationship among each other (which then is further developed through memo writing about categories, re-coding statements on the basis of focused codes). By comparing codes and arranging them into categories, the themes and situations initially focused on are compared with each other and allowed for a more comprehensive understanding of the data. In this fashion a conceptual system of categories is gradually build out of initial observations and preliminary analyses.

5. Findings

5.1. Malmö: A Story of Collaborative Transformation of an Industrial City to a Sustainable KNOWLEDGE City

The Institute for Sustainable Urban Development (ISU) was officially founded in 2007 as a joint, collaborative project between Malmö University and Malmö's city administration to facilitate research and planning collaborations between both organizations in respect to furthering the sustainable urban (re-)development of Malmö (e.g., [68]).

During the 1990s, Malmö faced a deep economic and social crisis with vast numbers of unemployed, civil unrest in its nation-wide notorious banlieues, such as Rosengård, and the rapid closing down of its traditional manufacturing industries; [69] (p. 50). The establishment of the university in the former shipyards of Malmö's central Western Harbor district was a cornerstone in the transformation strategy of the city administration (OZN P11; ID P21; DD P39) (These acronyms indicate a single interviewee, but in order to protect their identity they have been randomized. The P followed by a number indicates the paragraph in the transcript which is referenced). The city's transformation plan strategically focused on sustainable urban development, which was also ingrained in the statutes of the newly founded university. It was to concentrate its research and teaching on the conservation of nature and natural resources and, consequently, all issues relating to sustainable urban development [70]. Through its university, Malmö was to become a "multicultural city of knowledge" that would be "attractive,

green, resource and ecologically efficient” [70] and able to connect well-educated people through excellent education, innovative employment opportunities and high-quality (sustainable) housing [71] (pp. 16–17). From the beginning, the relationship between the university and city was very close, whereby the university had a clear mission to contribute to the city’s development in a very collaborative, applied and vocational manner.

While Malmö’s transformation into a smart and sustainable city is closely linked to the economic crisis in Sweden in the 1990s, it is also influenced by the national Swedish research policy. This changed from having a primarily academic focus to become a governance tool in the efforts to develop/transform Sweden into a “knowledge-based economy” [72], (p. 246). In 1997 a string of reforms were undertaken so as to focus Swedish universities on solving concrete social problems in collaboration with social stakeholders and to match their education to the needs of the labor market (DD P97–99; IZ P13) [72]. At the same time, the core funding of Swedish universities was cut back due to austerity policies. It was substituted through external, competitive funding through research council and sectoral funding agencies, such as the Swedish Foundation for Strategic Research (SSR) (<https://strategiska.se/en/>) or the Swedish Foundation for Strategic Environmental Research (MISTRA) (<https://www.mistra.org/en/>). Both are among the largest research funding institutions in Sweden. They fund industrial doctorates, applied research centers at universities and collaborative networks between universities, companies, public agencies and other stakeholders to collaboratively engage in research areas considered of strategic importance for “Sweden’s future competitiveness” and its “good living environment”, as well as promote opportunities for industrial application of research (SSF, strategiska.se; MISTRA, [mistra.org](https://www.mistra.org)).

5.2. From “Center” to “Institute”: Continuously Institutionalizing Collaboration between University and Administration

The history and development of ISU is closely connected to the development of Malmö’s transformation story. The idea to institutionalize a collaboration between city administration and university originated with the international exhibition for sustainable housing Bo01 (The name of the exhibition is derived from “Bo”, the Swedish word for “to dwell” and the year of its opening 2001 (Austin 2013)) in Western Harbor in 2001–2002 (DD P17, BM P50). This led to the implementation of a project called “Urban Ecological Knowledge and Development Center in Malmö” (called SEKUM) in 2003. Its objective was “to promote sustainable urban development from a local, regional and global perspective as well as to increase cooperation between the different parties [i.e., city administration and university]” ([70] own translation). Its vision was to “gradually develop into a powerful hub and platform for cooperation between industry, universities and colleges, public organizations and other organizations” [70].

This grander vision of facilitating collaboration for making Malmö a smart, successful and sustainable city was accompanied by high hopes for the opportunities that such a center could offer the parties involved. In an internal document [73] it was discussed how SEKUM would enable the city to get excellent knowledge for their city planning (through commissioned theses and later an “Industrial PhD” in cooperation with Malmö University). It would enable the university to increase the quantity of their externally funded research projects, which in turn would increase the quality and relevance of Malmö University College’s research and training. It was further hoped that in the longer run SEKUM would gradually develop from a temporary joint project by city administration and the university into a hub and think tank for sustainability in theory and practice. It would not only be financed externally (through selling services, raising membership fees and collecting research funds), but would simultaneously create, finance or support specific development projects by the Malmö administration as well as produce excellent (marketable) research and training about sustainable urban development (Ibid.). After a start-up project phase, it was anticipated that SEKUM would have made major leeway towards the long-term goal of being an independently financed organization that maintained itself by attracting external funding, by providing paid-for training courses and study

trips [73], and by receiving membership fees from the private sectors that would pay for being included in the network [63].

Yet none of these funding models materialized within the initial set-up period of SEKUM (2003–2005)—no external income was generated at all, according to the budgets of 2003–2005. Thus, the premise for continuing SEKUM within a new framework as the Institute for Sustainable Urban Development was to shift operations from the initial “joint project” towards an “association” (förening) which would be able to continue and scale up SEKUM’s activities in the long term [74]. This meant on the one hand that the new institute or association would (gradually) cease to be primarily an internal project between city administration and university and instead open up to outside actors, organizations and businesses active in the field of urban sustainable development. The vision guiding this envisaged change was for ISU to become a “nationally and internationally leading competence center for sustainability, and a key player for the transformation of urban areas in the region” [63]. This would also mean that, instead of being dependent on continuous financing from its founding organizations, it would finance itself through membership fees and selling services [63]. The organizational example that was often mentioned as the future ideal for the new institute was MINC (Malmö Incubator), which was (and still is) a city-run, self-financed but non-profit “hub for startups and entrepreneurs”. In later phases of the discussion about the new institute, however, a new strategy emerged that shifted significantly away from a commercially successful incubator with a broad network of actors from the business sector toward “an institution of learning and research for sustainable urban development” [75] that would be financed through public funds (such as EU INTERREG Program) and research grants.

Despite this suggested organizational change, the Institute started gradually in 2006 (and was officially founded in 2007) in the same organizational framework that SEKUM operated in, i.e., as a collaborative project between Malmö City and Malmö University [76], (p. 5)—an arrangement that remained in place until the time of the field research in 2014.

5.3. Organizing the Cross-Sector Partnership

From its inauguration ISU has struggled to define its structural framework. On the one hand, it is organized as a project, meaning it does not have “its own organizational number” (BM P25; LI P42). As joint project without legal entity and own organizational status, i.e., tax number, ISU does not have its own budget, staff or office. Instead ISU’s staff and accounting is located at the university’s department for Innovation and Development ([68] (p. 15); BM P25–27). This does not mean that the department has any influence on the strategic steering and decision-making within ISU: the department is more or less an administrative “paper boss” (BM P26). The ISU Board, consisting of the heads of university and city departments (six in total, three from department in the city administration and three from university departments) and headed by a chairwoman (linked to the central university administration), decide on ISU’s focus and activities. This arrangement is based on the joint partnership agreement that was renewed in 2006 for 5 years, and since then on a 3-year basis (cf. [76,77]). ISU’s executive director develops a yearly report on its activities of the current and a plan for the next year (BM P13). Its project structure is congruent with the goal of ISU to facilitate bilateral collaborations between the partner organizations, as is also its employment structure of not having its own employees—except of an executive director. Its other staff, the four part-time positions of the so-called “ISU boundary agents”, is employed through ISU funds at their home department in either the university or city administration.

The ISU Board is, according to the partnership agreements, the main steering body of ISU. It meets approximately once a month (ONG P17) and its function is to develop ISU’s overall strategic program and decide what kind of concrete activities and projects should be focused on in the annual plan, and how accordingly the annual budget of ISU should be allocated (Ibid.; ID P11). Another important task of the board members is to “anchor” the institute in their respective department in either city administration or university (Ibid.). This task is not clearly defined, but for some of the board members it means to involve ISU within specific projects of their departments relating to sustainable urban development (LL P33), while other board members interpret this role more in the sense of making sure

that ISU works in a way that fits with the work tasks and style of the department. In a more general way, though, this task of “anchoring” in their respective departments also simply means for the heads of departments to build a tighter network among themselves, to meet regularly as the ISU Board and to exchange information about what the departments are working on or what kind of project funds they are applying for so as to increase opportunities for cooperation between the departments (ONG P25). In this way ISU forms as a “neutral area” in between the departments:

“And ISU is, I think regarded by us (. . .) as a rather neutral area. So, if in the Board we often say: ‘Let’s leave this to ISU’, I think we are at the same time saying that this is a question of common interest and no one has the leading part, not the university, nor the city (. . .)”. (DD P29)

However, this quote also sheds light on the difficulty of the Board to assume a leadership position in respect to ISU, when their perspective is to have it as their “neutral meeting ground” and leave things of common interest to ISU, where no one of the city or the university would take the role of “the leading part”. At the same time, leaving things of common interest to ISU suggests that indeed ISU would be more than a neutral area, but would at the simultaneously be an entity of its own, that could take over and take the lead on the issues of common interest to the heads of departments. However, this attitude of leaving things to be developed by ISU conflicts with the strategic leadership role of the board. For example, the executive director stated concerning the Board’s idea to develop the position of the “boundary agent” within ISU:

“I was not taking part of bringing forward the boundary agent concept. It was put on my lap and I had to take care of it, but I didn’t like the framework or the lack of framework I should say. But I should just take care of it and I should just fix it. The Board was like: ‘But you are the director, you should do this —’Yes, but what did you want?’—And nobody was there either. (. . .) I should just fix it and then the boundary agents, that have been assigned, also come to me and ask: ‘What are we gonna do?’ —‘I don’t know what you should do’”. (BM P237)

This problem concerning a strategic decision of the board that subsequently no one took responsibility for, so as to ‘leave it to ISU’ is thus coupled with pressure on the part of the director and the boundary agents to fix it, to make it work, without exactly knowing what the board’s criteria are for determining whether something works or not. On the one hand the vague leadership emanating on the board does create space for the boundary agents to develop their own cross-organizational team. As one boundary agent recalls:

“I think we, when we started this project, the purpose was kind of vague, what we were supposed to do. So, we developed that purpose ourselves, after trying, discussing, thinking about it a lot in our group. And we have a really interesting collaboration and a good collaboration in this boundary agent group, which I think makes us a very strong entity.”. (IR P36)

Thus, one could say, because of the lack of leadership and organizational coherence within ISU, the boundary agents were free to develop their collaboration and succeeded to establish a close group identity and professional network across the different sectors and organizations. However, as they are also considered ISU employees they are simultaneously confronted with the expectation to deliver on ISU’s envisaged project outcomes as specified in the annual partnership agreement and ISU project plan. The two boundary agents from the city administration were particularly frustrated and admitted that they recently considered stopping to work with ISU:

“I was considering if I want to continue already. This is mainly where I felt there was no common picture. We—as in [the director] as one unit, the steering board as one unit, the boundary agents as one unit—have no common idea, vision, what do we want to do with

ISU, how do we get there? (. . .) It has happened that from the steering committee’s side suddenly it’s like: ‘No, this is not at all what you’re supposed to do!’ And then we do not get an explanation what is it they expect from us”. (QY P404)

The organizational dilemma demonstrated in this quotation constructs ISU as a self-organizing network of professionals, which, at the same time, is subjected to implicit expectations to produce concrete project outcomes. This dilemma is further expressed by the executive director, when she describes her role as being required to lead without having the authority to do so:

“I would like to become better in how to lead without being a boss. Because, I have to lead but when you are not somebody’s boss, it is extremely difficult to lead and to get the person to do something that you want them to do when you are not their boss and you actually don’t have anything to say about them, but it is a part of your work task to lead”. (BM P172)

This dilemma of ISU being a somewhat leaderless initiative is closely linked to the contradictory identity of ISU being a neutral meeting and networking place between professionals, a tightly budgeted project expected to produce immediately beneficial results for the partner organizations, and a viable organizational entity with clear mission and coherent boundaries. This dilemma culminates in the position of the director, who was specifically chosen by the board because she is considered a networker, rather than a leader:

“You can also see how ISU was working depending on who has been the director of ISU. For example, the first we had this woman [who] was very much involved in building ISU as a sort of independent institution (. . .) that was more or less independent of these networks inside the university and city administration. It had a life of its own. (. . .) But on the other hand, we had an organization that from an organizational point of view was working quite well. But no one—even I, who was sitting in the board—knew what was going on. And then we changed the director, so now we have a director with more broker competences (. . .). She has a very good competence to work in networks, to connect different people with each other and so on”. (ONG P96–98)

However, one of the boundary agents states that for him a fundamental problem with ISU is that the director is neither “strongly anchored in the University, nor in the city. She is to some extent free-floating” (JA P129). Although the boundary agents were supposed to anchor ISU more to its parent organizations, they do not consider themselves part of ISU as an organization. Instead, they have developed their group identity in opposition to the organizational identity of ISU and the position of its director:

“The group [of the boundary agents] is very strong, and [the director] is kind of lonely because she’s the only one sitting, working in ISU. And we are connected to ISU but we are not working inside of ISU, and I think that also makes it a bit difficult”. (IR P36)

The boundary agent’s idea of ISU is very much constructed in opposition of the “lonely” and detached director and the organization she stands for. Their vision is that in the longer-term there would be more boundary agents in both organizations and their contact would be more informal and established within their respective organization (IZ P91; RZ). So, in the long-term there would be no need for something like a formal organization like ISU to organize the links between city administration and university. Instead the issues currently linked with and to some degree outsourced to ISU—collaboration across organizational boundaries in order to make Malmö more sustainable—would be more embedded within the values of the parent organization as such, meaning every employee would be considered as a kind of boundary agent and allowed to spend a substantial amount of their work time outside the boundaries of their home organization, to explore ways on how they can work together in order to push for a more sustainable Malmö (IZ P91, P97; QY P24). As one of the boundary agents from the university states:

“I see ISU and all the activities that ISU does as instruments to make people to get together and talk, to establish links and mutual interests and even friendships and that those connections in themselves should work in the future. So, one of the goals of ISU should be, I don’t know if that would happen, but to make itself superfluous in a way, that it shouldn’t have to be, because connections are already there.”. (JA P85)

These remarks in a way show another side of the ISU dilemma between project, organization and network. On the one hand, from the expressed free-floating attitude the ISU process is perceived as horizontal, creative and leaderless. On the other hand, there are strong expectations that ISU should have a clear organizational profile, as well directly deliver concrete project results. This directly contradicts the ideal of ISU to be a place of networking, open conversations and informal communion, where common projects and benefits would emerge effortlessly and naturally, without formal planning and tight performance control. A positive ideal of ISU then is linked to a good, communal, almost familiar climate among the board members (horizontally linking with fellow heads of departments on their professional level), as well as among the boundary agents (horizontally linking with fellow colleagues on their professional level). The negative picture of ISU is that of an organization that is failing as its parts are not vertically integrated. For most interview partners, this image is embodied by the position of the director, who is supposed to lead, while not having the mandate to do so, and should thus lead without being a leader. For others this is embodied in the ISU Board, which does not properly function as a steering body and head of ISU as an organization but is rather a horizontal meeting and networking place for ISUs external partners (the departments of city administration and university).

Both of these perspectives might suggest that ISU in an ironical way is fulfilling its task of creating horizontal links between the mother organizations, because it is failing as an organization and in a way is not able to vertically integrate internally and create boundaries against the organizational outside. Yet, there is a sense of frustration about the lack of forward movement and a clear vision, which is linked to ISU being partly considered and presented as an issue organization and institute pushing forward sustainable urban development in Malmö and expected to work as an independent actor that can be developed by those professionally responsible. At the same time, however, those professionally responsible for ISU (i.e., especially the executive director, but also the boundary agents) do not feel they have the freedom or mandate to do so. They seem to be frustrated by feeling required to lead and develop, while also being expected to adhere and follow the board, which in turn assumes a leadership position without providing the coherent vision or concrete organizational leadership needed, but instead merely exchanges information and loosely defines areas of common interest that then should be developed by ISU (cf. DD P29 above).

5.4. Advantages and Disadvantages of the Fuzzy Profile between Project, Organization and Network

The advantage of such an undetermined structure is perceived by the interviewees to lie in its flexibility and responsiveness, which would allow ISU to adapt its activities to the current and changing needs of the departments, so as to seize on emerging opportunities for collaboration in a timely manner (ISU 2014a; IR P171). However, the disadvantage linked with this structure is described in terms of ISU being governed in an ad-hoc way without clearly formulated organizational boundaries and a committed long-term vision [77]. Instead, as the executive director of ISU states, the quick turn-around of departmental employees being partly financed via ISU and the yearly discussions about what the needs of the departments are leads to a constant, self-referential and inward-looking debate about what to do with ISU and to work on how to work together instead of actually moving forward as an organization (BM P237).

Linked with this perception of pointless debates and the need to constantly explain what ISU is, should or should not do, is a long-standing and widespread sentiment that ISU lacks a clear profile, that it is a “container” or “archipelago” of projects of the heads of departments in the ISU Board. These would use ISU to address their short-term issues and departmental interests, instead of building a

long-term vision and focus for the organizational profile of the institute (LI P42; LI P110). In 2011, an outside evaluator of ISU concluded in his report:

“There is also a strong belief that the ISU’s profile has been too fuzzy. It has not been sufficiently clear what ISU stands for and what role it should play. Some say that this is linked to ISU having become too inward-looking. The institute has marketed itself badly. Another factor may be that the concept of an institute creates expectations for something bigger than what you can live up to my opinion”. ([76]-own translation)

This statement highlights the disadvantages of ISU being run as an internal collaborative project, but simultaneously forming (or posing) as a somewhat independent institute, an independent issue organization with a focus on advancing knowledge on sustainable urban development. The disadvantage of this is, as the evaluator stated, too high or even false expectations about what ISU can or should do, resulting in a fuzzy profile, thematic inconsistencies and an organizational over-stretch [78]. An interviewee expresses this dilemma in a similar way within the context of ISU’s work in respect to sustainable urban development:

“I mean, sustainable urban development, it’s a huge area and I think it’s important for ISU to have a red thread in what we are doing, because it’s easy that you try to work with everything within this area and then nothing will be done of relevance. (. . .) You have to be very strict on what you’re doing. So, you have to learn to say: ‘No, ISU can’t do this. We are focusing on these questions and will be doing so for another year’, or something like that”. (DD P79–81)

Thus, in developing its profile, a thematic focus on sustainable urban development would be necessary. This would imply strict rules about the type of projects accepted and carried out by ISU. This kind of approach would create a clearer profile as a thematic institute. Put the other way around, if ISU were not a temporary project but could operate as an institute, it would be easier to develop such a focus, to reject some demands and expectations by being able to say more clearly what ISU stands for in terms of sustainable urban development (LZLZ P197–202). However, such an approach is opposed to the idea of ISU working as an open, inclusive and flexible meeting place for potential collaborators and their project ideas and accordingly, when asked how exactly ISU could better manage expectations, one interviewee answers:

“I don’t think you can manage the expectations, actually, because people see us as a kind of a meeting place—‘Can’t this be something for ISU?’, etc.—not realizing that the personal resources are very short. And so, we have a discussion within the board almost every meeting saying: ‘Are we doing the right things and how does this new task connect to the others? Is it something ISU should be doing or is it something we could leave to other partners?’. (DD P85)

Managing external expectations (and saying ‘no’ to external audiences or stakeholders) is described by the interview partner as running counter to ISU’s image as a meeting place for professional networking. Rather than confronting outside partners and rejecting their ideas, the Board internally argues whether this is something ISU should engage in, and if not, transfer (or divert) it to other partners in its network. In any case, here emphasis is placed in avoiding rejection so as to not threaten ISU’s (beneficial) image as an open, inclusive meeting place. However, in the earlier statement by the chairwoman above, being strict and saying no was simultaneously seen as a necessary requirement of ISU being able to navigate the vast thematic field of sustainable urban development coherently and efficiently. The two statements exemplify the ambiguity between ISU as an institute or issue organization and ISU as an open meeting place for projects: The organization should be strict and also reclusive, yet, gain profile and direction, while the meeting place should not manage external expectation, yet rely on its network to transfer project ideas that do not fit to other partners, so as to not lose focus and concentrate on what ISU should actually stand for.

The problem of inconsistently labeling a collaborative project as an institute and raising expectations can also be positively understood in the sense that you appear (in the eyes of external audiences especially) to have something bigger, more attractive, capable and qualitatively different (the institute) than what you actually paid for (a project). For example, ISU figures as an independent, neutral host or additional guest for workshops, network events and conferences organized by the university or city administration and is included as a separate entity in university or city administration projects or administrative publications (BM P164). When ISU disseminates information about urban development projects in Malmö, these seem to be coming from a more independent source than if it were issued by the city administration itself. Thus, it might not be an accident or necessarily a sign of weak leadership that ISU remains a hybrid between project and organization, as the blurred boundaries also produce benefits. To borrow a term from psychology, these could be called “secondary gains”, i.e., short-term, but specific benefits that accrue from not overcoming a conflict, contradiction or problem. As the executive director sums up the enormous list of adjacent university or administrative projects ISU is engaged in:

“We are valuable because we are neutral. We are not the city and we are not the university, so therefore we are not dangerous or a competitor. (. . .) We are just a neutral platform and we give away so much for free. We are like a consultant firm they don’t have to pay”. (BM P164–166)

Being engaged in a multitude of tasks and projects links to the value ISU has by being a “container” for all kinds of projects that the university and the city are involved in. Its special value is also connected to the neutral “institute brand” it wears that can be easily applied to other projects and add the value of sustainability like it did to the city’s “The Line” (This project is organized by the city to show Malmö as an innovative business environment and various initiatives, start-up and internet companies connected to sharing-based economic models located along a pedestrian and cycle path linking Malmö center and Western Harbor) with its business focus. The many projects and tasks ISU is involved in and the way its funds and resources are re-directed back to the departments at university and city or adjacent projects of the city and university departments, also serve to “neutralize” ISU as a danger or competitor. Since ISU cannot use funds to build up an independent organization, it remains readily available for utilization as a free consultancy, available brand and service provider to the various endeavors of the parent organizations. As an interviewee from the city administration (and ISU Board) states:

“You could say the main organization or mother organizations they want, they need this organization between, and they want it to be effective and have a high profile, but not too effective and not too high profile. Because suddenly it might be competing with the mother organizations, so it’s a balance, always a balance for these types of cross board organizations. And they will always be questioned in the aims and goals and results. That is, I think, built in to the logic in itself”. (ID P65)

By keeping ISU, a project, the partners ensure control to question, recalibrate and adjust aims and goals through temporary agreements and part-time employment contracts of departmental employees (rather than having an institute with its own employees). They thereby can still enjoy the benefits of a (seemingly) effective organization that can be used to enhance the profile of the mother organizations endeavors, activities, events. However, the interviewee is also aware that such an approach does inhibit the long-term development of the initiative and curbs the motivation of those working with it:

“When you are a group of people you have to work with your own identity, that’s natural. But it very fast becomes a risk to become an irritation for the mother organizations. (. . .) This is a very important question, I think: How do you secure the commitment of the mother organizations and support from the mother organizations and at the same time, develop the inner life of this organization that it can keep the people that are working here and it gets a known profile and momentum?”. (ID P77)

What in the first quote by this interviewee was expressed in terms of balancing, might as well be understood in terms of a contradictory expectation: To fulfill the leadership’s needs for control and flexible utilization of ISU as a project, while also developing a corporate identity, a long-term strategy, so as to generate the direction and momentum necessary for the development of an independent organizational life of ISU. However, instead of dissolving this contradiction it could also be managed by separating outside appearance from inside substance: having the outside appearance as an (independent, high profile) institute on sustainable urban development, while being internally organized (controlled and bound) as a project for facilitating commitment and collaboration between two parent organizations. Such a concept could be visualized as in Figure 1:

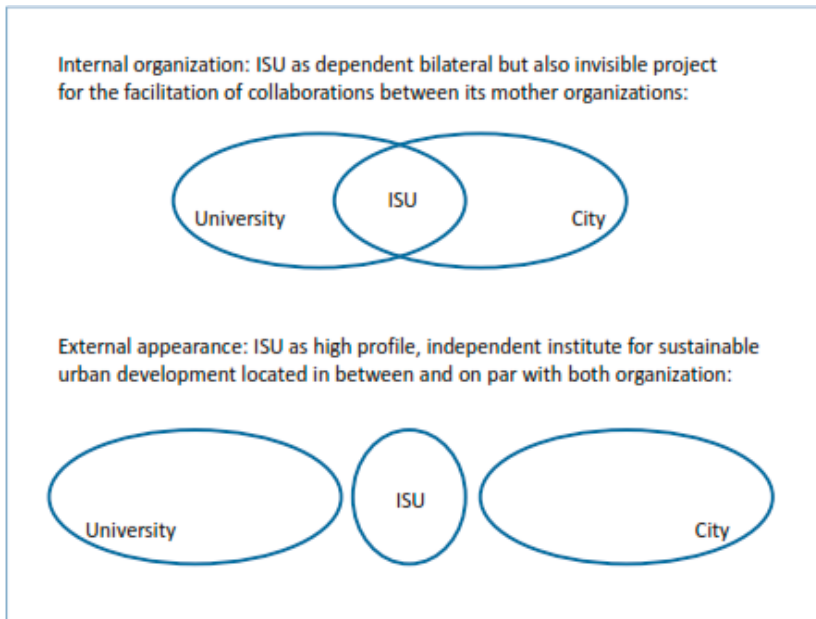


Figure 1. Differing Internal and External Understandings of ISU Structure (Source: own illustration based on interviews and [76]).

Many interviewees point out that the first model is the way ISU should work and the latter would show what should not happen, namely the emergence of an organization detached from its mother organizations and located in between both, blocking their direct interaction or competing with them (ID, ONG, OZM, LI). However, at the same time these two models represent the simultaneousness of ISU’s internal project and networking dimension and the external institute dimension of ISU.

5.5. Employing the Fuzzy Profile by Focusing on Learning and Critical Thinking—The Urban Research Day and the Thesis Program/Urban Strategic Forum

Now we want to highlight the ISU’s activities or interventions that seem fruitful for developing the different organizational identities of the initiative separately but in concert. First, an annual research conference, Urban Research Day. Here ISU acts as an independent host organization for an event where university academics, students and city administrators meet and discuss sustainable urban development with external experts and interested publics. The other intervention is a combination of a project-oriented cross-organizational workshop format (the so-called Urban Strategic Forum) and a networking format developed by the boundary agents (a thesis match-making program). The first kind of activity develops ISU’s external identity as an independent institute, organization or brand, pushing

forward the critical debate on sustainable urban development, while also linking the cross-sector partnership to the greater transformation story of Malmö. The other two activities aim at developing ISU's internal dimension by producing tailor-made knowledge and collaborative projects through establishing a learning and training network spanning across university and administration.

First, an important aspect of the open, more public meeting format of the conference is that it enables ISU to get known among relevant audiences outside the confines of its mother organizations by connecting with Malmö's prestigious transformation. This "brand development" is relevant when it comes to the so-called Urban Research Day, which is organized partly by the university and partly by the city (with help by the ISU director), but with ISU figuring as the principal organizer and host. It is an annual, international conference, organized at the end of each year, the last time (before the field research phase) in December 2013, where the topic was "Culture and Sustainable Urban Development" [78].

Another important aspect of this conference was, that it opened up the issue of sustainable urban development for critical discussion (LL 19). LGQ explains that this Urban Research Day brought about some "really interesting conflicts with the planning department" (LGQ P91) in the city. According to the interview partners this resulted from ISU organizing this event in an open way, inviting critical voices to confront the city administrators and their economic growth-focused "planning culture". They thereby made visible that people involved in the collaborative process of planning a certain industrial area in Malmö had "totally different agendas and objectives" (LGQ P98). She concludes that the incident at the Urban Research Day indicates that one of ISU's important tasks is to be "very open-minded when it comes to allowing for different interpretations and inviting different kinds of people into the debate and into this space that ISU is" (LGQ P100). This would allow conflicts to become visible, which in turn is a necessary prerequisite: "(...) for us to develop a creative collaboration. Since we need to accept that we have different agendas, if not, sustainability will remain an empty signifier that we can fill with whatever." (LGQ P104).

The tense panel on the Urban Research Day was underscored by many critical questions about gentrification (especially from students, LL P19). It not only triggered subsequent inclusion of the cultural department of the city in the collaborative project of the planning department in that Malmö area to be redeveloped (P19), but also led many in the audience to consider this debate as highly relevant and important. Since ISU was organizing it, it sparked interest in its work and in sustainable urban development as a whole. LGQ concludes:

"Targeting these actors that are not normally included in this process, in that way, ISU has kind of provided a parallel, to a certain extent, to the administrative space provided by the municipality. Or, to the academic spaces provided by the university. So, a kind of middle ground. And inviting non-expected agents into this dialogue, it's become political". (LGQ P120)

She highlights the importance of ISU acting as an independent host. This conception is linked with the purpose, identified above, of ISU as an actual, issue-focused institute. Later on, she links this with the issue of whether ISU should be understood as working more informally on building up networks or provide a formal framework and concrete inputs for the creation of joint projects:

"It is extremely key I think, to have these kinds of open platforms, which are not instrumentally targeted towards funding, towards specific goals, or specific impact criteria, whatever. ISU should be much more open. And it's important because we don't know what will be the issues in two years' time. And we need these platforms where we can come together and not react to other people's preformulated questions and so on, but actually formulate our own questions.". (LGQ P138)

"Open" here also means public as opposed to the spaces behind closed doors as an important countermeasure against insider networks, instrumental logics and short-sighted perspectives. However,

for her coming together in an open way also means conflict and accordingly ISU should continue these kind of open public spaces “for encounters where consensus is not already the natural goal, but where there is also room for controversy and debate” (LGQ P46). By inviting unexpected voices and the public, conflicts bring out surprising insights and open up new perspectives on the overall ambition of Malmö’s transformation and its story of being a pioneer in sustainable urban development. This in turn strengthens ISU’s public profile as a credible, internationally recognized institute and capable force within the field. In the end, though, as LL argued, it was the tangible political scandal of having the growth-focused planning culture of the city’s planning department ‘exposed’ on the ISU stage, which expanded the collaboration effort in the redevelopment area, to include from then on, also the cultural department of the city, as a more competent partner for those issues related to culture as a driving force for sustainable urban development. However, it also raised the interest of administrative and academic staff formerly disinterested in the work of ISU and contributed to ISU’s organizational development, because only afterwards the cultural departments of the city and university were systematically included in the ISU board and boundary agent program.

Second, complementing the public conference format raising ISU’s profile as an institute are those more internal and cross-organizational intervention formats organized by the boundary agents, i.e., the partner thesis matchmaking and the Urban Strategic Forum. They are organized together with the city departments around key sustainable urban development issues for the city departments. The boundary agents assembled a list of 50 different topics from which students could choose their bachelor or master thesis topic, e.g., how to make Malmö’s neighborhoods denser and more mixed-use (BM P61; IZ P29, P31). Subsequently, the boundary agents facilitated contacts and supported the process of the thesis program, meaning they linked students, their supervisors at the university and the city administrators whose questions or issues they explore. In the first year this process led to 20 theses produced by student teams consisting of 50 students ([68]; BM P61). By “matching” the institutions, tutors and students with administrators who have issues in need of research one idea is to produce direct results for the city’s planning projects (IZ P37). However, an important objective of this program is to more substantially bring in the academic supervisors of the students into the network between students and administrators. Here the idea is to use the students as a low-threshold and personal way to connect university and city professionals and inspire larger collaborative research projects that could possibly lead to joint applications for research funds and better educational formats for the graduates of Malmö University ((DD P74; IZ P21; LI P18; BM P71). In a way, the student work is seen as a subtle, indirect way to better engage academics with the practical problems of the city administration via education and training (rather than trying to instigate senior research projects directly).

The thesis program was then linked to an Urban Strategic Forum, which is a bi-annual, formal meeting format between university researchers and city administrators introduced in 2012 with the aim to facilitate the identification of common research/planning issues so as contribute to the joint development of projects and funding proposals [79]. The particular Forum in which a selection of student theses was presented was generally lauded (LGQ P76), even called “the best Forum we had” (ONG P66, cf. IR P88).

Seven working groups formed on topics such as “fairer access to the city” or “the dense, green and healthy city” [80]. There is a general hope that these working groups will grow gradually and either directly produce collaborative projects or at least more binding and continuous relationships among researchers and city administrators. Several of those involved describe the key for process as linking the practice and research through setting up encounters between the institutions on a “more grassroots level, between students and civil servants” (LGQ P73), to “use the students as a way to connect” (LI P104), to create personal connections, “to simply meet face-to-face” (BO P125) so as to show that “behind every subject there is a person on either side” (IZ P29).

However, there is a feeling that these working groups would need to be continuously facilitated and supported by ISU so as to ensure that they remain “alive” (BO P108; cf. IR P81). With ISU’s limited resources, this is seen as a big challenge. A more realistic assumption might be that ISU will not be

able to “follow up on the working group, it has to live by itself” (BM P79). In this respect several interviewees also mention that even though the working groups might not result in formal projects and applications, they would still consider them a success, in that they contributed to establish informal, personal connections between researchers and administrators. Furthermore, they got to know that there is someone on the other side who is also working on the same issues (BO P108). Here one could argue, that ISU’s focus on creating informal connections is due to its limited organizational capacity to more substantially control and lead the process that is supposed to result in concrete collaboration results and projects. It, however, also links to ISU’s problem to clearly show its organizational impact as the relationships they instigate must live (or die) by themselves, and if they indeed at some later point in time would yield any concrete project results, these would not easily be traced back through the network of collaborators to ISU’s activities.

The expectation that ISU should facilitate project organization in a more hands-on way (cf. RI P92–94) links back to the problem of ISU being a project, which is lacking in own, freely usable resources. It also specifies the issue of creating a free space for discussion, where people more fundamentally reflect and ask themselves what they should do together, rather than immediately jumping into the work. As LI argues:

“If the intention with ISU is to develop new project and then to be some kind of breeding ground/place that breeds new projects, then ISU should have a kind of venture fund or time fund (. . .). Because there’s a problem in finding time for sitting down and developing ideas. And (. . .) it’s also some kind of risk, because maybe you’re sitting together and you’re doing a couple of workshops and then everything ends up in nothing, because lots of ideas won’t come together, because they’re too complicated and when (. . .) analyze it you discover: ‘it will not work’”. (LI 33)

The Urban Strategic Forum and its link to the student thesis program is perhaps a good practice in this respect, as it was generally lauded by those participating. More specifically though, it seems to successfully link more formal, project-focused and also time-efficient aspects of collaboration between professionals and their organizations (the Urban Strategic Forum format), to the longer-term, informal and relationship-focused aspects of the student thesis program. The aspect of informality of the students can here be considered to provide a more personal bridge between the organizations, allowing their professionals to connect for the longer period of time it takes to produce a thesis and enabling both to assume a similar, more personal mentor role (instead of retreating to their different organizational or professional roles). At the same time, the 20 student theses produced within an applied science context facilitated by ISU allows those organizing it to point to outcomes that would not have emerged without its activities. This helps ISU to demonstrate that it can deliver on the expectations that the resources put into ISU should yield a timely return on investment. However, at the same time, it seems important to acknowledge that ISU in its limited scope and with its limited resources can only lay the “breeding-ground” or produce a germ cell for more substantial and higher-quality projects to develop and “live or die” by themselves, i.e., to self-organize gradually and involve administrators and academics in a self-determined, horizontally networked and project-focused way. In the same way, it seems important to acknowledge the open-ended, autonomous character of these network projects or project networks: this means to allow them to fail and grant those engaging in them leeway in terms of time, labor and resources they can spend free from (conventional) organizational performance controlling.

6. Discussion and Conclusions

In accordance with D’Andrea and Gosling’s suggestion for a whole institutions approach [23], we explored a central dilemma between identifying as project, organization or network within the change process towards more sustainable HEIs. We did so by researching how individuals engaged in an illustrative cross-sector partnership narratively make sense of the organizational dilemmas and

ambiguities that stem from the complexity of working together across sectors in pursuit of an integrative approach to knowledge production. The meaning of our findings for the whole institution approach in HEIs is manifold. Instead of organically complementing each other in a kind of teleological movement from project via organization to self-organizing and inclusive network, we found in our analysis, that often the different organizational identities as project, organization or network competed with each other and canceled each other out. In the end, the organizers did not end up with a teleological, virtuous development from project, via organization to self-organizing network across sectors, but with an undetermined and aimless movement back-and forth only resulting in a general sense of stagnation and frustration among especially its regular members. This might also be interpreted against the background of the vagueness of the concepts of sustainable development and Education for Sustainable Development (Authors 2011). However, our findings also suggest that the fuzziness of the cross-sector partnership and its indeterminacy is seen as something that should not necessarily be overcome, but that the state of indeterminacy in various ways contributes to the different goals of project development, organizational development and network development, which—by their nature—involve conflicts, trade-offs and unsolvable organizational dilemmas. Thus, a fuzzy profile, while being often criticized as a hindrance to the further development of the cross sector partnership and as something that is diminishing its potential impact, can also be seen as a (relative) success story as it supplies many “secondary gains” to those involved by not overcoming their differences and organizational dilemmas. These findings extend the dimensions, dilemmas and tensions identified by D’Andrea and Gosling’s conception for a whole institutions approach [23].

In this context, three activities of ISU were analyzed more closely, because they suggest a portfolio, which would allow to develop the three different identities of ISU as project, organization and network separately but in concert. First, the annual public conference “Urban Research Day” hosted by ISU, which boosted its public profile, successfully linked the institute to the prestigious Malmö transformation story and also delivered on ISU’s organizational expectations to be a viable, publicly relevant and critical institute. Second, the thesis match-making program organized by the ISU boundary agents, which helped to deliver on the project expectation to produce specific outcomes (theses), that have at least the potential to directly benefit the work of the administration, as well as it directly contributes to the universities educational mission. At the same time, it realized the cross-sector partnership’s ambition to nurture personal and professional network relationships, because it focusses the professionals on a learning-process via the students. Third, the “Urban Strategic Forum” which brings together academics, students and administrators in a workshop format to further develop their learning network established through the thesis match-making program by providing the breeding ground for project groups to self-organize across organizations.

However, when using this specific research focus and the accompanying set methods there are important limitations.

First, because this study relies on mainly narrative accounts in interviews, focus groups and program documents, it cannot make claims concerning the objective performance of cross-sector partnership. Our results are limited to what the interviewees give for accounts and judgements and how these accounts and judgements allow them to construct their cross-sector partnership as meaningful. Second, because this study relies on investigating only one case of meaning making in and through cross-sector partnerships, the generalizability of the interpretations and claims deduced from the analysis are very limited.

Accordingly, the results presented should not be read as providing general knowledge about the phenomenon of cross-sector partnerships as such, but as providing, theoretically informed patterns identified through conducting interviews and analyzing documents in respect to a unique cross-sector partnership. However, the results presented are grounded in rigorous analysis and systematic and transparent reference to evidence in form of interview and document extracts. In this way they produce context-sensitive knowledge about the specific process of meaning making in a cross-sector partnership,

which provides tentative theoretical concepts that can be used to inform further research and theorizing about other cases of cross-sector partnerships.

However, it seems imperative to not measure the cross-sector partnership as a rational process of efficiently pooling resources and effectively integrating project, organizational and network logics as parts of a smoothly growing, naturally synergetic and expanding organism, yielding evermore benefits for everyone involved. Instead, project, organizational and network logics in a cross-sector partnership need to be acknowledged as constituting substantially different, narrative ways of making sense of the same initiative. They each emphasize different objects of value (tailor-made project results, organizational autonomy and viability, network development), different modes of exchange (professional workshop, public conference, learning program), different roles (professional experts, organizational employer/employee, mentor/student) and organizational relationships (project teams, formal/hierarchical organization, personal/horizontal networks).

This is why we suggest that research in sustainable development in HEIs should more substantially investigate the different professional and organizational identities of the cross-sector partnerships undertaken in the context of a whole institutions approach and more specifically explore the process of narrative boundary-making in between them as that which separates and links the actors in their continuous struggle to make sense of respective professional and organizational identities. We are confident that such research could contribute substantially to better define and implement whole institution approaches in the context of promoting sustainable development in and through HEIs.

However, its explorative investigation into one cross-sector partnership for the promotion of sustainable development in and through a HEI showed that more work is required to understand boundary-making as a narrative process of making sense of whole, i.e., complex institutions such as HEIs. We demonstrated that it is especially worthwhile to focus the whole institution approach more systematically on navigating organizational dilemmas and tensions (as D'Andrea and Gosling suggest [23]) by taking into account how these dilemmas and tensions allow individuals to establish their agency through continuously conversing about dealing with them, and where to draw the line through them, so as to define 'what the story is' and 'what to do about it' [81]. In this way this study suggests to integrate insights from narrative and psychological research in organizational studies into the practice of promoting sustainable development in HEIs through a whole institutions approach. A worthwhile next step in better employing a whole institutions approach in sustainable development of HEIs would be, for example, to integrate Michael White's approach in his work on narrative therapy, in which he worked out a detailed analytical framework and investigative method to explore how people develop ceremonies and cognitive maps to orient themselves and connect to others [82]. Another example is Gavazzi and Fox [83], who use their background in family and marriage therapy to approach partnerships between university and the regional community surrounding it. A further important avenue for future research on the issue of sustainable development in HEIs in general and cross-sector partnerships in context of a whole institutions approach in particular, is the integration of theoretical concepts and methods of cultural psychology and specifically the sub-field of narrative liminality, i.e., the study of boundary-making, border and liminality construction in and through transdisciplinary cross-sector partnerships between universities and non-academic partners. For example, Picione and Valsiner [84] highlight the psychological significance of semiotic borders, demarking separation, differentiation, distinction-making, connection, articulation and relation-enabling. They argue that the border is a narrative tool, which enables actors in organizations to maintain stability and induce transformation at the same time by way of creating an ambiguous and instable "liminal space", and in this way induces creativity, leads to novelty and the creation of new narrative forms of organizing (Ibid.). In a related work Picione and Freda approach the border as a semiotic concept that allows individuals to position themselves to others and the world by creating a dynamic boundary in terms of necessity, obligation, willingness, possibility, permission, and ability [85]. This study has laid a first path, but future studies on sustainable development in HEIs and the whole institutions approach involving cross-sector partnerships would certainly benefit a lot from more systematically integrating

concepts and approaches from organizational (or group) psychology. More systematically focusing on the narrative construction of professional and organizational identities in a complex, interconnected world, would also allow for cross-sector partnerships to become recognized as critical case for studying how individuals organize their professional selves and organizational relationships in late-modern, increasingly digitalized and globalized knowledge societies in which a radically more sustainable form of development has become essential for survival of human civilization on this planet.

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Article

Assessment of Sustainability Governance in Higher Education Institutions—A Systemic Tool Using a Governance Equalizer

Sebastian Niedlich ^{1,*}, Mara Bauer ², Margarita Doneliene ¹, Larissa Jaeger ², Marco Rieckmann ² and Inka Bormann ¹

¹ Department of Education and Psychology, Freie Universität Berlin, Habelschwerdter Allee 45, 14195 Berlin, Germany; margarita.doneliene@fu-berlin.de (M.D.); inka.bormann@fu-berlin.de (I.B.)

² Department of Education, Faculty of Education and Social Sciences, University of Vechta, Driverstraße 22, 49377 Vechta, Germany; Mara.Bauer@uni-vechta.de (M.B.); Larissa.Jaeger@uni-vechta.de (L.J.); Marco.Rieckmann@uni-vechta.de (M.R.)

* Correspondence: sebastian.niedlich@fu-berlin.de

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Abstract: The paper aims to add to the discussion on sustainability governance in higher education institutions by examining the role of sustainability assessment and introducing an assessment tool inspired by systemic thinking and centered on a ‘governance equalizer’. It discusses recent research and argues that the complexity inherent in sustainability governance remains to be addressed adequately. While a number of models and frameworks have been proposed, most of them remain caught between narrow, management-oriented approaches on the one hand, and rather abstract approaches that provide little guidance for improving the field on the other. Sustainability assessment tools represent a potential way to bridge this gap. While there are existing tools which include issues of sustainability governance, these are often limited to aspects that are easily quantifiable and neglect more complex aspects. Against this background, the article proposes an alternative tool to assess sustainability governance in higher education institutions. The tool is based on a multi-case study in Germany and has been tested in a series of workshops. Drawing on the concept of a ‘governance equalizer’, it focuses on the functional requirements of sustainability governance in five dimensions—politics, profession, organization, knowledge, and the public—and how they are addressed by the HEI. The tool raises the level of abstraction in order to capture complexity, but at the same time keeps sight of governance structures, processes, instruments, and practices. It combines clearly defined criteria that are assessed using carefully developed maturity scales with a focus on stakeholder participation and knowledge.

Keywords: sustainability assessment tool; sustainability governance; higher education institutions; systems theory; governance equalizer; politics; profession; organization; knowledge; public

1. Introduction

‘Sustainable development’ (SD) is a widely used term with varying meanings [1]. This paper uses the term to describe efforts to integrate environmental and socio-economic issues in order to meet human needs now and in the future. It involves societal reform and transformation, and a reconceptualization of the relationship of the human race with nature. Higher education institutions (HEIs) are frequently counted among the key players in creating a path for society towards sustainable development. It has been pointed out that this requires a fundamental change in the culture, purpose, policy, and practice of HEIs [2] and a transversal, inter- and transdisciplinary approach, integrating the core HEI domains of teaching, research, campus operations, and outreach [3–5].

A key question which arises is therefore how HEIs can coordinate and steer their actions toward sustainable transformation. This question of sustainability ‘governance’ has been addressed from different angles by a number of studies. While some try to integrate sustainability governance into existing management approaches, others emphasize its complexity and provide more abstract frameworks. Issues of governance also feature in sustainability assessment tools. Such tools appear promising in that they potentially provide a bridge between abstract models and concrete strategies. However, the existing tools have been criticized for addressing only those aspects of governance that lend themselves to quantitative measurement, while other important aspects have been neglected.

Against this background, the article introduces a sustainability governance assessment tool that combines ideas from systemic thinking with the concept of a ‘governance equalizer’: It focuses on functional requirements of sustainability governance in five dimensions—politics, profession, organization, knowledge, and the public—and how they are addressed by HEIs. The tool thereby raises the level of abstraction in order to capture the complexity of the subject, but at the same time does not lose sight of governance structures, processes, instruments, and practices.

The article starts with a short overview of recent research on sustainability governance in HEIs, followed by a discussion of sustainability assessment tools for use in HEIs and of the role of governance issues in such tools (Sections 2 and 3). Section 4 explains how our own assessment tool was developed in the ‘HOCH^N’ project based on case studies in eleven German HEIs and validated in a series of workshops. Section 5 presents the tool in detail and provides some remarks on how to apply it in practice. The paper concludes by discussing three perceived merits of the tool.

2. Sustainability Governance in Higher Education Institutions

The issue of sustainable development in HEIs continues to gain attention in both practice and research. Although recent studies show progress towards sustainable transformation of HEIs, including signs of holistic and systemic approaches [3,6], they also report that efforts are often compartmentalized, and practical integration of sustainable development goals remains difficult [7,8].

These findings raise the issue of sustainability governance in HEIs. Governance can be defined as “the process of steering society and the economy through collective action and in accordance with common goals” [9] (p. 4). Drawing on this definition, we use the term ‘governance’ to denote the process of steering HEIs (and related external actors) through collective action toward the common goal of sustainable development. Questions relating to this process have been investigated in a number of recent studies. Such studies can be categorized into three groups: Case studies, analyses of drivers and barriers, and frameworks and models [3].

Initially, research frequently took on the form of institutional case studies, often of a descriptive nature and with a focus on storytelling [10]. While some case studies discuss different approaches and give recommendations on supporting sustainable development in HEIs (e.g. [11,12]), theoretical advancements from this line of research are few, and its potential for improving the field remains largely unexploited [4,13] (see also [3]).

Other research focuses on drivers of and barriers to change in HEIs. Based on a literature review, Verhulst and Lambrechts [14] identify three clusters of barriers: (1) A lack of awareness, (2) the structure of higher education institutions, and (3) a lack of resources. They also point out recurring drivers in the literature on organizational change management, such as organizational culture, empowerment and involvement, and internal communication. Other scholars highlight the role of campus SD champions [15] or “a dedicated team of ‘sustainability entrepreneurs’, continuous interaction among all HEI actors, the creation of a sustainability office of some kind, a predictable budget, alignment with the topics of the imparted careers, formal networks and open and recurrent communication on sustainability on campus and beyond” [5] (p. 4283). Overall, however, drivers and barriers are often described in a “laundry list style”, without allowing a profound understanding of how they interact and change over time [14] (p. 191).

Frameworks and models of change, by comparison, tend to provide a more comprehensive perspective, although approaches and perspectives vary. A number of publications attempt to link the issue of sustainable development to management strategies and practices in HEIs [16–19]. Some of these draw on the Plan-Do-Check-Act (PDCA) cycle and define key steps in the sustainability process. For example, Velazquez et al. [16] emphasize the importance of developing a sustainability vision and mission, setting up a sustainability committee in order to create policies, targets, and objectives, and develop sustainability strategies.

Other scholars identify phases or stages of sustainable development in HEIs without reference to management strategies or approaches [2,5,20]. Instead, their focus lies on emergent processes in HEIs. Hugé, MacLean, and Vargas [5] (p. 4279), for instance, conceive sustainability implementation as a process of social issue maturation involving four phases: Emergence, popularization, formalization into a governance framework, and maturity (uptake of sustainability as a norm). Models such as this convey a less rationalistic image of sustainable development in HEIs; they also leave more room for different, diverging approaches of sustainability governance. However, due to the high degree of abstraction involved, it becomes more difficult to derive recommendations for sustainability implementation from them.

A kind of middle ground can be found in a contribution by Ferrer-Balas, Buckland, and de Mingo [21]. Drawing on systems thinking, they distinguish three interacting dimensions—the framework (changes in culture, institutional structure, and technology), the level of system change (system optimization, system improvement, system renewal), and the actors (cooperation between different stakeholders)—which can be used to establish and evaluate strategic and operational objectives. One of the strengths of this framework is that it is utilized in combination with an assessment tool—an approach that can also be found in other frameworks and models [14] (p. 189). This appears interesting, as such tools can provide a bridge between rather abstract models and frameworks, and practical action to promote sustainability in HEIs.

Another approach is the use of a governance equalizer. This idea is not new. It can be traced back to Clark’s notion of “pathways of coordination” in higher education [22]. Schimank [23,24] later used the term ‘governance equalizer’ in an allusion to the equalizer in a mixing console or a stereo system, where different dimensions can be turned up or down. He focused on how the introduction of New Public Management (NPM) gradually shifted dimensions of governance in higher education—such as academic self-organization or top-down management. This research interest led to rather specific governance dimensions. In order to broaden their applicability to other research, Brüsemeister and colleagues put forward an alternative set of governance dimensions that encompasses five dimensions: Politics, profession, organization, knowledge, and the public (for an overview, see Brüsemeister [25]). The five dimensions were initially derived from empirical findings, but are also supported by sociological and organizational theory [26,27].

Recently the governance equalizer has been applied to SD in HEIs with the five dimensions conceived as functional requirements that sustainability governance must address if it is to work effectively [28,29]. This approach used the governance equalizer as a heuristic framework for the analysis of sustainability governance in HEIs. While it thus remained open to different approaches and contexts, it did not provide criteria and procedures to assess sustainability governance in HEIs. This paper aims to close this gap by introducing a (self-) assessment tool based on the governance equalizer. To this end, the following section takes a closer look at sustainability assessment in HEIs before turning to the development and specifics of the tool.

3. Sustainability Assessment in Higher Education Institutions

Sustainability assessment tools (SATs), which are deemed an essential component of sustainability processes in HEIs by some scholars (e.g. [4,28]), have been in use for some time. Several studies provide analyses and comparisons of these tools [29–33]. They show that different purposes and functions are associated with SATs. We summarize these into two key functions: An analytical or cognitive function,

and a communicative or social function. The analytical/cognitive function comprises monitoring of an HEI with the aim of measuring what is being done to move toward sustainability and how it is done, to draw comparisons across campus, to assess progress and identify performance gaps and good practice, and to provide knowledge for creating strategies and planning. The communicative/social function includes building bridges among different stakeholders and encouraging an HEI's move towards sustainability by communicating goals and experiences, stimulating reflection, advocating policy change, triggering and supporting organizational change processes, and lobbying government and media to promote campus sustainability.

In addition to functions associated with them, extant SATs also differ in the domains they cover as well as in the underlying methodology. Yarime and Tanaka [30] show that education, research, and outreach are not well addressed by most tools, as their focus frequently lies on operational eco-efficiency and governance issues. This focus has been explained by the fact that aspects of governance and operations “are easily observable and manageable, often with quantitative goals and objectives” [30] (p. 74). However, this does not apply equally to all aspects of governance. Governance indicators in SATs frequently refer to visions, strategies, policies, planning, and initiatives. By contrast, informal and more complex issues—such as faculty development in sustainability areas, implementation of policies, multi-stakeholder involvement in decision-making, and inter- and transdisciplinary approaches—have not been addressed adequately [30] (p. 73 f.).

The choice of methodology is thus crucial for SATs. Quantitative approaches alone have been judged insufficient for sustainability assessment purposes because they are unable to capture the interactions within complex systems [34] (p. 2). It has also been criticized that SATs in HEIs predominantly follow a managerialist approach, which aims to incorporate sustainability issues into existing management accounting practices and, in doing so, fails to question underlying unsustainable patterns [4] (p. 1764). SATs, it has been concluded, should not focus on accountability and control, but on stimulating reflection and change, and the use of qualitative indicators is called for to support this aim [28] (p. 818). At the same time, the issue of subjective bias in qualitative assessment needs to be addressed by engaging all stakeholders, defining clear criteria, and insisting on dialogue and consensus among all involved in the assessment [28](p. 819).

4. Tool Development—Background and Project Design

In the following, we introduce a tool for assessing sustainability governance in HEIs. On the one hand the tool builds on the insights obtained from the literature. On the other hand it draws on empirical data from case studies in eleven German HEIs, which were carried out in the project ‘Sustainability at Higher Education Institutions: Develop—network—report’ [35]. The case studies consisted of 61 face-to-face interviews with different stakeholders (management, sustainability coordinators, student initiatives, technical administration, and academic staff). Inclusion of interview partners followed a selective sampling process. In addition to their time and willingness to participate, criteria for selection included knowledge of and first-hand experience with their institution's sustainability process [36] to ensure that substantial expert knowledge of the sustainability processes of the higher education institutions could be collected. The interviewees were identified and recruited in collaboration with partners within the HOCH-N project and through desktop research. The case studies drew on the concept of a governance equalizer to investigate, inter alia, how the HEIs addressed the functional requirements of sustainability governance (see next section for details).

The interviews were analysed using qualitative content analysis [37]. This included examination of the measures the HEIs took to improve the five dimensions of the governance equalizer, of how progression in each dimension was manifested in institutional arrangements and practices, and of how stakeholders judged the performance of the HEIs in each dimension. By comparing the eleven cases, five levels of progression were defined for each dimension. The findings fed into a preliminary version of the assessment tool, containing a key question and a five-point scale of progression for each governance dimension, along with practical examples for each point on the scales.

The preliminary version of the assessment tool was published as part of a (beta version of a) guide on sustainability governance in HEIs [38]. In a subsequent project phase, the assessment tool was put to the test. To this end, stakeholder workshops were held in several German HEIs which were neither included in the case studies nor in the HOCH-N project. We attempted to include representatives from all stakeholder groups in the HEI, but actual participation from these groups varied. Overall, however, the workshops included feedback from all relevant stakeholder groups. The workshops started out by explaining the five governance dimensions and the assessment scales. Participants were then asked to assess their HEI's performance on each scale and to provide arguments and concrete examples to substantiate their assessment. Furthermore, following the assessment, participants were asked to comment on the comprehensibility and applicability of the tool. The feedback gathered in the validation workshops led to a number of revisions: Comprehensive explanations of the five dimensions were added, definitions of the levels of progression were improved, and additional examples for each point of the scales were included. The description of the tool in the following section reflects these revisions.

5. A Systemic Tool for Assessing Sustainability Governance in HEIs

The design of the assessment tool picks up on some key points discussed above. The tool's main purpose is to support HEIs in their transformation toward sustainability. It aims at providing analytical insight and practical guidance for HEIs while acknowledging the complexity of sustainability governance. In particular, we see the need to ensure an integrated, transversal perspective, to account for the entangled relationships among actors in HEIs, and to recognize the importance of context for sustainability processes and their outcomes. Our approach thus bears a certain proximity to systems thinking (cf. [39] p. 18 ff.). Systems thinking deals with complexity by "increasing the level of abstraction or overview, rather than the conventional reductionist route of examining detail and dividing the issues into smaller parts" [2] (p. 49 f.). The tool follows this prescription to some extent, but attempts to uphold a link with concrete governance structures, processes and instruments.

To this end we approach sustainability governance from a functionalist perspective, as represented by the governance equalizer. As mentioned, the five dimensions represent requirements that sustainability governance must address if it is to work effectively (see also [27,40]). The tool provides a scale for each governance dimension. Some of the criteria and examples in the scales lend themselves to quantification. However, such quantitative indicators alone do not provide sufficient information to assess the state of sustainability governance. Qualitative information—for example, on the quality of multi-stakeholder interaction, the creation of a common understanding of sustainability, or the transfer and use of knowledge—is also required. To allow a comprehensive assessment, the tool uses clearly defined criteria that are assessed using carefully developed maturity scales (cf. [41,42]). It thus provides a means to analyze the existing status of sustainability governance, to identify areas for improvement and, by being applied repeatedly, to assess progress in governance.

This section provides an overview of the five dimensions and how they are accounted for in the assessment tool. Each subsection begins with a definition of the respective governance dimension. This is followed by the five-point scale used to assess progress in the dimension, including definitions, key aspects, and practical examples for each point on the scale. Finally, points of particular interest are discussed, including issues raised in the validation workshops.

5.1. Politics—How is Sustainability Entrenched and Legitimized in the HEI?

This dimension deals with the question of how sustainability can move beyond individual support points and be embedded long-term on the HEI's agenda. The term 'politics' in this context does not (primarily) refer to political institutions outside the HEI, but to actors within the HEI who need to take formal and informal decisions regarding internal goals, structures, procedures, and measures, as well as membership of external networks in the context of sustainability. Collectively binding decisions

lend justification to and offer guidance for actions toward sustainability, and provide criteria to judge their success.

On the lowest level of progression in this dimension, support from decision-makers for SD-related activities is merely granted unofficially (see Table 1). The next level includes public, official commitment to the goal of sustainability. On the following levels, sustainability is subsequently codified as an institutional goal (becoming more and more independent from the support of key individuals), broken down to different HEI domains, linked to responsibilities and resources and, finally, operational measures are defined and their implementation and effects assessed.

Table 1. Assessment scale: ‘Politics’.

Level	Definition	Examples
5	The objectives of the sustainability process are translated into <u>binding, operational measures and their implementation and effects are evaluated.</u>	<ul style="list-style-type: none"> - Agreements on sustainability-related targets have been set and implemented. - Procurement agreements include concrete sustainability-related provisions and criteria. - Binding decisions to include sustainability in research have been taken. - Administrative sustainability units and steering bodies are mandated to approach and involve other HEI staff to pursue sustainability-related goals - Sustainability-related evaluation, accountability, reporting, and control instruments and practices are established - Sustainability-related auditing/certification takes place. - Binding operational measures in different domains have been introduced.
4	The goal of sustainability is broken down to and <u>embedded in different domains.</u>	<ul style="list-style-type: none"> - Issues of sustainability are included in procurement directives. - (Domain-specific) strategies are available and include sustainability-related objectives. - Sustainability is included in the HEI’s charter. - Responsibilities for sustainability issues and tasks have been assigned. - Concepts and/or guidelines on sustainability have been developed.
3	Sustainability is codified—in a non-binding form—as a <u>general goal</u> of the HEI.	<ul style="list-style-type: none"> - Sustainability has been included in the HEI’s mission statement and has thus been established as a task independent from individual agents in the HEI. - Sustainability features in the HEI’s name or in the name of one or more of its organizational units. - Agreements about participation/membership in inter-organizational networks among HEIs have been signed by the HEI.
2	Decision-makers in the HEI <u>publicly voice</u> their <u>commitment</u> to the goal of sustainability.	<ul style="list-style-type: none"> - Public declarations stating the commitment of decision-makers in the HEI to sustainability exist. - Decision-makers in the HEI openly support existing initiatives towards sustainability.
1	Individual decision-makers in the HEI recognize and support sustainability-related activities in <u>informal and non-public ways.</u>	<ul style="list-style-type: none"> - There are informal, non-public declarations of intent and commitment to sustainability.

On the lower levels, the scale emphasizes the role of decision-makers. It is important to clarify that this term does not exclusively refer to top-level management in the HEI, but encompasses all members of the HEI that take part in decisions on goals, priorities, resource allocation, etc. The emphasis on decision-makers echoes the important role that is attributed in parts of the literature

to decision-makers in general and of top management in particular. In our view, this role should not be overestimated, however. Managers of course have an important role to play, but while their leadership can be a necessary condition of success, it is hardly sufficient. Instead, successful transformation requires that the goal of sustainability should spread throughout the entire organization and must be translated into concrete decisions and actions. The upper levels of the scale reflect this imperative. Furthermore, it is important that binding decisions should not be confused with centralized, top-down decision-making. Decisions can be arrived at via both hierarchical as well as participative decision-making processes, and, in many instances, broad stakeholder participation may well be more conducive to the sustainability process.

5.2. Profession—How are Different Professional Perspectives and Competencies being Connected?

The dimension ‘profession’ focuses on the development of an interdisciplinary and transversal understanding of sustainable development in the HEI. The different domains—education, research, campus, and outreach—are marked by different demands, processes, and framework conditions. As a result, they require specific competencies and knowledge, and exhibit specific standards and cultures. Similarly, differences among academic disciplines as well as among external actors related to the HEI can be observed. Moving towards sustainability necessitates a cross-cutting dialogue about what SD should encompass, what principles and standards should apply, and how SD can be integrated in everyday practices in the different domains and disciplines.

On the lowest level of progression, this involves reflections on issues of sustainability by individuals in specific domains or faculties (see Table 2). A next level is reached when groups of individuals in a domain or in a faculty jointly reflect on sustainability. Higher levels include an exchange of ideas and perspectives across domains and/or disciplines, eventually resulting in a common position on sustainability which, ultimately, is reflected in everyday professional actions and joint (interdisciplinary and transversal) activities.

Table 2. Assessment scale: ‘Profession’.

Level	Definition	Examples
5	A common understanding of sustainability is reflected in inter-/transdisciplinary and transversal practices within the HEI and beyond, and such practices are a defining trait of the HEI.	<ul style="list-style-type: none"> - Inter- and transdisciplinary courses and research projects are continuously developed and refined. - Sustainability is a mandatory course content for all students at the HEI. - Transdisciplinary activities (such as project workshops, Real-World Laboratories) within the HEI and together with external actors are realized on a continuous basis. - Sustainability serves as a criterion in appointment procedures. - There is a range of trainings on sustainability-related issues that are mandatory for HEI staff. - Permanent and temporary academic positions in transdisciplinary research on sustainability have been created.
4	Actors across disciplines and domains have developed a common understanding of sustainability, which they continuously review and revise.	<ul style="list-style-type: none"> - A common understanding of sustainability for the whole HEI (e.g., in the form of a mission statement) has been developed. - A joint transversal position on sustainability has been established. - A sustainability strategy exists.
3	A dialogue on sustainability across different domains and across disciplines takes place.	<ul style="list-style-type: none"> - Different formats of interdisciplinary exchange (such as a research platform) have been established. - Conferences and symposia on sustainability-related issues are held. - Interdisciplinary lecture series, colloquia, degree courses, and research projects addressing issues of sustainability are carried out.
2	Sustainability issues are addressed collectively within individual faculties or domains.	<ul style="list-style-type: none"> - Sustainability issues are addressed by environmental management. - Teachers at a faculty collaborate to strengthen/include sustainability in the faculty’s courses.
1	<u>Individual actors</u> within separate faculties or domains address issues of sustainability.	<ul style="list-style-type: none"> - Individual researchers or research projects focus their work on sustainability issues. - Individual teachers address sustainability in their courses. - Individuals from other stakeholder groups work on sustainability-related issues.

Examples in the ‘profession’ scale frequently refer to professional practices such as academic courses or environmental action. This is particularly pertinent for Levels 1, 2, and 5. Finding a few of these or similar examples in an HEI, however, can hardly be seen as progression of the HEI as a whole. The assessment must therefore also include the institutional spread of such practices.

In this context, it also needs to be stressed that some of the examples, such as courses focusing on sustainability, are important steps toward an education for sustainable development. In the context of the assessment tool, however, this aspect is not of particular interest. By contrast, changed practices are important because they indicate a transformed professional understanding, which can form the basis for joint action and institutional transformation.

Part of this is the process of aligning different ways of understanding of sustainability. Importantly, this does not mean that a single, unified understanding should be achieved. Both case studies and validation workshops repeatedly showed the need to leave room for diverging professional perspectives. Nonetheless, it is important for HEI stakeholders to come to an agreement that allows joint action. To this end, it might be helpful to settle on a set of normative boundaries within which all stakeholders can pursue their different professional rationales.

5.3. Organization—How are Cooperative Work and Task Performance Made Possible?

Moving HEIs towards sustainability requires breaking down sustainability-related goals so that concrete actions can be taken. This includes the provision of adequate resources and creating structures and procedures that ensure continuous and reliable work. What is more, actions must extend beyond existing organizational boundaries, and interdisciplinary and transversal networks and coordination of activities play an important role. Networking involves actors exchanging views and knowledge and cooperating, whereas coordination aims to ensure coherence and synergies between sustainability-related activities. Overarching coordination does not necessarily mean centralized control, however. Rather, it can also aim to support decentralized initiatives in order to maximize their effectiveness.

At the lowest level of this dimension, individual actors in an HEI take actions towards sustainability (see Table 3). On the subsequent levels, such actions are channeled through projects or other initiatives, structures, and procedures are created to facilitate networking, and resources are provided to coordinate sustainability-related activities. While such provisions are often temporary and rely on specific (competent, motivated, well-connected) persons, at the highest level of this dimension, networking and coordination are established as a permanent function in the HEI and backed by regulations and long-term allocation of resources.

Table 3. Assessment scale: ‘Organization’.

Level	Definition	Examples
5	Firmly established (yet flexible) institutions and processes for the <u>coordination</u> of sustainability-related activities exist on a <u>permanent basis</u> .	<ul style="list-style-type: none"> - Permanent functions/staff positions to ensure coordination and networking independent of specific individuals have been created. - Other sustainability-related tasks and objectives have been codified and permanent staff positions have been created to ensure implementation. - Management functions have been expanded to all domains (from environmental to sustainability management). - Procurement throughout the institution is based on binding sustainability-related directives.
4	<u>Resources for coordination</u> of sustainability-related activities are provided on a <u>temporary basis</u> .	<ul style="list-style-type: none"> - A central coordination unit for sustainability-related issues has been established on a temporary basis. - Institutions such as green offices or similar contact points have been set up. - Temporary posts are in place in the administration for the performance of sustainability-relevant tasks.
3	Structures and procedures exist to facilitate <u>networks</u> among sustainability initiatives in the HEI.	<ul style="list-style-type: none"> - Networking and dialogue across faculties and domains (possibly including external stakeholders) have been institutionalized, e.g., in the form of round tables, working groups, commissions, or other authorized bodies. - Networks and communication platforms to ensure dialogue and cooperation with external actors exist.
2	Sustainability-related <u>actions</u> are taken <u>collectively</u> within separate faculties or domains.	<ul style="list-style-type: none"> - Decentralized procedures to align sustainability-related actions in the HEI exist (no overarching coordination). - Projects and initiatives are carried out independently, without coordination across faculties or domains.
1	Actions towards sustainability are taken by <u>individual actors</u> in the HEI.	<ul style="list-style-type: none"> - Individual students or academic or administrative staff members carry out sustainability-related activities.

In total, the examples provided in the scale deal with collective capacity for action and how action can be directed towards sustainability through rules, incentives, etc. Many of the examples refer to

structures that need to be in place for this purpose, such as committees, coordination units, or staff positions. The formal existence of such structures by itself, however, does not guarantee effective action. When assessing the ‘organization’ dimension, it is therefore necessary to reflect how these structures work in practice and to judge if they actually serve their purpose. This would include, for example, analysing the quality of interaction in a committee or the actual mandate of a coordinating unit and the barriers that it might encounter in its work.

5.4. Knowledge—How is the Necessary Knowledge Generated and used Competently?

Sustainable development calls for complex knowledge management. For joint action, actors in HEIs must develop a common understanding of the problems to be addressed and their causes (systems knowledge), they must agree on a judgment of the current situation and set goals for the future (target knowledge), and they must identify ways to solve the problems at hand (transformation knowledge). In addition to technical expertise, this requires knowledge about actors, structures, and processes in the HEI in order to determine the preconditions for successful implementation. Furthermore, it is insufficient for effective sustainability processes to draw upon knowledge in the HEI on an ad hoc basis. Instead, the HEI needs to create ways to continuously identify, generate, disseminate, and utilize knowledge in order to react adequately to emerging problems and facilitate longer-term learning processes. In addition to technical solutions, this calls for participation and networking to support knowledge transfer.

On the first level of progression in this dimension, the relevant knowledge is held by a limited number of individuals (see Table 4). On the next level, the existing knowledge is documented and made available to other actors. While in this case knowledge only flows in one direction, the subsequent levels increasingly include the mutual exchange and joint creation of knowledge. This involves creating opportunities for knowledge transfer, joint problem-solving activities and, ultimately, building the capacity to continuously process and use knowledge to support the sustainability process in the HEI in a longer-term perspective.

It was mentioned before that in assessing structures, the actual working processes associated with them need to be taken into account. This is especially relevant for the ‘knowledge’ dimension. The structures and procedures listed above are merely the ‘containers’ that serve to facilitate knowledge work in the HEI. Consequently, the existence of such informal and formal structures, while an important prerequisite, is merely the starting point, and the contents and processes of this knowledge work and their quality should be at the centre of the assessment in this dimension.

Table 4. Assessment scale: ‘Knowledge’.

Level	Definition	Examples
5	Structures and procedures for <u>continuous joint knowledge work</u> are used to <u>support the sustainability process in the long term</u> .	<ul style="list-style-type: none"> - Dialogic forms of cooperation (e.g., committees) exist that provide room to work on sustainability-related issues in a long-term perspective (independent of present problems that require short-term solutions). - Comprehensive knowledge (inventory, analysis of problems and causes, analysis of actions and their effects) is generated and used to support the management and coordination of the sustainability process. - Sustainability reporting is linked to concrete sustainability-related measures and goals.
4	Structures and procedures for <u>joint knowledge work aiming at (short-term) solutions to present problems</u> are in place.	<ul style="list-style-type: none"> - Dialogic forms of cooperation (e.g., committees) exist that provide room to work on concrete actions toward sustainability (e.g., events, guidelines, courses, or projects). - Evaluations of specific activities/measures are carried out. - Sustainability reporting provides an analysis of sustainability-related issues and challenges.
3	Opportunities for <u>knowledge exchange</u> are in place.	<ul style="list-style-type: none"> - Research platforms that enable the sharing of individual knowledge have been created. - Conferences and colloquia on sustainability-related issues take place. - Transformative, participative, interactive courses focusing on sustainability issues are carried out.
2	Knowledge is <u>documented and made available</u> (unidirectional, without dialogue/exchange).	<ul style="list-style-type: none"> - A sustainability report is published. - Libraries and databases provide sustainability-related literature and information. - Sustainability-related training for employees and researchers is available. - Individual lectures and seminars on sustainability-related topics are held. - Handouts and guidelines on sustainability are provided, e.g., by the administration. - Formats such as newsletters or websites on sustainability exist.
1	Relevant knowledge is <u>limited to individuals and/or projects</u> and is not taken up by the HEI.	<ul style="list-style-type: none"> - Knowledge on sustainability issues is generated individually, e.g., thesis papers or research projects.

5.5. The Public—How is Awareness of the Need for Sustainable Development Achieved in HEI?

Making sustainability initiatives visible in public is an important part of sustainability governance in HEIs, because doing so creates the opportunity for stakeholders to observe issues, positions, activities, and their results, and to react to them. For instance, actors in HEIs can contribute to increased awareness and participation by demonstrating the need for action, communicating goals and measures, and reporting on progress made. Public attention also helps to reinforce the importance of sustainable development both within and outside the HEI, and to communicate sustainability as part of the HEI’s profile in relation to (potential) students and external partners.

On the lowest level, the public dimension involves active communication about sustainability by a small circle of individuals, mostly in their immediate professional surroundings (see Table 5). The second level is reached when individual faculties or other organizational units pursue a targeted communication approach. On the third level, such an approach addresses the whole institution as well as the external public. Ideally, this leads to sustainability becoming a characteristic part of the HEI’s identity and, ultimately, the HEI’s profile.

Table 5. Assessment scale: ‘The public’.

Level	Definition	Examples
5	Sustainability is a central distinguishing feature of the HEI, both internally and externally.	<ul style="list-style-type: none"> - Specific faculties, departments, or the HEI as a whole carry the term sustainability in their names. - When new professorships are advertised, they are specified with sustainability in mind. - Local sustainability-related debates are taken up and shaped by members of the HEI. - Sustainability research and teaching are attractive for students and teachers.
4	Sustainability is a visible part of the HEI’s conception.	<ul style="list-style-type: none"> - Sustainability is included in the HEI’s mission statement. - The HEI awards sustainability prizes. - Sustainability-related courses, lectures, and other events are open to external interested parties (pupils, senior citizens, etc.). - A sustainability report is published.
3	A coordinated approach exists to communicate sustainability issues within the whole institution and to the general public.	<ul style="list-style-type: none"> - Research platforms that enable the sharing of information on sustainability-specific issues have been created. - Conferences and colloquia on sustainability-related issues take place. - Transformative, participative, interactive courses focusing on sustainability issues are carried out. - The HEI’s website provides information on its sustainability-related goals and activities.
2	Targeted measures are carried out by organizational units to communicate sustainability issues.	<ul style="list-style-type: none"> - Sustainability-related issues are addressed in newsletters by faculties, while administrative departments or projects address sustainability issues in newsletters or at specific events, press conferences, etc.
1	A small circle of individuals actively engages in (informal) communication about sustainability issues.	<ul style="list-style-type: none"> - Sustainability-related information is passed on to those directly affected (e.g., energy-saving in the administration). - Committed stakeholders share sustainability-related information with their colleagues.

Making sustainability part of the HEI’s public image was a particular point of discussion in the validation workshops. While the case studies included HEIs that built their entire identity around the issue of sustainability, some workshop participants argued that this was impossible for larger HEIs, which can’t focus solely on a single issue and for which it is more difficult to raise awareness of sustainability issues throughout the institution. The revised scale reflects these concerns, but also maintains that incorporating sustainability in an HEI’s identity, both internally as well as in its public image, is an important functional requirement for the transformation toward sustainability.

5.6. Working with the Assessment Tool

The main function of the tool does not lie in objective measurement and assessment of sustainability governance, much less in providing the basis for benchmarking among HEIs. Its primary purpose is to enable stakeholders in an HEI to attain a comprehensive picture of sustainability governance that is grounded in systematic analysis, includes different perspectives, and draws on different types of knowledge. In this way, it facilitates dialogue among stakeholders and promotes agreement on both the existing status and the way forward. Furthermore, while some of the information required for the assessment can be obtained from official documents such as strategy papers, sustainability reports, or procurement directives, the knowledge of different stakeholders in the HEI is the key source for a comprehensive assessment.

Against this background, a participatory approach that involves all stakeholder groups in the HEI is recommended. This can take the form of stakeholder workshops (as used in testing the assessment tool) or similar formats. In addition, the test phase showed that it can be helpful to take stock of sustainability governance before carrying out a stakeholder workshop and to present an overview (possibly coupled with a preliminary assessment) to the workshop participants. By doing so, participants are provided with a shared knowledge base and a more structured discussion is facilitated.

The analysis should cover all domains in the HEI (education, research, campus, and outreach). It is not to be expected that sustainability governance will be equally developed in all domains. For example, there might be far-reaching governance structures in place in campus management, but not in education or research. It is therefore important to look at each domain specifically. Some participants in the validation workshops even suggested conducting a separate analysis for each domain. However, we believe that the concept of sustainable development requires a whole-institution approach and that all domains should therefore be included in an integrated analysis.

The assessment process starts out by identifying elements of sustainability governance in the HEI that are relevant for one or several of the five dimensions, and assessing their contribution to those dimensions. This includes the following steps:

1. Creating an overview of existing governance elements (gathering information on all elements of sustainability governance).
2. For each governance dimension: Checking which elements are relevant (assigning all relevant elements to the respective dimension(s)).
3. For all elements assigned to the respective dimension: Evaluating the contribution of each element (assigning a score on the assessment scale).

The examples listed in the assessment scales provide some orientation for identifying and assessing governance elements. It is important to be aware, however, that in the end they are just that—examples. This means that effective sustainability governance does not require that all examples from the scales are in place or that forms of sustainability governance should be limited to these examples. On the contrary, the analysis needs to be open to specific approaches in the HEI that may differ from the examples.

The results of the analysis can be documented by creating a table for each governance dimension that lists all elements of sustainability governance assigned to each point on the scale (using the assessment scales as templates). As above, this can lead to a number of examples at each level of a scale. The analysis then moves on to the next steps:

4. Conducting an overall assessment in each dimension (determining a score).
5. Identifying the strengths and weaknesses of sustainability governance in the HEI and the requirements for action.

Determining a score for each dimension requires weighing the relative importance of different governance elements, and should be based on discussion among stakeholders. While the assessment scores are thus not objective, they are grounded in the stakeholders' expertise and undergo intersubjective validation. Together, the scores from the five governance dimensions provide a comprehensive assessment of sustainability governance in the HEI. Forms of visualization such as a spider diagram can be used to illuminate the relative strength of the five governance dimensions. It is then up to the stakeholders in the HEI to discuss how the situation should be judged, if one or more governance dimensions needs to be intensified, and how this could be achieved.

6. Discussion

The governance equalizer focuses on the functional requirements that sustainability governance needs to address if it is to work effectively. Framing these requirements in the form of the governance equalizer suggests that HEIs can influence—'turn up' or 'turn down'—the level of each dimension

in their institution—and that turning up one or more dimensions will increase the chances of successful sustainability processes. Elements of governance—structures, processes, instruments, and practices—can thus be analyzed by asking if and how they contribute to these functional requirements. This approach, in our view, has several advantages.

Firstly, by considering different functions, the analysis facilitates a multi-dimensional understanding of governance elements, instead of limiting them to a single purpose. For instance, sustainability reporting can provide an information base ('knowledge') for decisions about a sustainability strategy and to judge its success ('politics'). At the same time, the process of gathering data, assessing progress, and writing the sustainability report could change stakeholder understanding of sustainability and their own role in moving toward it ('profession'). Furthermore, publication of the report could raise overall awareness of sustainability issues ('the public'). Sustainability reporting could thus affect several governance dimensions to different degrees—and its main impact might differ from what would be expected at first glance.

Secondly, by focusing on functions we avoid any overemphasis on individual elements and ask instead if and how the mix of different elements provides a basis for effective governance. For example, parts of the literature highlight the role of sustainability 'champions'. This is also reflected in the assessment tool, as several of the definitions and examples make reference to dedicated and influential individuals. However, the assessment scales also illuminate the complexity of the task of moving HEIs toward sustainability, and demonstrate the multitude of other pieces that also need to be put into place. In the process, rather than depending on individual actors, sustainability has to become institutionally embedded through a number of complementary elements.

Thirdly, the functional perspective offers a way to analyze the divergent governance structures and processes that the HEI creates on the basis of specific institutional cultures (cf. [43]) under a common framework. Instead of looking for 'the best way', the assessment tool leaves room for different approaches to sustainability governance that might be effective (in specific contexts), and thus creates the possibility of identifying 'functional equivalents'. While this can also be done for individual elements of sustainability governance, it applies in particular to the combination of several elements, i.e., the governance mix that underlies an HEI's sustainability process.

The assessment tool aims to create some middle ground between quantitative, objective measurement and the need to capture the more complex aspects of governance. To this end, on the one hand, the analysis is based on clearly defined criteria that are assessed using carefully developed maturity scales (cf. [41]). On the other hand, the tool puts a strong emphasis on the participation of stakeholders in HEIs. These are not just important sources of information—assessing the five governance dimensions ultimately relies on their judgment. We concur with some of the literature that the inclusion of different perspectives in this process represents a way of ensuring its quality, as the chances of avoiding one-sided judgments improve. However, this does not mean that stakeholders need to agree on all issues. In fact, as systems thinking teaches us, it can be useful to deliberately seek out differences in order to achieve a better understanding of the situation [39] (p. 12). In this sense, identifying areas of disagreement can be an important part of the assessment and provide clues for improvements.

Of course, governance in HEIs is only one element of their transformation to sustainability, but one that should support fundamental changes in an HEI's core domains. Sustainable development in these domains can also be supported by sustainability assessment tools. It is the aim of this article to provide the means for a more refined analysis of sustainability governance. This does not mean that other domains should be neglected, however. In fact, it could be both useful and feasible to use more than one assessment tool to support sustainability processes in HEIs [28] (p. 819).

7. Conclusions

This article introduced a sustainability assessment tool centered on five governance dimensions. While these dimensions have been drawn on for analytical purposes, they do, of course, also include

a normative component. They are based on the premise that attaining sustainable development is desirable and that, in order to do so, organizational boundaries need to be bridged, perspectives aligned, overarching coordination ensured, and so on. These assumptions are in line with much of the literature on sustainable development as well as with governance literature in general. Nonetheless, they, too, should be subject to further empirical research. Future insights might therefore require a revision of the functional norms represented by the five dimensions. Moreover, the dimensions and examples were derived exclusively from empirical cases and workshops in German HEIs. The applicability of the assessment tool for HEIs in other countries, especially in the Global South, remains to be empirically investigated.

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Article

Transfer for Sustainable Development at Higher Education Institutions—Untapped Potential for Education for Sustainable Development and for Societal Transformation

Benjamin Nölting ^{*}, Heike Molitor, Julian Reimann [†], Jan-Hendrik Skroblin ^{‡,§} and Nadine Dembski

Faculty of Landscape Management and Nature Conservation, Eberswalde University for Sustainable Development, Schicklerstr. 5, 16225 Eberswalde, Germany; heike.molitor@hnee.de (H.M.); julian.reimann@netzwerk-n.org (J.R.); jan-hendrik.skroblin@posteo.de (J.-H.S.); nadine.dembski@hnee.de (N.D.)

^{*} Correspondence: benjamin.noelting@hnee.de

[†] Current address: netzwerk n e.V., Berlin, Germany.

[‡] Current address: Coordinator for development policy of the district office of Spandau, Berlin, Germany.

[§] The views expressed in this paper are this author's personal views.

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Abstract: Higher education institutions (HEIs) are increasingly confronted with societal needs beyond research and teaching. These include sustainable development and technology transfer as well as the practical application of knowledge and ideas. Several HEIs already put sustainable development and transfer into practice. These practitioner–university partnerships comprise a broad range of actors, disciplines, topics, and formats. However, transfer activities that contribute to sustainable development in society still make up only a very small part of HEIs' activities. In response to calls from society as a whole, HEIs could combine transfer and sustainable development more systematically. In this article, we suggest a concept of transfer for sustainable development. The focus is on sustainability transfer in teaching. We used mixed methods for this conceptual work: exploratory workshops, expert interviews, and a case study of transfer in teaching. One of the results presented in this article is a working definition of sustainability transfer at HEIs. In addition, six characteristics for describing sustainability transfer in its various forms are formulated. This conceptualization makes it possible to analyze the diversity of HEIs' sustainability transfer activities, it helps to identify and encourage potential transfer actors at HEIs as well as practitioners, and, thus, tap the full potential of sustainability transfer.

Keywords: sustainable development; higher education institutions; university; transfer; practitioner–university partnership; societal impact; education for sustainable development

1. Introduction: Linking Transfer and Sustainability at Higher Education Institutions

Higher education institutions (HEIs) or universities (which include universities of applied sciences), can make important contributions to sustainable development if they structure their teaching, research, and operational tasks to be sustainable. In keeping with a whole institution approach, the initial focus is on the internal relationships within the organization. This article broadens the viewpoint as it addresses the external relationships of universities, i.e., their interactions with actors outside the university system. The latter are referred to hereinafter as practitioners.

This view from the outside is in line with a trend in recent years that societal actors are placing new demands on universities in Germany that go beyond the core tasks of teaching and research. The intention is therefore to intensify and improve the transfer of knowledge, ideas, and technologies

to society. The goal is to enable knowledge developed at universities to be applied more directly and more rapidly in practice, thereby satisfying mainly specific societal needs. This is also discussed under keywords such as societal impact or third mission [1,2]. Furthermore, universities are called on to become active in the area of sustainable development and to research, teach, and become more sustainable themselves to serve the common good [3].

This article links the areas of transfer and sustainable development focusing on transfer for sustainable development—in short, sustainability transfer. This is seen as having great potential for development because solving sustainability problems requires cooperation between actors from very different sub-systems in society. Universities can contribute theoretical and empirical knowledge, methodological competence, criticism, and reflectivity to achieving this goal. This is associated with a claim by universities to contribute to shaping sustainable development in society through cooperation between practitioners and universities, always understood as an extension and differentiation of the university system, not as a normative guideline for academia [4]. Many stakeholders in universities propose a role change in this process. While they are aligned with the academic system in terms of teaching and research, in the case of sustainability transfer they are dependent on cooperation with practitioners and are one of many societal actors [5]. They operate in a field that is determined by societal problems and demands and where they are confronted with “real life”. This necessitates an inter and transdisciplinary approach because specialized disciplines cannot sufficiently address the complexity of social-ecological systems. The challenge to scientific thinking that this involves can provide impetus for sustainable development, but there are certain prerequisites.

A broad range of sustainability transfer activities can be observed at HEIs, such as in research and teaching in two cases in Germany: the Leuphana University Lüneburg implemented the *Innovation Incubator* (2009–2015), a research driven project for regional development where about 250 researchers implemented 45 regional projects (<https://www.leuphana.de/koooperationen/regional.html>); the Eberswalde University for Sustainable Development has established the *InnoForum Ökolandbau Brandenburg*, a regional network of about 80 organic farmers and businesses along the entire organic supply chain, allowing for on farm teaching in the universities’ organic farming programs (<http://innoforum-brandenburg.de>). Other examples include the *School of Sustainability* at the Arizona State University that links academics with practitioners in the community who are implementing sustainability solutions (<https://schoolofsustainability.asu.edu/about/school-of-sustainability/>) and the *Community Engaged Learning* program of the University of Toronto where students work for 5–7 hours per week with a non-profit organization or social enterprise specialized in front-line service provision, community-based research, community development, or educational work (<http://www.newcollege.utoronto.ca/academics/new-college-academic-programs/community-engaged-learning/>).

These inspiring examples raise the question of how to grasp the diversity of such practitioner–university partnerships. It is helpful to understand how sustainability transfer works, what universities are already doing, and where development potential exists, but also where there are limitations. How can such cooperation be described, analyzed, and, if necessary, further developed? This paper therefore aims to present an initial conceptual description of sustainability transfer for universities in Germany. This will enable relevant activities at universities to be identified, made visible, and analyzed in detail.

In view of the diversity of sustainability transfer [6], the focus here is on sustainability transfer in teaching so that the conceptual ideas can be tied to a specific area of focus. Several case studies of transfer in teaching point to an enormous potential for concrete, low-threshold contributions to sustainability with students as transfer actors [7–10]. However, such teaching approaches have so far received little attention in HEIs as a whole and their potential remains untapped. Against this background, the article examines the question: How can sustainability transfer at universities be described in conceptual terms using the focal area of teaching as an example?

To answer this question, Section 2 looks at the position of transfer and sustainable development in university practice. The methodological process used for the qualitative empirical investigation is then

outlined (Section 3). Section 4 presents the empirical results, which are used to derive a conceptual description of sustainability transfer (Section 5). Finally, this draft concept is discussed in the context of its implementation in teaching and the whole institution approach (Section 6).

2. Background of Sustainability Transfer—Positioning in University Discourse and Practices

The conceptual description of sustainability transfer is meant to tie in with the practices and discourse of universities with a view to making it compatible with day-to-day university operations. Consequently, the focal areas of transfer and sustainability are explored in the context of (a) discourse on university policy, (b) practical implementation, and (c) scientific approaches relevant to the actors involved. The idea of sustainability transfer is positioned against this background.

2.1. Transfer as a Focal Area

Transfer has gained in importance in *higher education policy discourse*. The German Council for Science and Humanities stresses the practical orientation of transfer, whereby scientific knowledge is to be applied “as broadly as possible” through cooperation [11] (p. 35). The German Federal Ministry of Education and Research (BMBF) is also attaching increasing importance to transfer in this sense [12]. An important role is played here by the “*Innovative University*” funding initiative to promote a research-based transfer of ideas, knowledge, and technology from universities of applied sciences, and small and medium-sized universities. Since 2018, 48 universities have received funding in 29 transfer and innovation projects. State ministries also want to improve cooperation between academia and the private sector, policymakers, and civil society; for example, the State of Brandenburg with its transfer strategy [13].

Many individual actors are involved in *practical implementation*, they pursue the most diverse facets of transfer, with a wide range of different partners from practice. Just as diverse are the forms of implementation, such as technology and knowledge transfer, further training, consulting, participation in social and cultural life, participation in policymaking, science communication, contracts with companies, public agencies, and municipalities, etc. [14] (p. 13). At universities of applied sciences, transfer has a long tradition, especially with companies.

Many universities have established transfer offices or transfer centers to provide targeted support for these kinds of activities. The transfer audit of the *Stifterverband für die Deutsche Wissenschaft*, a German organization that seeks to address challenges in science, research, and higher education, in which 33 German universities participated between 2015 and 2018, provided stimulus for discussion of the issue. In the meantime, several universities have defined their own transfer strategies, which were prompted, among other things, by the transfer audit and the “*Innovative University*” funding initiative, which made a transfer strategy a prerequisite for submitting applications.

The understanding of transfer has changed. This is relevant for the *conceptualization* of transfer of universities. The traditional understanding is based on technology transfer, which involves transferring scientific and technical findings from research to companies for use in the production process [14]. The term has been expanded to include knowledge and research transfer, which means the transfer of research findings from all scientific disciplines for use in companies, but also in municipalities, public administration, and civil society actors, including policy consultation. Regional economic clusters and innovation systems around universities and research institutions are examples of this definition of transfer [15]. Against this background, Roessler et al. [14] characterize transfer as reciprocal relationships in which the activities of universities have a direct impact on society and the economy and vice versa, as trends from the private sector and society are reflected in the university [14] (p. 39).

Even broader is the concept of the third mission. Alongside teaching and research, this “*third mission*” is defined by higher education institutions as interaction with external actors outside the university, which relates to societal needs and which cannot be met by conventional teaching and research alone, but is at least loosely associated with them [1] (p. 18). The third mission includes involvement in society (including cultural, social, and environmental activities), technology and knowledge transfer (including science communication, policy advice), and further education [1,2].

There is a big overlap with similar concepts like the social responsibility of universities, entrepreneurial university, societal collaboration, service learning, living labs, etc. [6]. Trencher et al. criticize that the focus of the third mission is often narrowed down to economic contributions, namely through technology transfer. For this reason, they suggest as a fourth mission the co-creation of sustainability, characterized by collaboration with diverse social actors, to create societal transformation in a specific location, region, or societal sub-sector and based on the values of sustainable development. This fourth mission is more than a mere offshoot of the third mission—it is a differing but compatible mission on its own [6].

2.2. Sustainable Development as a Focal Area—with the Focus on Teaching and Education for Sustainable Development

The *higher education policy discourse on sustainable development* is shaped by the United Nations Sustainable Development Goals (SDGs) and the UNESCO World Programme of Action on Education for Sustainable Development (ESD) (2015–2019), which is specified in more detail in the National Action Plan for the implementation of the World Programme of Action for Germany [16] and the recent UNESCO framework “Education for Sustainable Development: Towards achieving the SDGs” (2020–2030) [17].

The BMBF has been supporting sustainability research for about 20 years now, with funding priorities including socio-ecological research, the Research for Sustainability program (FONA), and the Sustainability in Science Initiative (SISI). In this context, the BMBF specifically supports sustainability activities of research organizations (*LENA project*), students (*netzwerk n*), and universities through the collaborative project Sustainability at Higher Education Institutions: HOCH^N, around which a network of sustainability actors from more than 100 German universities has formed in the meantime. As the representative body of higher education institutions in Germany, the German Rectors’ Conference (HRK) 2018 declared its commitment to firmly enshrine the goal of sustainability at German universities along with a culture of sustainability [3].

Given the many definitions of sustainability, one challenge in the *practical implementation* of sustainability is to clarify the underlying understanding of the term, to incorporate it into university operations, and make it explicit so that it is accessible for scientific analysis and criticism. Possible starting points could be the guiding sustainability principles of individual universities or a university-wide understanding of sustainability, such as the one developed in the collaborative HOCH^N project [18]. The same applies to the reflective framework for research in social responsibility of non-university research institutes [19]. Another conceivable point of reference are sustainability concepts legitimized through established policies, such as the 17 SDGs of the United Nations or the German Sustainability Strategy.

The central areas of focus for implementing sustainability at HEIs are teaching, research, and transfer [6], as well as the universal themes of governance, operations, and reporting, which are the subject of research at HOCH^N. Just as in the area of transfer, there are many, very diverse initiatives at universities, making an overview difficult.

Since teaching in particular is viewed here as a key area for the practical application of sustainability transfer, ESD will be examined as a central concept. ESD is an international, value-based concept that plays a special role in the process of implementing sustainable development [17,20]. At universities, this concept represents an opportunity for sustainability transfer in teaching, as shown in Figure 1, because “*socially responsible science means that HEIs provide the orientation knowledge necessary for social transformation*” [21] (p. 51). Sustainability transfer in teaching should work towards sustainable development through ESD. This entails content-related and methodological-didactic requirements for universities, such as dealing with real-life, job, or training-related sustainability problems [22]. Teaching formats, such as projects related to the degree program (learning in real-world situations), are suitable for this purpose. This is where the life and experience of the learners comes into play and

where actual sustainability problems from the real world are addressed or solved with the university actors as equal partners.

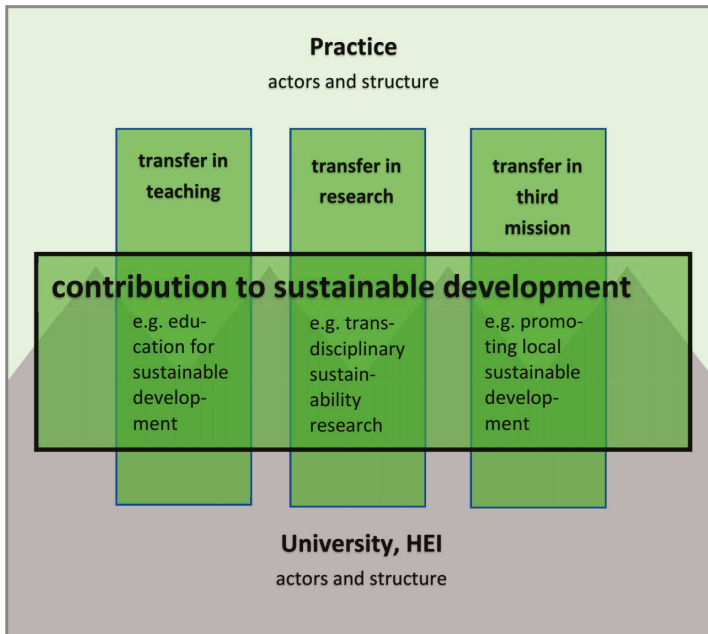


Figure 1. Positioning of sustainability transfer in the context of higher education institutions.

These learning experiences are therefore of great importance, as they are acquired in practice (real social contexts) and can be studied or reflected upon in a theoretical framework. This means that the place of learning is not just the university, but also the public space or the working and living environment of the practice partners and the issues they work on. This format of project-based learning allows students a high degree of self-determination (and thus results in a high degree of participation).

Since the world can be described as a complex, interconnected ecological, psychological, societal, and economic system, this requires a systemic approach from multiple perspectives. Many issues and complex themes, such as biodiversity, climate change, poverty alleviation, health, natural resource management, production, and consumption, are closely interwoven and are reflected in the 17 SDGs [23–25].

An important element of ESD is competence-based teaching, which is particularly relevant to sustainability transfer processes [20,26,27]. The following competencies are addressed by sustainability transfer processes:

- Systemic and forward-looking thinking because topics relevant to sustainability in university teaching are complex, often ambiguous, and in some cases, full of uncertainty; many things are interlinked and systemically interrelated;
- Ability to cooperate, negotiate, and participate, because sustainability transfer in teaching requires participation in the discussion of sustainable development issues and a shared decision-making process;
- Ability to reflect on personal values and those of others in the context of sustainable development and on one's own role in local communities and (as citizens of the world) the global context, since issues and problems relevant to sustainability do not stop at national borders;
- Empathy, which includes mutual understanding and respect for the needs, ideas, and activities of others.

In summary, the aim of ESD in higher education is to enable students to engage with the major changes of our time from a scientific point of view (understand), to assess the resulting consequences from the perspective of sustainability (evaluate), to rethink the relationships between human beings and nature (change), and to assume responsibility to be able to actively participate in society's transformation toward sustainability [28].

In research, a transdisciplinary sustainability approach is well suited to the topic of transfer [29], as shown in Figure 1. The core element is transdisciplinary exchange with practitioners, where heterogeneous groups of actors shape a common process of learning, impact, and reflection [30,31]. Building on this, transformative sustainability research aims to support transformation processes in the direction of sustainability through innovation and to promote the process of change in society through the scientific development of concrete solutions and innovations in industry and society [32,33]. One interesting approach to transdisciplinary research with a high level of transfer relevance are real-world laboratories where HEIs, municipalities, NGOs, companies, government institutions, associations, etc. work together to find sustainable solutions. Under the guiding principle of sustainable development, they join forces as pioneers of change in real-world laboratories and conduct experiments to develop, test, and research new ideas [34].

2.3. Interim Conclusion

Both the overview of practices and discourse at universities and an evaluation of academic literature show that an understanding of sustainability transfer can draw on both HEI concepts of transfer and sustainable development. Transfer can be described as a partnership between practitioners and universities exchanging technologies, knowledge, and ideas in the focal areas of teaching, research, and a third mission. When the protagonists relate their transfer activities to sustainable development, it can be termed as sustainability transfer. There are even specific approaches that are in line with sustainability transfer in teaching, namely in ESD, and in research, especially transdisciplinary sustainability research. Reliable, as well as innovative, approaches are problem and project-based learning, service learning [8], research-based learning, as well as transdisciplinary research projects (such as action research or real-world laboratories [34]).

Based on this initial evidence, it seems possible to link the university themes of transfer and sustainable development, as shown in Figure 1.

Even though there are interesting and inspiring cases, sustainability transfer has so far hardly been explicitly addressed by HEIs and does not play a significant role in university governance in Germany. Considering the enormous potential for HEIs to contribute to sustainable development through direct interaction with practitioners, it would seem to be a promising endeavor to systemize and conceptualize the notion of sustainability transfer for analyzing the broad range of activities to attain a better understanding of transfer mechanisms and their impacts in the university setting. Such a science-based concept can be used as a reference by the actors involved for further developing their transfer activities.

3. Materials and Methods

The empirical study for the development of a sustainability transfer concept was broken down into three steps: first, an exploration through expert discussions and workshops with actors working in the areas of transfer and sustainability; second, an empirical survey of experts on transfer; and third, an empirical study on the implementation of sustainability transfer in teaching to identify a concrete teaching format.

In line with a heuristic approach, the first step was to develop a working definition and to test its acceptance in workshops. An initial working definition and elements of sustainability transfer were outlined and presented in four workshops in 2017. These workshops specifically addressed transfer actors, including actors from all university levels as well as practitioners from the private sector and public administration. Participants in these workshops therefore included actors from

university administration, students, students' self-administration organizations, research and teaching staff, as well as representatives from the private sector and public administration. Established transfer activities, results, and proceedings of implemented projects and potential new formats were discussed. Workshops therefore provided an overview of different existing activities with a regional impact and analyzed to what extent these projects can already be considered to be transfer activities and how they can be developed further. Cooperation with the student association *netzwerk n* was helpful in this process [35]. With the help of examples, aspects of sustainability transfer were explored in greater depth, terms were clarified, and the working definition fine-tuned.

In the second step, categories for the analysis of expert interviews were identified based on this exploratory study (Step 1) and further reading. In addition, questions were asked about the focal areas of teaching, research, and the third mission, although only teaching will be addressed below.

Interviews were conducted with seven transfer experts in April and May 2018. The aim of the interviews was to examine and validate the initial conceptual ideas and to position sustainability transfer in the context of academia and HEIs. The experts were selected on the basis of their publications and the focus of their work with different university and non-university based backgrounds. Two of them manage university transfer offices and four work in the area of HEI research and consultation either at university institutes or in foundations, thus providing an overview of transfer activities inside and outside of universities. One expert works in transdisciplinary sustainability research and teaching. They cover a wide range of expertise and research inside the university in the field of transfer and third mission. The aim was to describe sustainability transfer from different perspectives.

The methodological approach to the guideline-based expert interviews and the qualitative content analysis is based on Gläser and Laudel [36]. The interviews were exploratory, and some were conducted as conversations lasting about one hour. They were transcribed using the MAXQDA tool and analyzed using a category system. The categories were initially developed deductively on the basis of theory and the explorative workshops and then supplemented inductively during the course of the evaluation, resulting in main categories such as basic understanding of transfer, actors, interaction and formats, framework conditions, third mission, and transfer in relation to sustainability. The relevant statements were extracted from the text by means of coding and redundancies were then eliminated. The material was merged in evaluation documents under the main categories to render the interpretation steps transparent. Characteristics and description categories for sustainability transfer were identified on this basis.

In the third step, these key aspects were applied to a case study of sustainability transfer in teaching in order to test and validate the analytical categories. Step three was designed to gain concrete empirical insight into the implementation of sustainability transfer, not as best practice but as a regular case study with strengths and weaknesses. Sustainability transfer was analyzed in a concrete teaching format as part of a master's thesis in 2019. The subject was the module "*Projektarbeit und ganzheitliche Projektgestaltung*" (project work and holistic project design) in the master's degree program Regional Development and Nature Conservation (M.Sc.) at the Eberswalde University for Sustainable Development [37]. In this module, working groups of four to six students design and implement a regional development project together with a practice partner. It is a compulsory module with 12 credits of the European Credit Transfer System.

The following research question was pursued in the master's thesis: How can students, as participants in sustainability transfer, shape sustainable regional development? In total, reports of 17 student projects from the winter semesters 2016/17 and 2017/18 were evaluated, and six of the reports built the data as detailed case studies. These reports consist of (a) a content-related project report and (b) a presentation of the process and project management. Twelve documents from the case studies were thus evaluated using qualitative content analysis. The following criteria, among others, were considered: forms of interaction, methods for structuring interaction, role of students, factors influencing the cooperation process, types of results, and links to sustainability.

In addition, six exploratory interviews were conducted with the practice partners in the six case studies in order to assess the learning and impact potential of the projects on the part of the practice partners.

4. Results for the Description of Sustainability Transfer

This section presents the results of the workshops held to explore and refine the investigative categories for the expert interviews. The results of the interviews and of the in-depth study on the implementation of sustainability transfer in teaching are also presented.

4.1. Exploring the Characteristics of Sustainability Transfer for Investigative Categories

Starting from the approximate understanding of the transfer and sustainability activities of HEIs, as shown in Figure 1, the discussion in the explorative workshops highlighted the following aspects that needed further consideration.

In one workshop with researchers, lecturers, and transfer office staff, a first draft of a description of sustainability transfer was presented and discussed. This basic understanding included the content, goals, and success criteria of transfer. A difficult question was the distinction between transfer and the third mission of universities. Another workshop with practitioners from business and public administration explored the transfer actors. This included a broad range of diverse groups of actors on the practitioner side from large companies to individual citizens, their roles, motivation, and interest in practitioner–university partnerships. In addition, a large variety of forms of interaction and specific cooperation formats in teaching, research, and a third mission were described. Two workshops with students and lecturers were dedicated to transfer in higher education. The discussion explored the interests of students and lecturers in transfer (relating also actors and forms of interaction).

Framework condition was a topic in all four workshops. Potential, restrictions, and preconditions of transfer were discussed, focusing on the general conditions of transfer at HEIs with regard to structures, organizational conditions, relevance for university development, transfer strategies of HEIs, and organizational restrictions. A crucial topic dealt with in all four workshops was how to generally differentiate transfer from transfer for sustainable development. The discussion touched on possible definitions of sustainability and the understanding of sustainability in practitioner–university partnerships, different sustainability goals for transfer activities, the sustainability impact of transfer, varying levels of ambition in terms of sustainable development.

The following investigative categories for the expert interviews were identified in the four workshops:

- Basic understanding of transfer including a differentiation between transfer and third mission.
- Actors and forms of interaction.
- General conditions of transfer.
- Sustainability in transfer.

4.2. Characteristics of Sustainability Transfer

The interviews with the transfer experts were evaluated using the above-mentioned research categories.

4.2.1. Basic Understanding of Transfer and how it Differs from the Third Mission

Several experts adopted a broad understanding of transfer comprising (nearly) all activities of HEIs related to society and non-academic actors (Experts 1, 2, 6). Transfer activities range from intellectual property, and business start-ups to university for children or exhibitions. The concept of transfer has meanwhile been broadened from the traditional understanding of transfer. It started with technology transfer in the 1990s incorporating more and more aspects, such as research and technology transfer, later knowledge transfer, and recently just transfer (Expert 6). Especially the transfer office staff that were interviewed think that quite a lot of transfer activities are taking place at HEIs (Experts 2, 6).

Instead of a one-way transfer from the university to practitioners, the experts emphasize mutual exchange and dialogue as a central feature of transfer, which may encourage the transfer concept (3, 4, 5). As a result, not only technologies, knowledge, and ideas are transferred, but concepts, views, and values are also exchanged in more integrated forms of interaction (Expert 1). Nevertheless, transfer may also include unidirectional activities and formats like public lectures and popular scientific publications (Expert 7). Even though there is a broad variety of transfer activities, not all university members are required to engage in transfer activities. Whether transfer is useful and productive depends on the topic, the disciplines, and the actors (Expert 3).

Universities produce knowledge in research and teaching that can be rendered useful to society through transdisciplinary formats in research and teaching. In these debates, universities can argue that the knowledge they produce is useful to society. In general, all members of HEIs can become transfer actors (Expert 2). To date, universities and transfer offices have focused on transfer linked with research (Experts 2, 6). Transfer in teaching plays a less important role and is not specifically addressed by a transfer office (Expert 2). However, a clear distinction between research and a third mission or teaching and a third mission in relation to transfer is needed (Expert 7).

Transfer activities are often motivated by researchers who are interested in applying their results and putting them into practice. As a result, they contact transfer offices of HEIs (Expert 6). Universities are interested in bringing new products and services that were developed in their organization to the market. Moreover, it is in the university's interest to have these products and services contribute to sustainable development (Expert 2).

In a broader sense, universities' efforts to support social change and transfer can be seen as a means to this end (Expert 2). They have the potential to create social and technical innovations linked to environmental goals by providing arenas for societal discourse and experimentation (Expert 3). In transdisciplinary sustainability research, e.g., in real-world laboratories, research goals are often adopted from practitioners. This is an example of how practice may shape transfer and its aims (Expert 7).

Experts suggest making the goals of transfer transparent because HEIs' activities are financed by public money and they have a responsibility to society (Experts 1, 2). Transparency is thus seen as one success factor (Expert 1). However, concrete goals for transfer activities may also constrict and reduce the scope of action for the transfer partners. For this reason, it may be wise not to overburden the goals of transfer activities but to maintain sensitivity to the actors, the process of cooperation, and the blind spots of academia (Expert 3).

Confronted with a broad range of goals, actors, and topics of transfer, the experts interviewed called for a differentiation of transfer activities. For example, they differentiate between the duration and degree of the institutionalization of cooperation as well as the trust between transfer partners (Expert 1). In general, it seems useful to distinguish between the degrees of complexity of transfer in order to internally analyze the organization's own transfer activities. However, these degrees of complexity do not imply that one form of transfer is rated "better" or "worse" than another (Expert 1).

When asked about the potential conceptual differences between a third mission and transfer, the transfer experts interviewed admit that there is a significant overlap between the concepts (e.g., Expert 1), nevertheless, they try to differentiate between them. The third mission is seen as an approach to encourage universities to engage with challenges relevant to the region and society as a whole. The third mission aims to motivate the universities to adopt a positive approach to their societal activities, to communicate them more effectively to the outside world, whereas transfer focuses on the central tasks of the university itself, i.e., teaching and research, in order to develop them further by engaging with practice (Experts 4, 5). In line with this thinking, the third mission opens the door for cooperation with practitioners. In addition, it is seen as the broader concept, including the prerequisites and structures, as well as the impacts and consequences of the practitioner–university partnerships, while transfer is restricted solely to the activities of dialogue and providing knowledge (Expert 1). The third mission includes all external relationships of HEIs with society in a broad sense (Expert 6). The term third mission also has a pragmatic aspect. The third mission is easier to link with teaching

and research, while transfer is rooted in the traditional image of a unidirectional dissemination of technologies and knowledge (Experts 4, 5).

However, transfer has many facets, and transfer and the third mission overlap to a large degree, making clear-cut definitions and differentiation difficult (Expert 2). The problem of a clear distinction is not only an academic question, but also a practical question for teaching and research that needs to be resolved for each transfer activity (Experts 4, 5).

4.2.2. Actors and Forms of Interaction

On the HEI side, transfer actors include all members of the university, such as researchers, teachers, students, university management, and administration, e.g., sustainability officers or transfer offices (Experts 1, 2). The non-university partners include companies and economic actors, policymakers, public administration, civil society organizations and initiatives, as well as citizens; in general, all non-academic actors (Expert 2).

HEIs cooperate with companies in different ways. Some companies seek out partnerships, some companies are interested in sharing knowledge, and others have no interest at all. For universities it could be an advantageous strategy to try and acquire companies that are interested, but not yet involved (Expert 2). NGOs are another partner for transfer because they often rely on scientific findings (Expert 3). More sophisticated partnerships include different groups of actors at the same time, including policymakers, entrepreneurs, and civil society groups (Expert 6). The most important transfer partner are still companies, but NGOs and social organizations have increased in number and awareness over the last years. Citizens and the public are not yet represented in practitioner–university partnerships (Expert 2).

The different transfer forms and formats of interactions enable a range of possibilities for cooperation in teaching, research, and the third mission. The form of cooperation between the participants is characterized by the fact that the transfer activities take place in a societal context in which transfer is collaboratively shaped for the mutual benefit of the transfer partners. The topics and contents transferred are determined by the interests of the transfer partners and their scientific and/or practical needs (Expert 1). In this context, there is a scientific link with at least a loose correlation to teaching and research (Experts 4, 5).

Experts suggest differentiating between forms of interaction, for example, between short-term and long-term cooperation or direct and indirect forms of interaction, such as exhibitions or leaflets without face-to-face contact (Expert 1). Further, the side initiating the transfer often defines the logic of the cooperation. When an HEI shapes the partnership, research (or teaching) logic is predominant, but when practitioners are in charge, the partnership is instead geared towards practical outcomes (Expert 7).

The assessments of the transfer experts differed on this point in the interviews. While some considered reciprocity to be a fundamental prerequisite for transfer, in order to identify problems, ascertain expectations, and be able to conduct a process of reflection involving all transfer partners, others emphasized the transfer form of contract research, in which reciprocity plays a lesser role because this transfer is unidirectional (Expert 6). Reciprocal exchange helps to identify the interests and needs of the transfer partner and feedback loops help to adjust mutual expectations and foster learning processes (Experts 2, 6). This encourages multiple perspectives on a problem and the incorporation of different forms of knowledge and expertise (Expert 3), thus stimulating innovation (Expert 1).

A partnership on equal footing accepts different forms of expertise and values different contributions to the transfer cooperation. Mutual respect is a prerequisite for building trust and more complex forms of joint knowledge production (Experts 1, 2, 6). This is a crucial element of transdisciplinary research (Expert 7). However, not every form of transfer is necessarily a reciprocal exchange on equal terms; the formats may vary according to the actors and topics (Expert 7).

4.2.3. General Conditions for Transfer

During the expert interviews it was stressed that the success of the transfer also depends on general framework conditions. A distinction must be made here between the overarching structural conditions which are determined outside of the HEI, e.g., by laws and financing, and the organizational conditions for implementation, which can be shaped by the HEI itself.

University management has a certain amount of freedom to influence the conditions for implementation; it can create structures that coordinate and support transfer activities (Experts 2, 3). Transfer offices in particular play a key role in this respect. They can reliably assume recurring tasks, pool and process knowledge, and establish and maintain contact between potential transfer partners. Transfer offices are thus key points of contact for actors interested in transfer from the university and from practice and are important in establishing contacts and formalizing transfer activities. Last but not least, they can support the transfer partners with suitable methods, formats, and communication (Experts 1, 2, 3, 6). University management and transfer offices may create a culture of facilitation (Experts 1, 7). In addition, some interviewees suggested setting up incentive systems for transfer and creating scope for developing transfer projects and concepts in day-to-day operations alongside teaching and research tasks (Experts 1, 2, 7).

This in turn relates to the overall structural conditions. Policymakers can, for example, provide universities with targeted resources for transfer and transfer offices, establish transfer-friendly funding formats, or raise the standing of transfer (for sustainable development) at universities, so that commitment in this area is also rewarded by additional funds, career opportunities, and reputation for the university (Expert 2).

4.2.4. Sustainability and Sustainability Transfer

Generally, the sustainability aspect of, or even impact on, transfer activities is difficult to assess due to the vagueness of the term sustainability. For this reason, it is important to create our own specific definition of sustainable development and/or refer to a widely accepted definition (Expert 7). Sustainability transfer may, for example, aim to bring about sustainable development in a certain region or municipality (Expert 1). Policymakers call on researchers to define the concept of sustainability more precisely so that it can be implemented through political measures (Expert 6).

The interviewees considered it important here to assess the contribution of sustainability transfer and thus make it tangible. This would also be helpful in assessing the impact of the projects and raising awareness of the effects of the transfer activities (Experts 1, 2, 4, 5). An impact analysis is thus an important feature of sustainability transfer, which can be used on the one hand to assess the impact of transfer projects at an activity and message level and, on the other hand, to enhance the reflection process among those involved in the transfer by creating awareness of their own actions and their impact.

Experts interviewed consider it possible to link transfer explicitly with the concept of sustainability (Expert 6). However, they were also critical of the use of the term sustainability transfer because it restricts transfer activities to a very specific field of transfer that only applies to a small part of HEIs' transfer activities (Expert 1). This specific idea of transfer activities narrows the scope for transfer actors (Expert 2). Some recommended using only the concept of transfer and adopting a multi-pronged approach, with sustainability research being one possible variant (Expert 6).

4.3. Case Study of Sustainability Transfer in Teaching

In the case studies investigated on project work in sustainable regional development, the students first begin by conducting a problem analysis with the involvement of the respective practice partners and thereby established links to sustainability in their projects. When clarifying the transfer task in the conceptual development phase, goals are formulated on the basis of the problem analysis together with practice partners and other relevant project actors, who focus on a contribution to sustainable development in the regional focal area of the practice partners. The students thus first establish a link

to sustainability in the transfer project. Second, they agree on concrete and transparent goals with the practice partners to promote sustainable development.

One quality characteristic of the students' activities in the projects is the active involvement of the practice partners in determining the technical and content-based focus of the project, identifying mutual expectations, and weighing up the options for action, taking into account the general conditions of the module.

The involvement of the practice partners goes beyond clarification of the task and continues throughout the product development process. The intensity of the relationship becomes clear in the process. The students engage in a continuous feedback loop with the practice partners to get feedback for decisions that show the way forward and to incorporate new findings into the clarification of the task and thus adapt the goals. The core element of participation is often workshops that bring together all relevant actors. This is where different requirements are discussed, topics identified, and solution strategies developed. This co-production is particularly highlighted by the practice partners, because the students create a strong impetus that has a transformative effect on the actors' environment in the process. This participation and its impact are mentioned more often as the success of the cooperation project than the actual end product.

The students' perception of their role in the project group and their methodological competence are of particular importance for the feedback and adaptation processes and for the active involvement of relevant actors. The students see themselves as a learning organization in the project groups, which makes them flexible and willing to learn in their interaction with the practice partners and open to changes to goals. They make targeted use of methods that they have learned during their studies in the process. For example, an environment analysis is carried out during project implementation in order to identify and involve relevant actors. The workshop structure is based on facilitation techniques.

The projects in the case studies have a wide range of objectives. They often have a structural and strategic focus—structurally, to give the practice partners concrete options for action so that, for example, decision-making processes in administrative workflows can be improved, and strategically, in order, for example, to identify concrete development opportunities for an organization as part of a socio-ecological transformation.

The concrete end products of student projects are often concepts and tools that usually cannot be implemented or applied with the practice partners during the project. However, they were used after the projects were over; for example, for project applications, to develop guiding principles and improve decision-making processes. The surveyed practice partners described the quality of the end products as innovative and creative, which inspired new ideas. One special learning effect for the students was the opportunity to apply the knowledge and methods acquired through the project-based form of learning. The practitioners benefited from this, as they were able to acquire new knowledge and methods and, in some cases, to develop new attitudes and viewpoints by working together with the students and to incorporate these into their workflows.

5. Evaluation: Conceptual Description of Sustainability Transfer in Relation to Teaching

A concept for sustainability transfer was developed against this empirical background and in line with the research literature. First, a definition of sustainability transfer is presented and then six analytical descriptors are outlined.

Sustainability transfer is defined as a specific form of transfer, namely those practitioner–university partnerships that contribute to or strive for sustainable development in society. A key characteristic is a mutual exchange between university and practitioners, because no group of actors can implement sustainability on its own. However, the degree of complexity and intensity of such practitioner–university partnerships may vary from a more unidirectional transfer (of technologies) to a co-production of knowledge and practical solutions (cf. Section 5.6.). Academia can contribute theoretical and empirical knowledge, methodological competence, criticism, and the ability to reflect. The goals of sustainability transfer are first to make concrete contributions to sustainable development,

such as projects, concepts, or discussions about sustainability. At a minimum, transfer partners should formulate explicit sustainability goals for their respective transfer activities. Further, they should strive to make their societal impact transparent and minimize negative effects as far as possible. Second, it is important to strengthen the capacity of the transfer partners to act. Through interaction, the actors can learn from each other and develop key competencies for sustainability, such as the ability to innovate, systemic thinking, foresight, and strategic and normative competence [38].

Although this definition creates a framework for sustainability transfer, the corresponding practitioner–university partnerships can still cover a wide range [6]. Different transfer activities can be analyzed using the following descriptive characteristics.

5.1. Sustainability Focus of the Transfer Activity

The classification and evaluation of the sustainability focus of transfer, understood as a contribution to sustainable development, is a central requirement for defining sustainability transfer and avoiding arbitrary use of the term. However, there are currently no generally recognized and reliable measurement and evaluation methods that can be used to clearly capture the sustainability impact of academic activities and especially of sustainability transfer [39]. This is why we propose three approaches to the issue of sustainability focus.

First, it can be verified whether or not the transfer partners formulate *sustainability goals* for the respective transfer activity. These goals, which are in the public interest, are normative statements that are not based on scientific research. Nevertheless, scientific arguments can be made, for example, with reference to transdisciplinary sustainability research or ESD. There are two possible approaches to developing sustainability goals. On the one hand, the transfer partners themselves can develop sustainability goals for their specific transfer activity. The reference point can be the transfer actors' understanding of sustainability, which can be seen, for example, in sustainability guidelines, sustainability statements, or societal positioning. On the other hand, externally defined sustainability goals, such as the SDGs, the goals of the German Sustainability Strategy, or goals specific to a certain area, e.g., of the energy transition, can be included. These goals have the advantage that they are accepted by society and have usually been tested from a scientific standpoint. However, they generally have to be incorporated into operations for concrete transfer activities. The discussion of sustainability goals between the transfer partners can culminate in a rationale for the goals, showing the extent to which a contribution to sustainable development can or should be made.

Second, the *sustainability impact* is of great relevance. However, capturing, let alone measuring, these effects is difficult because in complex, real-world situations it is difficult to clearly attribute impacts, because cause–effect relationships are hard to distinguish from other environmental influences and effects can be delayed, shifted regionally and functionally, and can also have (unwanted) side effects [40]. The formulation of sustainability goals is a starting point for capturing the effects, because criteria can be derived from the goals to evaluate the success or failure of transfer activities. For this purpose, various approaches are proposed in the literature, e.g., balancing model [1]; result types [41]; impact forms and effectiveness [39]; impact logic as diagram of a causal model [42].

Third, *minimum and exclusion criteria* for sustainability transfer can be formulated. In the interest of socially responsible research [19], the results of the transfer activities should be freely accessible, especially if the activities carried out by the university are part of a public contract or are financed with public funds (minimum criterion). Furthermore, the transfer activities may not conflict with sustainable development or cause or exacerbate sustainability problems. The SDGs can serve as a point of reference. If the transfer activity endangers the achievement of individual goals, then it is not sustainability transfer (exclusion criterion). In view of the internal inconsistencies of the SDGs, it will be necessary to strike a balance.

5.2. Focal Areas of Sustainability Transfer

The focal areas can be divided into research, teaching, and the third mission. According to the definition of [1], sustainability transfer in the *third mission* refers to those university activities that go beyond the compulsory tasks in teaching and research but are related to them. This then includes all third mission activities that make or aim to make a contribution to sustainable development. In contrast to this, sustainability transfer is explicitly linked with teaching and research here and in line with [5]. The decisive factor is the existence of practitioner–university collaborations in these areas of focus, as shown in Figure 1.

Sustainability transfer in *research* is only briefly described here. It focuses on a joint process of practical application and implementation, which is mutually supported by practitioners and university actors and which is intended to contribute to the solution of specific sustainability problems. This is therefore a sub-aspect of transdisciplinary sustainability research. Specific to sustainability transfer is the link to practical application, i.e., a test, trial, implementation in practice, for which the transfer partners jointly assume responsibility in the form of co-implementation. Since this is a real context, the practical benefit and success of the implementation is extremely important; the university actors cannot pursue their scientific knowledge interests on their own, potentially at the expense of successful implementation [5]. Another benefit for the actors involved are shared evaluations or even a joint reflection process, which can reinforce the learning effects for all participants.

In the transfer of sustainability in *teaching*, practitioners are involved in students' learning processes on sustainability. For example, practitioners report on their work, there are practical tasks, the real world is a place of learning, and students and practice partners work together on sustainability problems. The spectrum ranges from practitioners who come to the lecture hall to the incorporation of teaching in a practical setting.

Sustainability transfer in teaching can be based on the concept of ESD, which supports a clear sustainability focus [23,28]. The incorporation of practical experience strengthens the focus on competencies in particular, which in the case of ESD is aimed at acquiring competencies for influencing the societal impact.

The focus on competencies is promoted by learning in real-world situations because the social context of learning is real and is not a simulation in a lecture hall or seminar. Students shape the world and their environment and learn first-hand that they can make a personal contribution to shaping society, as the empirical study on student sustainability projects shows.

Didactic approaches are problem-based learning, research-based learning, and service learning. Examples are student projects and final theses with transfer partners, dual courses of study, internships, service learning, involvement of transfer partners in teaching, and mentoring and coaching [14].

5.3. Transfer Actors

On the university side, the transfer actors include all university members. The non-university partners include companies and economic actors, policymakers, public administration, civil society organizations and initiatives, as well as citizens. Sustainability transfer is thus shaped by very different actors. Relevant groups of actors for teaching are outlined below.

Transfer in teaching can be unidirectional or reciprocal until the learning process and learning outcomes are reflected on together with the practice partners. Students, teachers, and external partners in practice are involved in the learning process. This can go as far as collaborative efforts to impact society as equal partners. By including practitioners, new teaching–learning contexts are created in which students themselves can become transfer actors [37].

Students put their subject-specific and methodological knowledge to practical use in a real or realistic context and develop an integrated approach to shaping the world they live in.

Practice partners contribute relevant practical problems and gain access to current, research-based knowledge through cooperation. These kinds of teaching partnerships can provide low-threshold access to scientific knowledge, especially for small organizations and initiatives. Practitioners can

benefit from questions and suggestions from students and reflect on their activities from an analytical perspective, which is relevant, for example, for clarifying sustainability goals and priorities.

Teachers create the framework for this learning setting and manage the learning process and the associated communication in the form of learning coaches. They “translate” between students and practice. They can improve the quality of their teaching and gain insights into practical sustainability problems which they use as a basis to inspire teaching and research.

5.4. Phases of Sustainability Transfer

Sustainability transfer can ideally be outlined as a four-phase process, whereby considerable fluctuations are possible, and phases can overlap. “Typical” tasks and requirements can be allocated to each phase. This makes it possible to get an overview of possible courses of action, facilitates an analysis of the processes, and can show alternatives and options for action to further develop the planning of sustainability transfer. There are four distinct phases [43]:

- Initiation of transfer and identification of actors;
- Concept and goals of the transfer activity;
- Implementation of the transfer activity;
- Compilation and documentation of the results.

In the first phase of initiation, the challenge is to identify the theme and transfer partners for a specific class. The starting point can be problems from practical areas covered by the respective degree programs and modules. In a first meeting, the potential partners must assess the extent to which they agree on the transfer activity they want to undertake. On this basis, they can decide whether cooperation makes sense from their point of view, whether they fit together organizationally, and whether there is enough trust to engage in a joint learning process. Teachers often have the responsibility for this step.

The second phase of conceptual development involves planning the learning process and transfer activities. A suitable way of clarifying the content is to jointly agree on sustainability goals to be achieved in the learning process. Based on shared learning goals, a teaching–learning concept can be developed for which ESD offers a variety of approaches and suggestions for implementation, e.g., case studies, project work, internships, etc. It is important to bear in mind here that the learning processes in sustainability transfer are more open, more difficult for those involved to assess, and often involve a greater (time) investment for students and teachers. Nor can they always be smoothly integrated into curricula and examination regulations.

In the third phase of implementation, the task is to translate analysis, development, or testing of solution approaches into a learning process. The aim is to achieve a learning and development process that is as mutual as possible, in which theory and practice are linked, and scientific methods and concepts are applied. It is important to clarify roles in the various learning and working steps. The roles can change, e.g., students can be both learners and creators of ideas or teachers.

In the fourth phase of results compilation, learning outcomes and experiences are to be documented. Documentation forms the basis for making the sometimes interwoven learning processes transparent. From the teaching point of view, the formal examination is a core element in compiling results. Examination formats based on competencies can be used to compile the students’ results in such a way that they can be further used by the practice partners.

5.5. Universal Tasks

Furthermore, two universal tasks are examined which are set as requirements for sustainability transfer across all phases.

The task of *process management* helps to support different groups of actors with different competencies and interests in their cooperation. Organizational structures provide the transfer partners with certainty and the necessary resources. Another task is the internal and external

communication throughout the entire transfer process. It creates transparency of transfer activities and fosters a culture of cooperation. By comparing the tasks in the different phases and the real overall conditions for sustainability transfer, the possibilities, scope for impact, and potential, but also limits, in the implementation of sustainability transfer can be estimated.

As a second task, *reflection* can ensure the sustainability focus of transfer activities. Reflection plays a role in verifying and sharpening the sustainability focus of transfer activities; it helps to identify “blind spots” and side effects and to prevent risks. In addition, reflection in all phases can contribute significantly to the quality of the learning and knowledge production. Reflection can be undertaken separately by groups of actors, which is easier to implement. Joint reflection on the transfer process is more complicated but promises more knowledge gain. Through academically guided reflection, common insights and experiences can be identified that go beyond the respective case-related and context-specific results and can lead to transferable insights and experiences. Particularly with regard to the complex challenges of sustainable development, reflection should explicitly incorporate values and emotions. This also applies to learning from mistakes and failures.

5.6. Degrees of Complexity of Sustainability Transfer

Sustainability transfer can be differentiated according to how complex the interaction between university and practitioners is. The differences do not imply any judgement; the levels each have advantages and disadvantages, as shown in Figure 2.

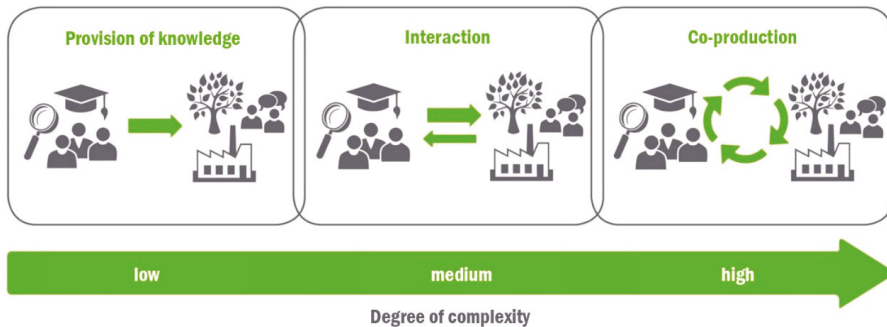


Figure 2. Degrees of complexity of transfer (own diagram).

Provision of knowledge: The basic form of transfer includes all cooperation between the university and external partners. In the foreground is a largely unidirectional transfer of knowledge, technologies, and ideas from university to practice. At its own initiative, the university provides societal actors with findings, knowledge, and products from teaching and research without getting feedback on societal needs and the impact from the practice partners. Such forms of transfer can be carried out with few resources and have a comparatively extensive coverage or reach many people, while the intensity of interaction is low. Examples are exhibitions, popular science and transfer publications, lectures, scientific training, science communication, or technology transfer in companies.

Interaction: The university actors strive to ensure that their transfer activities are effective in practice; this requires input and feedback loops from the practitioners to the university [44]. Universities survey the needs and problems in practice and try to determine, or at least estimate, the impact of a transfer. Reciprocal exchange between university actors and practitioners is thus a key characteristic. Examples are mutual problem descriptions for knowledge-based problem resolution or mutual evaluation of knowledge and technologies in the respective context of activity.

Co-production: If universities want to address sustainability problems and contribute to solving them, then joint knowledge production as equal partners makes sense. All transfer partners contribute their competencies, strengths, and perspectives to joint learning and research processes as part of

co-production. Examples are joint problem descriptions, joint development of guiding principles and sustainability visions, and the development of transformative solutions (e.g., in real-world laboratories).

6. Discussion and Outlook: what does Sustainability Transfer Mean for Universities?

The definition of sustainability transfer provided, and the six descriptive characteristics enable such transfer activities to be systematically identified and described. Visibility can increase appreciation for this form of transfer. The descriptive characteristics also enable empirical analysis and comparison between different forms of sustainability transfer, which in turn allows a more precise positioning in the focal area of universities and increases the academic compatibility.

Nevertheless, the concept needs further specification regarding the distinction between transfer and the third mission. The traditional notion of transfer in the HEIs' context as unidirectional top-down process from university into practice and business regarding technology transfer is problematic. Analyses of transdisciplinary research show that the process of co-design and co-production is crucial when addressing real-world problems and having societal impact [45]. For this reason, it might be productive to speak of a fourth mission of co-creation for sustainability [6]. The context of knowledge generation and especially that of adoption and implementation, the pick-up context, need further consideration with regard to transfer [40]. This implies a stronger focus on the perspective of practitioners.

Further, a more detailed consideration of the broad range of possible instruments and formats for transfer is preferable. In this regard, sustainability transfer can draw on experience with transdisciplinary concepts both from sustainability research and from ESD. For the latter, a service-learning model is an excellent example of how practitioners can communicate societal needs to university and how real-world problems can be integrated in teaching. In a service-learning model, students are expected to provide a direct community or social service that meets real community needs, while supporting purposeful civic learning [8]. Finally, the interviewees underline the usefulness of accepted forms of impact assessment for sustainability transfer that are still lacking.

In our estimation, sustainability transfer in teaching is already being carried out in some places at universities, without this being explicitly stated. By deliberately establishing a link to the concept of sustainability transfer, the potential, but also the limits, can be more clearly identified. In teaching, practitioner–university partnerships can enhance the practical focus of the degree programs, improve professional qualification of students, and support integrated competence orientation during studies [22]. Sustainability transfer can thus be a concrete implementation element of ESD.

The descriptive characteristics of sustainability transfer can be used to reflect on existing activities in teaching. The phases, the universal tasks, and the degrees of complexity help to position current or planned teaching activities and show very different starting points as well as development potential, which can be realized step by step.

Sustainability transfer is linked to a societal need. Students' learning and activities make a difference for society and the specific transfer partners. Students thereby become transfer actors in the context of sustainability and can make a contribution to society on behalf of universities [46]. In this way, sustainability transfer creates opportunities for the university to have an impact on society and to use its competencies in processes to shape society [5].

However, sustainability transfer in teaching depends on certain prerequisites. Resources such as time, space, and money are needed. Teaching concepts must be brought into line with university regulations, such as examination regulations, which requires flexibility on all sides. Moreover, transformative education and ESD are hardly incorporated structurally in teaching programs. There is a gap in HEIs' teaching concepts in Germany regarding ESD and educating change agents for sustainable development [47]. Nevertheless, HEIs are a highly appropriate place to train key competences for future change agents; and sustainability transfer in teaching is a promising approach that allows students to explore, test, experience, and reflect such key competences in a holistic as well as in a realistic way.

These aspects extend beyond sustainability transfer in teaching. In keeping with the whole institution approach, practitioner–university partnerships require that university actors communicate

as coherently as possible with practice actors. Regarding the case study of sustainability transfer in teaching with a focus on regional sustainable development, different practitioners cooperate with different members of the HEI, at least with students and teachers, possibly also with researchers as disciplinary experts and representatives of the administration. In this situation, students have to navigate between scientific rigor and pragmatic real-world solutions. This points to the crucial role of organizational culture in sustainability governance that enables and fosters consistent communication between diverse university actors. In this context, Niedlich et al. emphasize the importance of a holistic orientation based on the university's purpose and its concept of sustainability [48].

When HEIs open themselves up to a certain degree to practitioners and seize on new ideas, they are probably in a better position to contribute to sustainable development effectively. In turn, cooperation between practitioners and universities can have an impact on the internal activities of universities and even on their organizational cultures. One example for this are specific organizational interfaces between the university and practitioners that a reciprocal exchange, as well as communication and cooperation between heterogeneous members of HEIs, with regard to external relationships.

However, university transformation goes beyond organizational changes. Following a whole institution approach requires stimuli from the outside to trigger change within universities. This can also initiate alterations in the organizational culture, supporting a holistic orientation. This may enable a co-existence, an overlap, and a reinforcement of the different missions of HEIs [6]. In this sense, sustainability transfer can be understood as *one* element in sustainability transformation.

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Article

Interdependencies of Culture and Functions of Sustainability Governance at Higher Education Institutions

Mara Bauer ^{1,*}, Sebastian Niedlich ², Marco Rieckmann ¹, Inka Bormann ² and Larissa Jaeger ¹

¹ Department of Education, Faculty of Education and Social Sciences, University of Vechta, Driverstraße 22, 49377 Vechta, Germany; marco.rieckmann@uni-vechta.de (M.R.); larissa.jaeger@uni-vechta.de (L.J.)

² Department of Education and Psychology, Freie Universität Berlin, Habelschwerdter Allee 45, 14195 Berlin, Germany; sebastian.niedlich@fu-berlin.de (S.N.); inka.bormann@fu-berlin.de (I.B.)

* Correspondence: mara.bauer@uni-vechta.de

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Abstract: Sustainable development practices in higher education institutions are diverse, with regard not only to the types of challenges that have to be addressed, but also to the forms of sustainability governance adopted by individual higher education institutions. This paper aims to reflect on the aspects of organizational culture that are particularly crucial for the implementation of sustainable practices at higher education institutions. Specifically, it addresses the research question: how do different organizational cultures affect approaches to sustainability governance at higher education institutions (HEIs)? It reflects on data from multi-case studies at eleven German higher education institutions. Four of the cases are analyzed in this paper to draw out the insights they offer on how organizational culture shapes the institutions' approach to sustainable development. A governance equalizer is used as a functional framework for evaluating and discussing the influence of different cultural orientations on sustainability governance. In addition to providing many insights and findings in relation to specific cases, comparison of the different institutions, their governance structures and their cultures of sustainable development helps to emphasize that there is no single cultural factor that can be identified as directly promoting particular governance structures. Rather, there is an active interplay between cultural orientations, which influence, and are also influenced by, the measures deployed. Such influence is not instantly apparent but needs time to develop, and it evolves in a variety of ways as illustrated by the case studies.

Keywords: sustainability governance; higher education; organizational culture; governance equalizer; Germany

1. Introduction

The aspiration of integrating sustainable development (SD) into the structures and processes of higher education institutions (HEIs) while taking account of all their different fields of activity, such as research, teaching, outreach, and operations, has been recognized in practice and research alike as a complex and highly context-dependent task [1–4]. The definitions of sustainable development in the context of higher education institutions remain as rhetorically malleable and as fluid as those in public and political discourse [5]. As a result, SD practices in HEIs have been diverse, not only with regard to the types of challenges that have been addressed, but also in respect of the forms of governance that have been established to coordinate the approach to such challenges (e.g., [6]). Attempts to classify SD implementation structures within HEIs (e.g., [7,8]) have, along with other literature, highlighted the need for a shared commitment to sustainability goals, structures and processes amongst HEI staff, covering teaching, research and operations—in other words, the need for holistic governance [9].

Following that line of argument, HEI governance for sustainability aims to promote and support the changes institutions need to put in place to embed SD in their organizations. It is concerned with all the circumstances, pathways and methods by which sustainability reaches and permeates HEIs. At the core of these processes are the people that make up HEIs. The HEI and its sustainability pathway are essentially comprised of their ideals, vision and engagement, and the ways they communicate and consult [10–12]. This deserves special attention.

Since sustainable development is a complex concept, and HEIs are complex organizations, it is important to be aware of the implications and requirements of a thorough and comprehensive approach to the introduction of SD. For many HEIs, it will presumably mean making a number of fundamental changes within the institution. In this context, the word ‘transformation’ is not an exaggeration but a prerequisite [13,14]. Cameron and Quinn [15] stress the notion that the best way of implementing such major organizational changes is to take the organizational culture into account and shape it in a way that supports such change. “Although the tools and techniques may be present and the change strategy implemented with vigour, many efforts to improve organizational performance fail because the fundamental culture of the organization – values, ways of thinking, managerial styles, paradigms, approaches to problem solving – remains the same” [15] (p. 11). The failure to achieve organizational change often has ramifications for members of organizations, and could mean that their response to future change initiatives might be even less cooperative [15].

While Cameron and Quinn are concerned with organizational change in general, other research supports their findings in the particular context of sustainable development in HEIs [16,17]. HEIs need to find ways to embed SD into their specific norms and values and into the shared goals of their members, and to create common ground so as to enable their organizations to learn sustainability, learning being essential to the achievement of a paradigm shift [18]. Even though HEIs might be considered experts in learning, this does not necessarily apply to their capacity to learn for and about themselves [17].

As Adams et al. clearly state, “the failure to embed sustainability in HEIs suggests it has failed to become part of the culture” [16] (p. 2). We, therefore, seek to investigate whether this suggestion is supported by the experiences of HEIs, and, more specifically, which kinds of cultural variables feed into which governance structures. Organizational culture in general can be considered an integral part of sustainability governance, since each HEI has a specific mode of engagement with SD depending on its prior experiences, its code of communication, its resources in terms of expertise and time, its recognition of SD as an opportunity for profiling, its perception of public pressure on the HEI, etc. It is, therefore, appropriate to discuss the functions and cultures of sustainability governance at HEIs in greater detail.

Accordingly, this paper explains and brings together two different perspectives on sustainability governance at HEIs: culture and functions. Special attention is paid to the impact that certain organizational cultures have on the development of aspects of functional governance at HEIs, i.e., the structures, processes and environment that are created there. The corresponding research question is: how do different organizational cultures affect approaches to sustainability governance at HEIs?

Against this backdrop, we aim to investigate distinct aspects of organizational culture that are particularly crucial to the implementation of SD at HEIs. In this context, we are taking, as our basis, our earlier work in which we prepared two major frameworks—one on culture [19] and one on functions [2]—and which we will bring together in this paper. We identified two types of cultural orientation that are usually prevalent in HEIs in relation to the attitudes, assumptions and practices that they bring to SD implementation [19]. These are summarized in Section 2.1 and followed in Section 2.2 by an introduction to the governance equalizer, an HEI sustainability governance concept that we used in this paper as a functional framework for evaluating and discussing the significance of the cultural orientations in question. Section 2 thus provides an overview of the frameworks deployed in the analysis that follows.

The foundation for evaluating the various aspects of HEIs’ approaches to implementing SD was guided and supplemented by desk research but consisted primarily of extensive empirical research

on sustainability governance at eleven German HEIs, which resulted in eleven different case studies. The methodology and research process that eventually led to this paper are described in Section 3. Having laid the groundwork for a combined analysis of the cultural and functional aspects of SD governance in HEIs, Section 4 introduces four of the eleven case studies and investigates how the HEIs' organizational cultures are interlinked with their processes and structures for SD implementation. The subsequent discussion and conclusion highlight the main learning points, merits, limitations, and outstanding or emerging questions.

2. Frameworks on Culture and Functions of Sustainability Governance at HEIs

2.1. Cultural Orientations

Initially, basing ourselves on qualitative content analysis, we derived four cultural dimensions from our interview material, which were then conflated into two overarching cultural orientations that distinguish the way in which HEIs face the challenges of SD: *holistic orientation* and *organizational learning orientation* [19].

- Holistic orientation

This category combines the two dimensions *conception of sustainability* and *relevance and scope of organizational change*. Both dimensions emphasize the need to consider different elements simultaneously, and to link them in an integrated approach. Thus, we use the term *holistic* not as a philosophical concept, but to refer to the comprehensiveness of the HEI's orientation towards SD.

Conception of sustainability refers to the understanding that an HEI has of the comprehensiveness of SD. Does the HEI include ecological viability, social justice and economic capacity alongside each other in its long-term responsibilities? A variety of professional perspectives at an HEI might come with a variety of conceptions of sustainability that often focus almost exclusively on one of these dimensions of sustainability instead of taking an integrated approach [20]. The HEI's willingness to combine these perspectives and find common ground to start from can open up new spaces and options for SD that can be discovered and seized [21].

Relevance and scope of organizational change refers to an HEI's idea of where SD should be implemented. Viewing the HEI as a single system whose subsystems such as teaching, research, operations and outreach are given equal footing as fields of activity for SD (whole-institution approach) is deemed crucial [22,23]. As with the *conception of sustainability*, this dimension deals with the question of comprehensiveness. While the first is concerned with the content of SD, the latter considers the context. Taken together, the two dimensions, therefore, represent the holistic ideal inherent in the concept of sustainable development.

- Organizational learning orientation

This category combines the dimensions attribution of responsibility and purpose of the higher education institution.

The focus is on the degree to which SD is seen as an issue of organizational development and learning which, firstly, can be represented by the *attribution of responsibility* for SD. In this context, the call for collaborative and co-creative processes receives broad support [10,21,22,24,25]. SD should not be reserved to the institution's elite, but based on the approval and engagement of many [22] and, therefore, handled by means of shared responsibilities and co-determination. This also entails the institution's leadership taking an open-minded approach to the emergence of innovative ideas and unexpected developments in relation to SD from different members of the HEI and to taking SD ideas and goals seriously by fostering discussions [26].

Another aspect of organizational learning derives from the way an HEI perceives itself and its role in the societal context: the *purpose of the higher education institution*. Trencher et al. [27] have coined the term "fourth mission" as a description of the sustainable HEI's role in society: a debater, a networker,

and a transformer. HEIs can actively promote co-creation of societal transformation that goes far beyond technology transfer and other economic contributions, which is mostly what the third mission concept has been requesting and seeking to pursue. The idea of a “fourth mission” takes HEIs’ role in society further towards active engagement and mutual learning. If an HEI takes on this role, its chances of transforming itself as an institution and achieving a higher level of SD improve. This is especially true when active engagement and mutual learning are paired with participatory processes, since this creates an environment that promotes critical, systemic and future-oriented thinking.

On the basis of our findings, we had assumed that the two orientations had a linear relationship and tended to mutually reinforce each other [19], but, so far, we have not taken a closer look at their implications for the structures, procedures and measures of sustainability governance at HEIs. How are HEIs’ sustainability governance set-ups influenced by different cultural orientations? The next section will introduce a functional framework that forms the basis of the subsequent analysis of this question.

2.2. Depicting the Functions of Sustainability Governance through a Governance Equalizer

In order to illustrate governance structures within institutions, de Boer et al. [28] use the image of a piece of audio engineering equipment, known as an equalizer. Instead of base, reverberation or volume, this particular equalizer is equipped with slide controls that display different dimensions of institutional governance and the performance of the institution against each dimension, or functional requirement. In analyzing sustainability governance at HEIs, we draw on Franz and Brüsemeister [29], and have chosen five dimensions for our equalizer: politics, profession, organization, knowledge, and public [2].

The following overview gives a brief outline of the equalizer dimensions which are the result of combining the original heuristic with its representation within our case studies.

1. Politics: How is sustainability implemented and legitimized within and outside the HEI?

This equalizer dimension deals with the question of how sustainability activities are not only selectively supported, but form part of an HEI’s long-term development goals. The term politics should not be misunderstood: it does not refer to the state-level measures that set the overall framework for higher education institutions, but to the actions of the HEI members themselves. In order to embed SD, formal and informal decisions and resolutions are required that are binding on as many actors at the HEI as possible. Such definitions give legitimacy to those who are pursuing SD, providing a basis for their actions. They provide goals and standards that act as guidance for sustainability-related activities, and can serve as a basis for reviewing the success of such activities. Collectively binding decisions can be taken both by the hierarchy and as part of participatory processes.

2. Profession: How are professional perspectives and competencies linked?

The dimension of profession is about the gradual development of an interdisciplinary and cross-sectoral understanding of sustainability at an HEI. The different areas of activity at HEIs—teaching, research, and campus management (administration, technology, etc.)—have very different requirements, processes and framework conditions, demand different competencies and specialist knowledge, and have their own standards and ‘cultures’. The scientific disciplines also differ considerably in this regard, as do the external actors HEIs are involved with. However, SD requires that internal and external actors work closely together. This facilitates exchanges of views on what SD should include, what principles and standards should be taken into account, and how SD can be integrated into the day-to-day practices of different activities and disciplines.

3. Organization: How are collaborative work and task processing made possible?

In order to encourage SD in HEIs, it is necessary to specify goals and activities that facilitate implementation. This involves providing resources and creating structures and processes that ensure continuous and reliable work. In the context of SD, it is important to ensure long-term action across existing organizational boundaries—between different areas of activity as well as with non-academic actors. To do so, it is necessary to network actors and to coordinate their activities.

4. Knowledge: How is the required knowledge developed and used competently?

SD in higher education requires consideration of the complex issue of *knowledge*. The actors in HEIs have to develop shared ideas about what the problems are and what has caused them (analysis), they have to agree on how the situation is to be evaluated and what the aims will be in the future (goals). It is also important to clarify which measures will be used to solve problems (action). Alongside technical and professional expertise, knowledge of different actors' responsibilities, structures and processes at an HEI plays an important role in clarifying how measures can be best implemented. At the same time, each solution usually entails specific advantages and disadvantages. This means that deciding which measures to implement involves a normative judgment. It is not sufficient, therefore, for the sustainability governance at HEIs to access knowledge only in times of need. Instead, ways must be established to identify, disseminate, and use the relevant knowledge on a continuous basis in order to be able to react flexibly when problems arise and to facilitate longer-term learning processes. This requires more than technical solutions—it also involves collaboration and networking with the aim of supporting exchange and joint knowledge work.

5. Visibility: How is awareness of the need for sustainable development in HEIs created?

Making an HEI's sustainability efforts visible to the internal and external public plays an important role in SD governance, as it provides the opportunity for all the institution's stakeholders to observe and respond to issues and positions as well as activities and their outcomes. Public attention can thus contribute to greater participation in and awareness of SD, such as identifying the need for action, communicating and justifying goals and actions, and reporting on progress. Last but not least, in this way, the importance of sustainability for the HEI can be demonstrated and sustainability can become an important element of an HEI's profile and thus help to attract students or external partners.

We will consider the specific interplay of organizational culture and the implementation of SD at different HEIs against this framework. This paper will, therefore, analyze four cases relating to the ways in which cultural orientation trickles down and can influence the structures and processes that are being established to promote SD, and that then become visible in the governance equalizer. The general assumption that can be made at this point is that a strong cultural orientation towards SD leads to better and more coherent SD governance. How this can take place in different real-world contexts is shown in detail in Section 4.

3. Methodology

This paper is based on the findings of two earlier papers [2,19] that stem from the same research. The first [2] sought to validate the governance equalizer through ten expert interviews; this was then used as a theoretical basis for the evaluation of 61 stakeholder interviews. The second [19] focused on the evolution of categories from this extensive interview material, namely the development of an empirically-based categorization of the characteristics of sustainability governance in HEIs, and further condensation into two cultural orientations. Both the governance equalizer and the two categories of cultural orientations are explained above.

In order to answer the research question for this paper, "How do different organizational cultures affect approaches to sustainability governance at HEIs?", four exemplary HEIs were selected for the purpose of analyzing and illustrating the effect of organizational cultures on governance structures

and processes. The selected cases (described in Section 3.3) are divided into two pairs of HEIs that appeared to offer promising insights into the effect of cultural orientations on sustainability governance after being categorized in Niedlich et al. [19].

The following description of the research process gives an overview of the whole process, and then focuses on the measures that were taken in order to achieve insight into the interplay of cultural orientation and the governance equalizer. By combining the perspectives of culture and functions from the two earlier papers and the frameworks that these established, and feeding them with the four case studies, our aim is to deepen understanding of the significance of organizational culture for SD at HEIs in general, but also with respect to specific functions within HEI SD governance.

3.1. Data Collection

The study that provided the insights outlined above on sustainability governance and organizational culture for SD at HEIs looked at the experiences of, and observations from, eleven German HEIs. These HEIs are all members of the joint research project “Sustainability at Higher Education Institutions: develop-network-report” (HOCH^N) which, in addition to sustainability governance, focuses on research, teaching and operations as well as on the transfer of SD-related knowledge and approaches (see <https://hoch-n.org/en>).

The research design consisted of face-to-face interviews with different actors at the eleven HEIs. Interview partners were chosen on the basis of selective sampling. In order to gain an in-depth understanding and to incorporate different views and perspectives on sustainability governance, 61 stakeholders from the following groups were interviewed:

- HEI management (11 interviews),
- SD coordinators/commissioners/managers (10 interviews),
- Student initiatives (14 interviews),
- Technical administration (14 interviews), and
- Academic staff (professors and researchers) (12 interviews).

In addition to time and willingness to participate, selection criteria included knowledge and first-hand experience of their institution’s sustainability process (cf. [30]). The interviewees were identified and recruited in collaboration with our partners within the HOCH^N network as well as through desktop research. The sample is thus limited by the number of project partners. These provided an interesting sample, as they all were willing to participate in the interviews, had sufficient range of stakeholders involved in the sustainability process at their institutions and hence could provide a variety of perspectives. Although the sample is not representative of all HEIs in Germany, as the participation in the HOCH^N project already implies a bias towards a stronger commitment to sustainability, it shows interesting cases, with very different approaches to the organization of sustainability.

The interviews were conducted using an interview guide consisting of five sections, each containing one key question and supplementary questions. The five sections were:

1. Development of the sustainability process;
2. Importance of specific actors, structures and processes;
3. Sustainability as a guiding principle for the HEI;
4. Assessment of the sustainability process;
5. Assessment of the stakeholder network by means of the governance equalizer heuristic.

Of the 61 interviewees, 30 were female and 31 were male. As the study was designed on a cross-sectional basis, all individuals were interviewed only once. The average duration of an interview was 47 minutes. All interviews were recorded and transcribed using a simplified approach [31].

3.2. Data Analysis

The material was analyzed in several successive phases. As an initial step, data from the eleven case studies were analyzed using qualitative content analysis [32]. To ensure that data were adequately analyzed and interpreted, all phases of the analysis involved a minimum of two researchers and data analysis and interpretation was validated between researchers using a communicative process (cf. [33]).

First, a qualitative thematic text analysis was conducted, using primary categories derived from the interview guide. After coding data in line with these and other deductive categories from three HEIs, additional categories and subcategories were created. The data from all eleven cases were coded using the revised categories and category-based analysis was undertaken, creating thematic summaries for all coded text segments.

On this basis, case profiles were produced, which, in addition to a timeline for SD processes, included findings on the state of SD activities, initiatives and actors, motives and objectives, views on the societal role of HEIs, influencing factors (structural/institutional, process related, personnel, HEI size, external), and factors of particular interest in relation to specific cases. The case profiles were used to carry out thematic cross-case analysis with the aim of identifying differences and similarities (Figure 1).

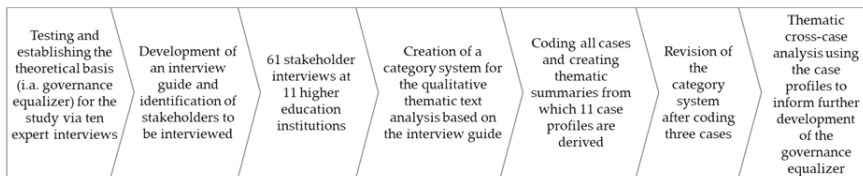


Figure 1. Original analysis (focus on sustainability initiatives and governance equalizers) [19].

This led to the identification of four major cultural dimensions of sustainability governance at HEIs [19] characterizing HEIs' conceptions of themselves as institutions as well as their attitudes towards SD (implementation). Each of these cultural dimensions (described briefly in Section 2.1) was then conceptualized as a continuum, ranging from an ideal type of slightest expression to an ideal type of strongest expression. Once every HEI had been located on each of the continuums by means of qualitative content analysis, the results suggested the condensation of the four continuums into two overarching orientations, each comprised of two of the former dimensions (Figure 2).

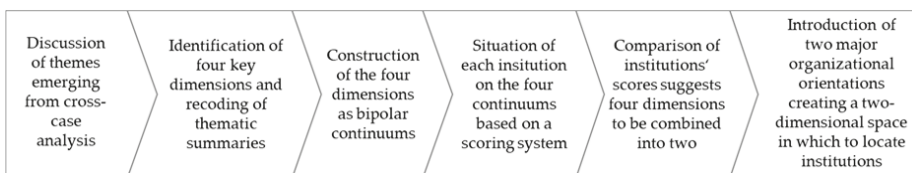


Figure 2. Subsequent analysis (recoding with a focus on the culture of sustainability governance) [19].

At the end of these two analytical phases, two different perspectives on sustainability governance at HEIs emerged: the governance equalizer, with its requirements relating to the functions of sustainability governance, and the organizational orientations crucial to sustainability governance on a cultural level. In order to probe the interrelation of these perspectives, further examination of the case studies appeared necessary and became the aim of this paper.

For that purpose, two pairs of cases were chosen, and their general sustainability processes were compared within each pair; more importantly, the governance structures that the institutions had set up in light of their organizational cultures were also compared. To facilitate this, the case profiles were

first examined individually for signs in the equalizer dimensions that allowed aspects of the HEIs' cultural orientations to become evident. We then compared the elements that we had identified within each pair to determine the extent to which the different cultures of HEIs had an impact on the design of individual aspects of governance. This acted as the basis for the formulation and discussion of more general assumptions about the interaction of cultures and functions (Figure 3). The reasoning behind the selection of cases is below and is followed by a retracing of the analytical process.

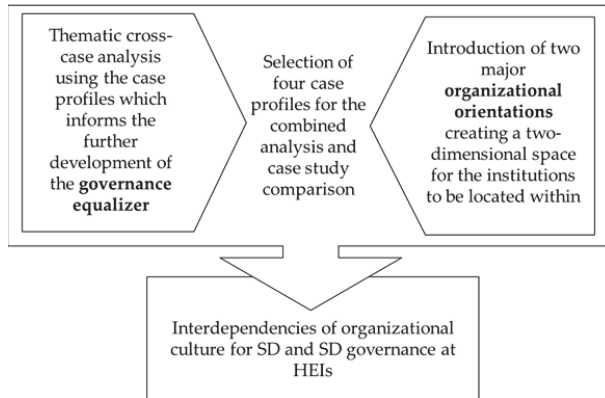


Figure 3. Combined analysis of the cultural orientations and governance equalizer dimensions.

3.3. Selection of Cases for a Comparative Analysis

Cases were selected on the basis of Niedlich et al. [19] and the classification of the cultural orientations at the eleven HEIs presented there. From this standpoint, two pairs of HEIs were identified as particularly interesting. They all stemmed from the center ground of the HEIs under consideration, with one pair showing diverging orientations and the other converging orientations in relation to the regression line (Figure 4) that was established for the complete sample of eleven HEIs. It revealed a clear tendency towards a linear relationship between *holistic* and *learning orientation*.

Cases VI and VIII were chosen here, for they were the ones that deviated the most from the assumption that *holistic orientation* and *organizational learning orientation* are in a linear relationship, but the nature of their divergence was different (note: the numbers of the cases correspond to their use in [19]). Case VI was found to have a more advanced *holistic orientation* than *learning orientation*, while case VIII had a culture that was more inclined to promote mutual and inclusive learning and was less focused on having a comprehensive concept of sustainability and all-pervasive processes [19]. We concluded that comparison of the two cases might reveal how the different orientations affected governance structures.

Cases III and IX both supported our assumption of a mutually reinforcing relationship between *holistic* and *organizational learning orientations* (Figure 4), but they diverged considerably in their expression of this. In fact, they were the two institutions at the opposite ends of a spectrum of HEIs in the center ground of the sample when cultural orientation was analyzed [19]. The cultural orientation of HEI III towards sustainable development was much less evolved than in HEI IX. It was deemed interesting to compare features of the governance equalizer dimensions for each institution as they related to different stages of development in governance.

Figure 4 situates the four HEIs in a matrix between *holistic orientation* and *learning orientation*. Since all four cases demonstrated mid-level performance as far as their cultural orientation towards SD was concerned (compared with the other cases in the sample), the field only ranges from relatively low to relatively high. Together, the four cases represent all of the possible combinations of the two orientations in the matrix (HEI VI = high + low; HEI VIII = low + high; HEI III = low + low;

HEI IX = high + high). A practical but somewhat coincidental area of common ground between each pair of HEIs is that their current sustainability processes started at similar times and in similar ways. Additionally, all four of the institutions are financed by the state and not privately funded, which also supports their comparability.

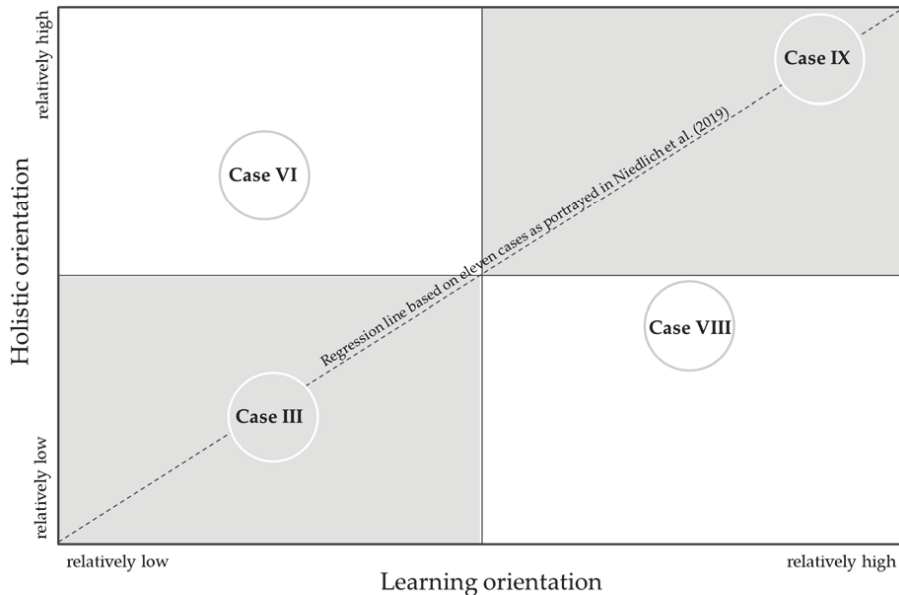


Figure 4. Matrix of selected cases between holistic and learning orientation.

4. Results

A comparative analysis of the two pairs of HEIs provides the following insights in respect of the effects of cultural orientation (*holistic and learning orientation*) on the functional requirements of sustainability governance, as illustrated by the sustainability governance equalizer. The two cases constituting each pair are first described separately and then compared with each other.

4.1. Cases VI and VIII: Strong Holistic Orientation and Pronounced Learning Orientation vs. Low Holistic and Distinct Learning Orientation

Cases VI and VIII were used to gain an impression of the extent to which a difference in the degree of the two cultural orientations impacts on governance structures. Case VI had a stronger focus on *holistic orientation* and case VIII had a more pronounced focus on *learning orientation*. While the SD structures and processes that were set up at the two HEIs appear quite similar from the outside, significant differentiation was found. The case descriptions and analyses below explore and draw out, in particular, the differences relating to the manner of structures’ outreach into their institution, how autonomous they are and what their conceptual focus is.

4.1.1. Case VI: Strong Holistic and Low Learning Orientation

HEI case no. VI has between 5000 and 10,000 employees and between 25,000 and 50,000 students in 100–200 different study programs with a broad spectrum, and is located in an urban environment. The beginning of its sustainability process can be traced back almost 30 years to the early 1990s when concerns about the scarcity of global resource were raised by campus operations staff. Energy efficiency has been on the construction department’s agenda ever since, with other environmental issues

being discussed in a working group specially established for this purpose. From there, sustainability as a concept evolved in HEI VI and was recognized by senior management in recent years as a guiding principle for the whole institution, with the potential to promote and underline its reputation for scientific excellence. A center of expertise was established as the central SD governance body, mediating between senior management and the rest of the HEI. It is comprised of five strategic working groups covering the whole institution and with participation by academic staff, administrative staff and students.

Many activities aimed at creating a sustainable HEI were initiated, including the preparation of a sustainability report and the development of a mission statement. Nevertheless, the HEI’s overall SD process is said to be lacking in terms of oversight of the various activities, the transfer of principles into day-to-day practices and broad participation.

Further descriptions of the case are given in Figure 5, which sets the HEI’s cultural orientation next to its governance equalizer dimensions. It creates a more comprehensive picture of the HEI’s relatively highly developed *holistic orientation* and relatively underdeveloped *learning orientation* in relation to SD. Taking all these aspects into consideration, in what ways they might have influenced each other in the particular context of HEI VI can then be discussed.

SD Cultural Orientations	Governance Equalizer Dimensions
<p><i>Learning orientation:</i> The HEI</p> <ul style="list-style-type: none"> • assigns sole authority to senior management in setting the tone for the whole process, • has established a centre of expertise that is subject to instructions from above, but seeks to open the process to all HEI members, • sees itself as well embedded in society, but its societal engagement is considered a ‘task for the future’. <p>→ relatively low expression</p>	<p><i>Politics</i></p> <p>There is an official commitment for SD on the part of senior management, accompanied by strategies and sub strategies and implemented through the center of expertise. Sustainability is embedded in the HEI’s statutes and in its general mission statement. → rather strong expression</p>
<p><i>Holistic orientation:</i> The HEI</p> <ul style="list-style-type: none"> • has a long tradition of taking environmental considerations into account, and many different conceptions of sustainability among its members, but the centre of expertise works to unite and concretize them, • pursues a whole-institution approach, supported by the division of the centre of expertise into different working groups. <p>→ relatively high expression</p>	<p><i>Profession</i></p> <p>The center of expertise has initiated a participatory process for the development of a joint definition of sustainability which has brought people from different fields together. Some of whom are also working on interdisciplinary research projects with direct relevance to SD. Sustainability is starting to be actively discussed, but is not yet dealt with in general lectures and seminars. The handling of the HEI’s sustainability paradigm differs markedly between departments. → low to medium expression</p>
	<p><i>Organization</i></p> <p>Many of the features of HEI VI already mentioned form a comprehensive organizational structure. The center of expertise, the statute and the strategies to promote sustainability are recognized as reasonable. However, the center of expertise’s efforts to involve a more diverse group of stakeholders in a structural way has so far not been as fruitful. Administrative procedures have not been aligned with sustainability standards due to a lack of direction, in spite of improved communication with senior management via the center of expertise. → medium to strong expression</p>
	<p><i>Knowledge</i></p> <p>SD-related knowledge at HEI VI consists of a variety of material that has been published by the center of expertise or the HEI in general. The more extensive examples are the sustainability report and a best practice compilation of different teaching formats for SD. However, there is criticism of the fact that internal knowledge transfer is not sufficiently pervasive and has not reached some key stakeholders preventing them from taking cohesive action. → low to medium expression</p>
	<p><i>Public</i></p> <p>There is currently some overlap between the knowledge and the public dimensions. Accordingly, the public is addressed, but has not been reached in such a way as to establish general awareness of the HEI’s sustainability process. → low expression</p>

Figure 5. Overview of the cultural orientations and the governance dimensions of higher education institution (HEI) VI.

In light of the cultural orientation, some of the governance equalizer values do not come as a surprise. The HEI’s low *learning orientation*, and in particular the fact that responsibility for SD is mainly assigned to senior management can facilitate and accelerate processes such as embedding SD in the mission statement (→ *politics*), especially when it is paired with a whole-institution approach (→ *organization, profession*). However, in terms of long-term prospects, the success of such a top-down process depends on whether HEI members are willing and able to commit to a mission statement that they were not involved in developing. In order to bring a top-down strategy to life (→ *politics, organization, public*), it may be necessary either to allocate additional personnel specific responsibility for achieving the objectives or to re-organize responsibilities, because it is unlikely that staff will have

too much time for unexpected tasks. Otherwise, a low *learning orientation* combined with a high *holistic orientation* towards SD might come in handy when it comes to announcing SD principles for the HEI as a whole, but it does not guarantee that such principles will be eagerly adopted.

As described above, the center of expertise has begun to promote an institution-wide conversation on SD (→ *profession, knowledge*) because of its belief in holistic transformation, but the power to make real changes to fundamental processes still lies with senior management, which does not take things quite so far. The thoughtfully constructed and broadly established center of expertise, which is striving to coordinate a diligent and coherent process (→ *organization*), may be in danger of becoming a toothless tiger. This might lead to problems for all the equalizer dimensions, since their development seems to depend on that very structure.

4.1.2. Case VIII: Low Holistic and Profound Learning Orientation

HEI VIII is also located in an urban environment. It also has 25,000–50,000 students across 100–200 different study programs and employs up to 5000 people. Sustainability became an issue at this HEI at the beginning of the 1990s, sparked by employees in the administration who demanded that the institution take meaningful steps to reduce its energy consumption, much like case VI. At HEI VIII, this led to a long process of ISO certification and ultimately resulted in the introduction of the Eco-Management and Audit Scheme (EMAS). Several small sustainability teams were entrusted with the development of energy saving measures at the departmental level; these had a great impact and helped the whole process to evolve.

Nowadays, there is a staff unit for sustainability and energy with approximately ten employees, who are recognized as important drivers of the sustainability process. The concept of sustainability has broadened over time. Through, inter alia, the engagement of a student initiative, the focus has been shifted from campus management resource concerns towards a comprehensive approach including research, teaching and outreach. A research center acted as the key catalyst for sustainable development in research, generally accessible courses were established with a clear relevance for sustainability, and participation in sustainability networks was increased.

As stated above, HEI VIII is an institution with a relatively low *holistic orientation* and a relatively high *learning orientation* towards SD. Therefore, to some extent, it represents the reverse set-up of HEI VI. A closer look at the governance equalizer dimensions for HEI VIII, as summarized in Figure 6, might help to pinpoint the possible effects of the different cultural environment that is indicated on the left side of the figure.

Throughout the five dimensions, the high *learning orientation* seems to have had an impact that is manifested in a collaboratively developed mission statement (→ *politics, organization, profession, public*) and also in the way the staff unit has been arranged (→ *organization, knowledge*). It has close links with senior management but is also working with sustainability teams in the HEI's different areas (→ *profession*). Responsibility for SD is spread between them and not completely centralized, which certainly increases public attention for the topic (→ *public*). The HEI's *learning orientation*, and specifically its conception of its own role in society as an SD educator, has enabled the development of new concepts of knowledge transfer (→ *knowledge, public*).

The main gap highlighted by the governance equalizer is insufficient coherence and shared understanding amongst HEI members with regard to SD (→ *profession*). Against the backdrop of a long tradition of ecological optimization and the ongoing focus on energy and resources in the staff unit, it seems logical that, despite collaborative processes, HEI members are irritated by aspects of the institution's concept of sustainability because the *holistic orientation* is somewhat limited. Nonetheless, the HEI has been able to establish solid overarching governance structures.

SD Cultural Orientations	Governance Equalizer Dimensions
<p><i>Learning orientation:</i> The HEI</p> <ul style="list-style-type: none"> • pursues the idea of shared responsibilities, • values the students as a great driving force and has identified actors in a range of positions as being part of a collective SD process, • has established a steering committee that helps to bring together the different views, expectations and experiences, • recognizes senior management commitment and support, but focuses more on the broad mass of HEI members, • stresses its role in society and aims for SD especially through its teaching activities. <p>→ relatively high expression</p>	<p><i>Politics</i> The activities are well supported by the HEI's senior management. Despite the fact that sustainability is not regarded as the key aspect of the institution's profile or a core issue, the institution has put in place environmental guidelines and a sustainability mission statement. The large staff unit and EMAS attest to a certain sense of responsibility for the SD process. Hence, the equalizer dimension politics is rather well developed in case VIII. → rather strong expression</p>
	<p><i>Profession</i> This dimension is not as well established. The mission statement was developed by means of a collaborative process and the major student initiative for SD manages to bring together representatives of the different fields of activity. However, HEI members complain about a lack of shared goals or concepts, and the lack of a common language between the disciplines. Given the starting point of the institution's sustainability process, aspects of climate change mitigation and resource savings still receive more attention than other aspects of SD. → medium expression</p>
	<p><i>Organization</i> The HEI has set up solid and effective structures that provide the engaged actors with agency and room for proactive process design. Through arrangements such as the sustainability teams and a steering committee mean that the needs of the individual fields in the HEI can be identified and solutions found. It is only the derivation of measures from the mission statement that has been insufficient. → rather strong expression</p>
<p><i>Holistic orientation:</i> The HEI</p> <ul style="list-style-type: none"> • focuses more on ecological aspects of SD than others due to its history, but is aiming for a more comprehensive approach, • has a staff unit for sustainability and energy which is eager to broaden the process and is supported by a steering committee. <p>→ relatively low expression</p>	<p><i>Knowledge</i> Knowledge and the public are both dimensions that have thus far had medium to low status at HEI VIII so far. Knowledge is evident in a diverse range of experience and theoretical knowledge, found mainly at the staff unit and the research center. However, systematic bundling, preparation and provisioning have not been arranged. Knowledge transfer is enabled through projects such as a program for high school students about sustainability and climate change, and the establishment of a sustainability research network. → medium expression</p>
	<p><i>Public</i> The institution generally addresses its public is through publicity for events (posters etc.) undertaken by the different actors and through its website, but response levels leave room for improvement. Thanks to the staff unit's affiliation to HEI senior management, the structure is quite well-known. → low to medium expression</p>

Figure 6. Overview of the cultural orientations and governance dimensions of HEI VIII.

4.1.3. Comparison of HEIs VI and VIII

The strongest equalizer dimensions for HEIs VI and VIII are *politics* and *organization*. *Profession*, *knowledge* and *public* are all developed to a medium level at both HEIs. At first sight, the different organizational cultures do not appear to have had a particular impact on HEI sustainability governance. However, as the individual case descriptions have shown, the HEIs' SD structures vary with regard to some important details. This is most prominently expressed in the relations identified between the main SD actors and the potential for these relations to be shaped by the culture of the organization (especially its *learning orientation*).

HEI VI with its center of expertise and HEI VIII with its staff unit have set up structures that aim to introduce SD measures into all fields of activity. They both have close links with senior management and are equipped with roughly the same number of staff. However, there are differences in their strategic alignment and integration, i.e., the way functions are organized as shown in the equalizer. These relate to three major aspects, which seem to go hand in hand with the HEIs' cultural orientations: the manner of their outreach into the institution, their degree of autonomy and their conceptual focus.

By 'manner of outreach', we mean the strategies adopted by the two bodies that might help them to gain acceptance for (common) SD activities in the HEI's community. The idea that responsibility for SD should be spread across several pairs of shoulders (→ *attribution of responsibility*, as part of the *learning orientation*), and that these shoulders need to have some level of autonomy, seems to have driven HEI VIII towards more open and extensive structures. Certainly, the staff unit is the team with primary responsibility; it is also dependent on senior management decisions. But through the sustainability teams in different departments, a unifying steering committee and a good connection with the biggest and highly active student and staff sustainability initiative, they have the potential to shape a coherent and collaborative process that receives a broad welcome. The institution's *learning orientation* has thus enabled reasonable structures in terms of *profession*, *organization*, and potentially *public*.

This is seemingly less the case in HEI VI, where the working groups are an integral part of the center of expertise, are made up of appointed members and, therefore, act less independently.

The structure is not bad per se, but it could be argued that greater awareness of and trust in a broader range of perspectives could help with implementation. This is evident at HEI VI in certain situations where senior management demonstrates a lack of appreciation for the achievements of extensive student engagement. The center of expertise, however, is working on overcoming this problem and is already considered a good contact point for SD issues by other HEI members. These efforts might eventually lead to changes in the HEI's cultural orientations. This would provide an example of how governance structures can influence an HEI's cultural orientation over time.

The conceptual focus refers to the aspects of SD that are being addressed by the staff unit or the center of expertise and their underlying *conceptions of sustainability*. Even though both HEIs originally focused on improving ecological rather than other aspects of sustainability, as the cultural orientations show, HEI VI is now applying a multi-dimensional approach more consistently than HEI VIII. This can be linked to the different staff configurations that are responsible for SD, and their backgrounds. On the one hand, the staff unit at HEI VIII has evolved from a staff unit for energy to a staff unit for sustainability and energy and was, therefore, built around—and still is dominated by—an expertise in energy and resource issues. The center of expertise in HEI VI, on the other hand, was conceived as an interdisciplinary team from the beginning and hence has been better able to identify with a multi-dimensional concept of sustainability.

When looking at overall SD governance at both HEIs, however, this head start has not resulted in a long-term advantage or disadvantage for HEI VI. This is doubtless due to a number of factors. It is suspected, though, that the *conception of sustainability*, which is only one part of the *holistic orientation*, might have less influence on SD governance than the second part, the *relevance and scope of organizational change*. At least regarding the initiation of the process, it seems to be more important for an HEI's SD governance to take an institution-wide approach than have a comprehensive conception of sustainability when structures are created, which can happen at any level and in any part of the institution. After all, the whole-institution approach is an aspect that these two HEIs have in common and that so far seems to have guided them in relation to structures. However, comparison of the two cases shows that the learning orientation needs to be factored in when designing the whole-institution approach and that a holistic orientation alone does not lead to all-encompassing structures and processes.

This last aspect suggests that the discrepancies between the two cultural assumptions, which were found only in HEIs VI and VIII out of the sample of eleven, are not only uncommon, but also, to some extent, counterproductive. A more linear evolution in orientation appears more desirable, although it does not necessarily mean an easy route of SD implementation as the comparison of the next two cases will illustrate.

4.2. Cases III and IX: Low Holistic and Learning Orientation vs. Distinct Learning and Holistic Orientation

Cases III and IX are intended to provide insight into how very different stages of cultural orientation affected governance structures at the HEIs in question. Case III had one of the lowest *learning* and *holistic orientations* and case IX one of the highest. Since they both represented cases where the relationship between *holistic* and *learning orientation* was linear, it was deemed of particular interest to investigate how these individual HEIs at the opposite ends of the proposed cultural orientation spectrum translate their cultures into governance measures. Many differences were identified between the two HEIs, but the most distinctive aspect arising from the comparison was their different approaches towards knowledge work in the context of SD as the following outlines illustrate.

4.2.1. Case III: Low Holistic and Low Learning Orientation

HEI III is an urban HEI with 25,000–50,000 students in 100–200 study programs and employs between 5000 and 10,000 people. The sustainability process was only begun in 2013 with a senior management decision to appoint a sustainability commissioner. Prior to that, a very active student initiative had been the only driver of sustainability-related change at an institutional level.

The sustainability commissioner, who is a professor and, therefore, does not have extra time resources, has been given the support of a research assistant and the task of supervising a 5 year sustainability reporting process with the aim of proposing appropriate measures. By the time the interviews took place, the team had almost finished its inventory and was about to start using it to derive strategies. One central idea is the establishment of a Green Office for process stabilization and continuity.

Apart from this central process, different individual activities are taking place. The abovementioned student initiative and the general student committee organize SD events, promote sustainable consumption on campus and search for innovative mobility solutions. A mixed group of HEI members is focused on making the campus bike friendly. As regards teaching, practical interdisciplinary sustainability courses are being offered.

This description of HEI III paints the picture of an HEI that has set a sustainability process in motion with a comparatively low *learning orientation* towards SD and an initially rather one-dimensional and top-down approach. Figure 7 reflects on some further insights into the HEI’s cultural orientation and outlines the governance equalizer dimensions.

SD Cultural Orientations	Governance Equalizer Dimensions
<p><i>Learning orientation:</i> The HEI</p> <ul style="list-style-type: none"> follows the idea that senior management and the sustainability commissioner need to structure and guide the way, is mainly concerned with the sustainability reporting team as the centre of the process, consultation with other HEI members is mostly inventory-related (for the sustainability report), has shown appreciation for the general idea of a broader attribution of responsibility and the transformative potential of an HEI but has not internalized and applied it to its own sustainability process. <p>→ relatively low expression</p>	<p><i>Politics</i></p> <p>Sustainability guidelines are being discussed and the Copernicus Charta was signed early on as an official commitment for SD. → rather low expression</p>
<p><i>Holistic orientation:</i> The HEI</p> <ul style="list-style-type: none"> does not network between the different actors, i.e. the technical staff feels rather isolated, has a sustainability commissioner whose expertise lies in the ecological aspects of SD, the whole process has evolved out of that. <p>→ relatively low expression</p>	<p><i>Profession</i></p> <p>Cooperation between different professions is enhanced through the range of interdisciplinary courses on sustainable development and a certificate that students can receive for attending a certain number of these courses. The sustainability reporting team reaches out to all relevant actors for their inventory and slowly builds relationships with them. But the actors are not actively networked with each other and collaboration is rather accidental. The technical department in particular feels rather isolated, but also claims to have no resources to join in any projects. In addition, there is no common understanding of sustainability. → medium expression</p>
	<p><i>Organization</i></p> <p>The active SD structures feeding into the organization dimension are the sustainability commissioner and his team who stay in close contact with senior management via regular meetings. The general student committee is engaged as are some of the teaching staff who organize the SD certificate courses. There used to be a quite influential student initiative that has now become independent of the HEI. In terms of external relations, senior management has joined an alliance with other HEI leaderships where concepts and ideas on the HEI’s development, also with regard to sustainability, are regularly exchanged. An external sustainability advisory committee is envisaged. → medium to strong expression</p>
	<p><i>Knowledge</i></p> <p>The generation and aggregation of SD knowledge was a focus of the HEI even before senior management started the official process and it has remained the main concern of the reporting team based on the idea that appropriate strategies can only be developed with a good overview of current data and processes. Decentralized events and the sustainability courses offer HEI members the opportunity to debate different options for action on an individual level. → medium to strong expression</p>
	<p><i>Public</i></p> <p>The abovementioned events and other activities organized by the student initiative also seem to be the best way of raising public awareness of the HEI’s sustainability ambitions. The reporting team spreads the word slowly by contacting individual actors for their inventory. They have not reached out to a broader public. → low expression</p>

Figure 7. Overview of the cultural orientations and governance dimensions of HEI III.

HEI III finds itself at a point in its sustainability process that can easily be traced back to its cultural orientation. The *learning orientation* in particular seems to be clearly reflected in the current governance. Senior management and the sustainability commissioner and his team preferred to learn about their institution before they learned with the institution when they decided that a sustainability report should be produced before any other centralized sustainability activities were pursued so that the latter could be based on reliable information (→ *profession, organization, knowledge*). It is arguable whether this was a wise or even necessary decision, and, in the long run, this will be illustrated by what the HEI eventually makes of the process that it has started, which it has mostly kept in the presidential office. For now, the activities taking place in addition to that official top-down process such as the sustainability certificate that students can gain—organized by some teaching staff, or other student or professional or technical staff-based initiatives—are trying in vain to find allies in their HEI.

Instead of supporting the building of an SD network within the HEI and starting to share responsibilities, senior management prefers to join external sustainability networks and seek alliances with elite representatives from other HEIs. Both are a potential source of valuable knowledge on SD implementation, but the exclusive involvement of senior management underlines once more the HEI's low *organizational learning orientation*. The establishment of a Green Office (a student-led sustainability bureau with HEI funding) may succeed in breaking with this pattern (→ *organization*). So long as it is not primarily an extension of the senior management but has some autonomy, it could be a good way to open up the process to the whole HEI community (→ *profession, public*).

Taking the HEI's holistic orientation into consideration, it has certainly had an impact on the ongoing process. The HEI does intend to apply a multi-dimensional approach to sustainability and to integrate it into its different fields of activity, but this concept was formulated only relatively recently. Besides the commissioner and his team, who are responsible for SD across the whole institution (→ *organization*), there are hardly any activities that indicate a comprehensive approach is being taken (→ *politics*). Due to his area of expertise, the sustainability commissioner mainly takes content-based responsibility for ecological topics. In this case, this has hardly any effect on the process within the HEI as a whole, as there has thus far been virtually no contact with the technical staff of the HEI (→ *profession*). The relatively low learning orientation is, therefore, preventing the equally low holistic orientation at HEI III from having an impact on procedures.

4.2.2. Case IX: High Holistic and High Learning Orientation

HEI IX is the only rural HEI in the selection. It has less than 1000 employees, between 5000 and 10,000 students and offers study programs in a narrow course spectrum. In 2013, some committed individuals at HEI IX started submitting requests to senior management for the HEI to promote sustainability. Some responsibility for SD was created in the form of target agreements between the HEI and the federal state. Institution-wide workshops in 2015 introduced further ideas about a sustainable HEI and were followed by the appointment of a sustainability commissioner, also a professor, who was provided with some personnel resources. The sustainability commissioner coordinates a SD working group that has prepared sustainability guidelines that were discussed in another institution-wide workshop including senior management and are being processed by the HEI senate.

The working group, which has a good mix of HEI members, and a student initiative host small events and participate in national sustainability action days. On the administrative side, sustainability considerations have impacted on a number of procurement decisions, and connections have been made between SD and the HEI's policies (e.g., gender equality, family friendliness, inclusion).

HEI IX has the most concise orientation of the four towards sustainability. Figure 8 provides more detailed information on both the cultural orientation and the governance equalizer. The interrelationship between the two is discussed below.

Interestingly, the governance equalizer does not actually portray HEI IX as having advanced sustainability structures and processes, as the organization's culture has suggested. However, that does not necessarily mean that the cultural orientations did not have an impact. Closer examination reveals that the structures and processes that have been implemented or are about to be implemented, especially in relation to *politics* and *organization*, do reflect a relatively high *holistic* and *learning orientation*.

The understanding that actors from all the different groups of stakeholders and fields of activity should have the opportunity to participate in the HEI's sustainability process is clearly expressed in the way the overall process has been executed so far. Several institution-wide workshops were held, which, among other things, resulted in common sustainability guidelines (→ *politics, profession, public*). The sustainability commissioner coordinates an open SD working group (→ *organization*), and student involvement is much appreciated, albeit difficult to maintain. From the very beginning, sustainability was considered to be a multi-dimensional concept, and this is well reflected in the guidelines. The steps may be small, but they set the tone for further development of the HEI's sustainability governance. This is especially true for the *knowledge* dimension, the least prominent equalizer dimension at HEI

IX. This case indicates that participatory processes not only take time, but also require staff resources, with which HEI IX is the least equipped out of the four cases presented here. Apart from that, this HEI certainly has some advantages—shorter distances, a smaller range of disciplines—which facilitate some processes, since it is by far the smallest of the four HEIs.

SD Cultural Orientations	Governance Equalizer Dimensions
<p><i>Learning orientation:</i> The HEI</p> <ul style="list-style-type: none"> • has so far undergone an organic and collaborative evolution of SD structures and goals, • has established a working group and hosted institution-wide strategy workshops; both support the exchange of view and mutual learning for sustainability, • is actively engaged with regional actors and influences regional development through various projects. <p>→ relatively high expression</p>	<p><i>Politics</i> Sustainability is certainly identified as a relevant issue on the political agenda of HEI IX. The official approval of sustainability guidelines by the senate is underway and target agreements with the federal ministry offer an important framework for initiatives. However, there are complaints about a lack of a clear strategy. → medium expression</p> <p><i>Profession</i> The working group serves as an effective network for people from different fields of activity, and is yet characterized by a variety of individual definitions of sustainability and their application for the HEI. SD is encountered in different ways by members of the different disciplines, especially in the context of teaching and research. Nevertheless, there are a number of (practical) seminars with a sustainability focus that are accessible for all students and often provided in collaboration with external partners. The HEI's narrow range of disciplines generally seems to favor more direct exchanges. → medium to strong expression</p>
<p><i>Holistic orientation:</i> The HEI</p> <ul style="list-style-type: none"> • has appointed a sustainability commissioner with an interdisciplinary background and is taking a holistic and collaborative approach to SD, • considers all its fields of action as equally relevant to SD. <p>→ relatively high expression</p>	<p><i>Organization</i> A clear course has been set with regard to structure. Further development and implementation are needed. Offers to participate are increasingly recognized and accepted, but student involvement is in question since several key players are leaving the HEI. → medium expression</p> <p><i>Knowledge</i> This dimension still needs to be strengthened. A considerable amount of research and teaching at HEI IX relates to sustainability issues and is constantly producing new knowledge, but the transfer of this to the HEI itself has not yet been regulated. For now, sustainability actions are based on single, somewhat unrelated ideas rather than systemic priorities. → rather low expression</p> <p><i>Public</i> There is a desire for greater public attention for, and knowledge of, the sustainability process particularly from students. There are activities aiming, inter alia, to give the issue greater prominence – such as the strategy workshops, the online presence, a lecture series on sustainability and a sustainability guide produced by the student initiative. Nonetheless, sustainability, or at least the awareness for the HEI's efforts, has by far not reached every corner of the institution. → low to medium expression</p>

Figure 8. Overview of the cultural orientations and governance dimensions of HEI IX.

4.2.3. Comparison of HEIs III and IX

At first sight, there are some commonalities in the two institutions' sustainability processes. They started around the same time after small groups or individual HEI members became engaged with sustainability. Once they had been successful in putting sustainability on the HEI's agenda, the senior management team in question decided to appoint a sustainability commissioner to be responsible for coordinating and overseeing the whole process. What appears to be quite different, though, is the conception of how best to set up the process. This is where the cultural orientations divide the two HEIs.

Although in the case of both HEIs, it has been a similarly short time since they initiated their sustainability processes, they have already adopted very different positions. It can be assumed that their cultural orientations have played a role in organizational development towards sustainability. HEI III went straight to action with a clear vision and introduced structures that should form the basis for a well-founded process. From an operational perspective, this makes sense, but the essence of sustainability seems to have been neglected or not fully internalized yet. This means that sustainable development, with its various substantive and methodological components, has either not been fully explored or has been reduced to distinct individual aspects. Even though the will to implement a multi-dimensional understanding of sustainability in all areas of the institution (→ *holistic orientation*) is generally present, the HEI is still faced with the challenge of transferring this will to the current elite and discrete structures and thus developing them further to make them more accessible. As was the case at HEI IX, the HEI's *organization* and *profession* dimensions would certainly benefit from such a concept.

HEI IX started with somewhat less concrete activity, but active stakeholder participation ensured that there was broad agreement with the central decision by senior management to appoint a sustainability commissioner. This openness signals to the members of the HEI that their engagement is wanted and that it can shape important aspects of SD. This also makes it easier to replicate the organizational culture amongst HEI members and encourage it to evolve collectively. The working group has promoted regular interdisciplinary exchange and collaboration (→ *organizational learning orientation*). Nonetheless, there is one equalizer dimension that has been developed notably further at HEI III than HEI IX: *knowledge*.

Maybe unexpectedly, this is also where the differences between the ways the HEIs' governance has been shaped by their cultural orientations are most obvious. The HEIs seem to apply quite different approaches towards knowledge and knowledge work in the context of SD. HEI III, with its focus on knowledge generation, has introduced a structure, namely the sustainability reporting team, which is efficient at gathering data and identifying important contributors for the report. Their knowledge work is a highly centralized and isolated process that does not open up to the potential for common exploration with diverse stakeholders on diverse topics, which is the approach taken by HEI IX. The combination of low holistic orientation and low learning orientation leads HEI III to a very target-oriented, and in that sense efficient, *knowledge* dimension that, however, will inevitably reach its limits when all information has been gathered. High *holistic* and *learning orientations* have helped HEI IX to lay groundwork that gives knowledge the chance to expand at a variety of levels. The downside of this approach is certainly that it takes much more effort in relation to proactive stakeholder engagement and coordination and, therefore, has not yet resulted in a strong *knowledge* dimension for HEI IX. This comparison of knowledge work captures the distinct styles of SD implementation at both HEIs and corresponds well with the aforementioned aspects. It also highlights the different qualities that can be found within a single equalizer dimension and encourages an integrative approach towards the governance equalizer when introducing governance measures.

Overall, neither of the two HEIs has addressed any of the equalizer dimensions in an all-encompassing way. They have made approximately the same amount of progress, if that is even comparable, and are now at a point where the implementation of concrete and significant measures is required. Their SD processes are relatively young and will need some more time to unfold. It remains to be seen whether they will manage to either seize or change their current functions and culture.

5. Discussion and Conclusions

The comparisons between HEIs VI and VIII and HEIs III and IX have revealed various ways in which the cultural orientations of HEIs are expressed in the functionalities of their SD governance. In each of the individual cases, it was in principle possible to understand the relationship between these two factors. But what general conclusions can be drawn from these observations?

It is certainly a central finding that the cases not only demonstrate an interplay between cultures and functions, but also that the individual cultural orientations interlock during the implementation of structures, etc., and usually produce a common result. It is unlikely to be possible to cite single cultural orientations, be they *holistic* or *learning*, that have clearly and directly affected and shaped individual governance dimensions. This is not least due to the fact that neither cultures nor governance dimensions can always be clearly separated, nor should they be during the consideration of governance measures. Ultimately, HEI sustainability processes are no 'optimized production lines'; they are instead complex social processes that are both, resulting from and leading to social innovations (e.g., [16,27,34]). This is precisely why consideration of organizational cultures is so relevant and why it is worth attempting to identify patterns hampering or supporting fundamental change.

Another essential aspect that emerges from the comparative case analysis is the observation that cultural orientations do not become visible instantaneously and simultaneously in all corners of an HEI. This is in line with approaches of organizational research according to which HEIs may be considered as what is labelled "loosely coupled systems" in which autonomy and cohesion apply at the same time

which allows for testing novel solutions without reaching out to the whole institution right from the beginning [35]. Particularly in large HEIs, there may be “communities within communities” that do not interact as intensely with each other [36] so that a cultural change in one sector does not immediately apply for another one. Apart from this theoretical consideration, the challenge of grasping the cultural orientation of HEIs is partly due to the underlying methodology and material used. For the study reported here, we subjected existing interview material, i.e., material collected for a different purpose, to secondary analysis. Therefore, we did not have access to all the information that would have been desirable to enable the cases to be explored in greater depth. The cultural orientations described here need time to develop and to influence governance structures. This also brings into play what has already been suggested by some of the four cases, namely the possibility that structures and processes implemented may in turn have an impact on cultural orientations, thus giving rise to a feedback loop as part of a living process, as Disterheft et al. [10] have also pointed out with regards to participatory processes in particular.

The analysis has shown, in some cases, that the most direct path from cultures to functions was via the elements assigned to *politics* and/or *organization*. For at least three of the HEIs considered (III, VI and VIII), these governance equalizer dimensions were initially in the foreground. It is quite possible that this reflects a pattern that also appears in other cases from the overall sample. However, there are certainly other ways for SD to get into the HEIs’ bloodstreams. For instance, informal and unofficial but significant and profound engagement for SD by a group of actors might favor the development of a collaborative network of HEI members before it seeks to become institutionalized [37]. It, therefore, remains to be seen how successful the approaches will prove to be in the long run and what advantages and disadvantages they each offer. A broader examination of the whole study sample, ideally in combination with a second survey at the same HEIs, could provide insight into this.

This exploratory study, based on a secondary analysis of existing interviews, has identified interesting starting points for further research and, building on Adams et al. [16] and Baker-Shelley et al. [17], has also expanded the understanding of the importance of organizational cultures for sustainable development in HEIs. Real-life examples were used to illustrate potential interdependencies and to draw some general conclusions about how the cultures and functions of HEI governance relate to each other. In particular, it has increased the awareness of the diversity of HEIs’ SD processes. No matter how similar some structures may appear, it is not uncommon for details that initially appear inconspicuous to have a significant impact on their success. Both comparisons have made this clear. What was also implied at some points was the need to recognize further factors that influence an HEI’s sustainability governance beyond its cultural orientation. Aspects such as the size of the HEI or regional (political, legal and socio-economic) circumstances certainly also need to be factored in and might show some of the SD processes discussed in another light. Some of these aspects are also very likely to have shaped the depicted organizational cultures. However, this opens a new discussion that requires further investigation and exceeds the material of this study.

Overall, the frameworks taken from Bauer et al. [2] and Niedlich et al. [19] have proven themselves to be useful analytical tools. The categories developed provided valuable guidance in the midst of the complexities of HEI SD governance. This combined analysis, enriched by the four case studies, identified some fine mechanisms that can take place at the interplay of culture and functions. At the same time, it enabled a new reflection on the original frameworks themselves. Future research can take this into consideration and also explore other ways of applying them.

In view of the small selection of cases, which is also limited to German HEIs involved in a joint project, the limits of generalizability are quickly reached. The interpretative methodology also imposes certain limitations on the results here. Further investigation on the basis of a larger sample is required in order to verify the findings. Nevertheless, the approach adopted in this paper contributes to the development of instruments that can be applied in practice, e.g., for self-reflection and self-assessment by HEIs (see [38]). It could also serve to further differentiate and operationalize the cultural dimensions for the purpose of standardized surveys or be applied to the development of counselling concepts.

Bearing the initial research question of this paper in mind, it can be stated that an HEI's organizational culture is highly likely to affect its approach to SD governance in crucial ways. The case studies demonstrated essential connections between cultural orientations and the governance approaches of HEIs, as illustrated by the governance equalizer. Many of these connections relate to the specific circumstances of the HEIs in question, i.e., with regard to the individuals involved. Although there will be no other HEI that functions in exactly the same way as one of these four, the perspective offered by this combined analysis of cultures and functions of SD governance at HEIs offers should make it easier to identify trends.

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Article

The Whole-Institution Approach at the University of Tübingen: Sustainable Development Set in Practice

Kerstin Schopp ^{1,*}, Matthias Bornemann ^{1,*} and Thomas Potthast ^{1,2}

¹ International Centre for Ethics in the Sciences and Humanities (IZEW), University of Tübingen, Wilhelmstr. 19, 72074 Tübingen, Germany; potthast@uni-tuebingen.de

² Chair for Ethics, Theory, and History of the Life Sciences, University of Tübingen, Wilhelmstr. 19, 72074 Tübingen, Germany

* Correspondence: kerstin.schopp@uni-tuebingen.de (K.S.); matthias.bornemann@uni-tuebingen.de (M.B.)

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Abstract: In the following paper, we scrutinize understandings and values behind Sustainable Development (SD) in a case study of the University of Tübingen, Germany. In so doing, we adopt the perspective of the whole-institution approach of SD. We do not only analyze documents, but combine our investigations with empirical research on key actors' understandings and values of SD, as well as the competencies and the knowledge to set SD in practice. First, we demonstrate that actors' understandings and the values behind them at the University of Tübingen are in accord with the United Nations' understanding of SD ('Brundtland Report'). Second, we show that at the University of Tübingen, many actors already work in line with the whole-institution approach; this shall be further fostered and strengthened by the Competence Centre for SD. Finally, we demonstrate that both knowledge and competencies are fundamental to act for SD. It is suggested that the University of Tübingen should explicitly adopt the general understanding of SD in the above-mentioned sense, and develop a sustainability strategy, not least in order to support the actors to acquire specific knowledge to reach SD for the whole university. Finally, we discuss the potential and limits of transferring the findings to other Higher Education Institutions (HEI) and the challenges of necessary global perspectives.

Keywords: whole-institution approach; sustainable development; higher education institutions; competencies; knowledge; values; case study

1. Introduction: Topic and Structure of the Article

"Why should I be studying for a future that soon may be no more, when no one is doing anything to save that future?"

(Greta Thunberg, climate activist) [1]

Already in 2009, the German University Presidents' Conference (HRK) decided to implement Sustainable Development (SD) in the fields of research and knowledge transfer, education and teaching and the institution, and to foster Education for SD [2] (p. III). In the same year, mainly initiated by a student initiative, measures for establishing SD at the University of Tübingen, Germany were initiated, e.g., a study program for SD and preparations for an EMAS-certificate (European Management and Audit Scheme). In 2013, the University set up activities aiming at establishing a Competence Centre for Sustainable Development. From its outset, the Competence Centre's main goal is to address SD in a whole-institution approach (see Section 2.2).

The Competence Centre organizes and realizes a wide range of activities across the university, such as network meetings with university staff, and students interested in and working on topics of SD. The Competence Centre's staff regularly evaluates these activities. Therefore, we, as members of the

Centre, already experienced that members of the University of Tübingen have different understandings of what SD is, as well as of how exactly it should be implemented. The Competence Centre is a network node which enables actors to act for SD and, therefore, needs to know the actors' different expectations and needs. Only then will the Centre be able to provide them with the various resources adapted to their needs. Since the different understandings of SD, as well as the knowledge and the competencies of actors at the University of Tübingen differ, it is obviously difficult to plan and implement further activities in the field of SD for the Centre.

Hence, as a reaction to this situation, we have started the research project "SD@UT" which pursued the following research questions:

1. What is the understanding of SD of actors, who are involved in different fields of SD at the University of Tübingen?
2. How and where shall SD be implemented at the University of Tübingen?
3. What kind of knowledge and which competencies do actors need to implement SD in the areas of operations, research, governance, transfer, teaching and education, and sustainability reporting?

In the following, we will present the findings of this research project, structured as follows: First, we will briefly introduce different understandings of SD typically found in the scientific discourse. We will then outline the concept of the whole-institution approach and link it to the German research project HOCH-N, which identifies governance, sustainability reporting, teaching and education, research, operations, and transfer as relevant fields of a Higher Education Institution (HEI) [3]. Thereby, we also consider the Competence Centre's role at the University of Tübingen, its goals as well as its past and future work endeavors.

In the second step, we dive into the Competence Centre's research project that we have briefly introduced above, by considering its starting point.

In the final section, we will discuss options and opportunities to transfer our research results to other (inter)national universities. We will also discuss the need to integrate perspectives of the Global South into these conceptions and explain further research possibilities and needs.

2. State of the Art

In this chapter, we first present several levels and understandings of SD, followed by an overview of the whole-institution approach, as well as the research project HOCH-N's fields of actions [3]. Both form a basis for the Competence Centre's whole-institution approach, which we present in the final part of this chapter.

2.1. Understandings of Sustainable Development

The idea and concept of SD is present in different contexts and on several levels [4] (p. 27). We distinguished four levels and categories, which are, however, only a first classification. These are (i) the political level, (ii) the philosophical level as well as (iii) the personal level. Additionally, there are (iv) models, concepts, and guidelines. We do not want the reader of this paper to understand them separately from each other or to think that they are always redundant, since they smoothly merge into each other. In particular, the boundaries between models, concepts, and guidelines are fluid.

On the political level, the Brundtland Report [5], which was published after four years of work by the World Commission on Environment and Development (WCED), defined SD for the first time in UN history. According to this report, SD "meets the needs of the present without compromising the ability of future generations to meet their own needs" [5] (p. 16). Another important political event was the UN Conference on Environment and Development in 1992, which is known as the Earth Summit [6]. It aimed at setting the course for a worldwide SD while taking into account the dependency of human beings on their environment. For this reason, one core element of the Brundtland Report was elaborated: Since SD has to happen within the frame of finite natural resources, the UN brought together environmental and development issues and politics. Out of this idea, finally the eight Millennium Development Goals

(MDGs) [7] were born and adopted in 2000 during the Millennium Summit, and then replaced by the Sustainable Development Goals (SDGs) [8] in 2015.

The philosophical level of SD is connected to the justice-based idea of “the good life”, which goes back to the ethics of Aristotle. He argued for the aim of all humans to strive for eudaimonia—happiness or well-being—which requires a good character and, therefore, a sense of responsibility. The philosopher, Hans Jonas, took Aristotle’s Eudaimonia, as well as Immanuel Kant’s categorical imperative, as basis for his ecological imperative: “Act in a way that the effects of your action are compatible with the permanence of real human life on earth!” [9] (p. 36, translated by the authors). These ideas, together with John Rawls’ institutional theory of justice [10], surely influenced the Brundtland Report, which deals with inter- and intragenerational justice—the “good life” for everyone at any time.

The personal level is another crucial aspect of SD. However, even though politics often emphasize the importance of people’s individual contribution to efforts such as the energy transformation, which shall contribute to SD, the personal level of SD is not yet highlighted in science. Parodi and Tamm state that “one half of the sustainability universe is still mainly unrecognized and unexplored” [11] (p. 1). In times like ours, when pupils demonstrate for their and the world’s future, it seems crucial not to forget this dimension of SD, and what an individual can and wants to contribute, as well as how this individual is involved emotionally, culturally or psychologically. Our questionnaires’ results demonstrate this level’s importance as well (see Section 4.2).

One, albeit inappropriate, model of SD, which is probably best known in German-speaking contexts, is the three-pillar model. According to this model, the economic, environmental, and social domains constitute three equal pillars, which carry the roof of sustainability [12] (p. 13). As mentioned above, models of SD are closely interrelated to concepts and guidelines of SD. These include, for instance, Kopfmüller et al. [13], who developed an integrative concept of SD including its elements, rules, and indicators; Ott & Döring [14], who discussed the concept of a “Strong Sustainability”; Grunwald [15] on the comparison of these concepts; and Ott [16] who strove for embedding the, also in his view, inadequate three-pillar concept of SD into guidelines of Strong Sustainability. Mainly, all of the authors mentioned above, relate their concepts and guidelines to the three-pillar model of SD to improve it further or give it a suitable framework. Nevertheless, we join in the critics of this model with our own critique (see Section 4.2.1).

We point out that the understandings of SD on the different levels can vary within a certain domain. Many actors share some of these understandings; others exist only on an individual level and contradict the well-known ones. Additionally, scholars are divided considering these different meanings. The philosophical level, for instance, has a normative understanding, whereas models are developed to depict something soberly, to make it visible and easy to understand. These multiple understandings build the crucial backdrop against which our research project “SD@UT” (see Section 3) has been conducted. Taking the general inter- and intragenerational justice basis seriously, there are still different understandings and justification levels of SD.

2.2. Understandings of SD of Stakeholders at HEIs

As shown above, there are differing understandings and conceptions of SD in the scientific discourse. When we now focus on a certain group of actors, the question arises, in how far these conceptions are reflected within these groups and which aspects of SD are relevant. There are some international studies asking these questions and concentrating on SD understandings of actors at HEIs [17–23]. Unfortunately, such studies are hard to find in the landscape of German HEIs, and moreover, “there is a shortage of research approaching how faculty and staff perceive their role in relation to sustainability” [22] (p. 46). Almost all of these studies set their focus, more or less, on academic staff or even on teaching staff only. Rarely, other university members, e.g., facilities management directors [20] or university presidents [19] are being interviewed. Almost all of the studies hitherto have been conducted in the context of Education for SD and, therefore, it “is crucial that university faculty and staff have the necessary conditions and competences to provide key SD skills to the students” [22]

(p. 46). Some of these studies also have a focus on evaluation, as they scrutinize the effects of measures (e.g., trainings and workshops) to implement and teach SD within the academic staff [18,21,23].

However, there are similar findings in these different research approaches. In general, one clear definition of SD does not exist amongst staff members [17] (p. 121), [22] (p. 53). Nevertheless, almost all actors refer to (natural/ecological/environmental) resources and some to (inter- and intragenerational) justice when asked for the meaning(s) of SD [17] (p. 116f.), [18] (p. 229), [19,20] (p. 119f.), [22] (p. 50f.). When first measures of implementing SD at the HEI took place, more reflective aspects, e.g., the values and norms behind SD, are present [21] (p. 34). Consequently, without those measures, some actors have a more superficial understanding of SD, “to keep the concept at a distance and avoid engagement with it” [17] (p. 116).

As we will illustrate later (see Section 3.2.), our study has another approach. It examines understandings of SD within the whole of the university and not only amongst lecturers or teaching staff, due to following the idea of the whole-institution approach.

2.3. The Whole-Institution Approach and HOCH-N's Fields of Action

As indicated above, different and complex understandings of SD exist. This complexity is particularly increasing when it comes to applying SD in concrete measures, e.g., in organizations or institutions, as such institutions can themselves already act as societies on a micro-level. At the same time, according to Sibbel, “it is essential to acknowledge the individual as a part of many social and cultural groups, so this calls for a whole systems approach” [24] (p. 74) to reach a sustainable society. This whole systems approach combines insights from theories of organizational change as well as livings systems theory [25] (p. 202ff). The idea of organic institutions and structures, of structures facing radical changes while at the same time being highly connected with their surroundings (such as other societal or political actors), is easy to apply to institutions facing SD. This is particularly the case compared to concepts focusing on top-down structures.

Consequently, in 2014, the UNESCO proposed that whole-institution approaches are a method to foster sustainability in learning contexts, because all aspects of the context come in focus and sustainability is implied in all of them [26] (p. 30). The idea of a holistic view on SD in certain institutions is highly linked to Education for SD, which is why this approach is often applied to schools, thereby referred to as a “whole-school approach” [26–28]. The process of teaching pupils SD is detached from strict lessons at school and broadened to the school as a whole institution. Therefore, it includes areas such as operations and governance.

In this conception, HEIs function primarily as a place where the educators are educated. A more specialized conception is the “whole-of-university approach” [29]. In transferring the whole-school approach to HEIs, the idea is, again, that a HEI in all its areas has to participate in applying SD. This idea takes into account that the sole education of SD in lectures and seminars is not enough. In contrast to school institutions, the whole-of-university approach adds research as another dimension and stresses the possible links between the different areas: “A whole-of-university approach, however, recognizes that all functions of the institution can benefit from sharing knowledge and that each influences the student learning experience” [29] (p. 57). Notwithstanding, the quote also illustrates some shortcomings in this approach, as the focus point rests on students and their learning of SD.

Authors taking into account the whole-institution approach at the university level equally put their focus on Education for SD (e.g., [30,31]). Our findings are supported by Lozano et al. (2015), who noted a clear focus on topics of education in the scientific literature on “sustainable universities” [32] (p. 4). The same study revealed that members of universities refer to campus operations when asked for SD implementation [32] (p. 9–10). Considering the fact that these respondents know the structures of HEIs, stresses the importance of widening the perspective beyond Education of SD. Therefore, “[f]uture research could explore in more detail differences between stakeholder groups in HEIs (i.e., students, teaching and non-teaching staff, and relevant external groups)” [31] (p. 763).

Consequently, the research project HOCH-N follows a different understanding of the whole-institution approach. The research network, which consists of different partner universities in Germany, identified six fields of action where SD can and has to be realized in HEIs. These are sustainability reporting, governance, teaching and education, research, operations, and transfer. These fields of action are highly interconnected and sometimes overlap. Therefore, actors in each field can provide relevant knowledge, experiences, and competencies, and at the same time, profit from relevant knowledge, experiences and competencies of actors from the other fields. For this reason, the focus lies not only on educating students in SD, but on addressing all members of the university as key actors for SD at HEIs. However, implementing a whole-institution approach with its demands of interconnection and holistic outlook is difficult to achieve in practice, even within universities that can be seen as forerunners of implementing SD at HEIs [33] (p. 94). Notwithstanding first trials of pursuing the goal of a sustainable HEI on the systems level via the whole-institution approach [34], there is still a lack of accompanying research studies on preconditions, challenges and outcomes. In our case, at the University of Tübingen, the Competence Centre is working on an implementation of the whole-institution approach and, therefore, has a central role in establishing and fostering this whole-institution approach within the university. We will illustrate the structure and activities of the Competence Centre in the following chapter.

2.4. Knowledge and Competencies to Implement SD at HEIs

When it comes to knowledge resources, which are necessary to implement SD, the Conference of the Swiss Scientific Academies (CASS) [35] refers to the three forms of (i) system knowledge, (ii) target knowledge, and (iii) transformation knowledge. Knowledge on the current situation is referred to as system knowledge. Target knowledge provides information on the condition, which is to be achieved or prevented. Finally, the understanding of transformation knowledge refers to knowledge stocks that indicate the path to the goal [35] (p. 15). Of course, these forms of knowledge are mutually dependent upon another and, at times, are not clearly distinguishable. However, it is obvious that they indicate a possible pathway from the (undesirable) present to the (desirable) future.

With information on the unsatisfying current situation, on how this situation should be, and on how one could reach the goal, system and target knowledge alone will not change the status quo. This is why another resource necessary to act for SD are action-related competencies. We understand “competencies” as “dispositions which individuals need in this environment for acting and self-organisation in various complex contexts and situations” [36] (p. 129). Accordingly, competencies for SD are competencies which individuals need to, for instance, implement measures to foster SD [37] (p. 205). In order to move from knowledge to application, the actors need competencies to transfer this knowledge into practical actions. In the field of Education for SD, de Haan identifies twelve different competencies and summarizes them under the general term of “*Gestaltungskompetenz*”, or ‘shaping competence’, [which] means the specific capacity to act and solve problems” [38] (p. 22). De Haan is one of the main contributors to discourse around Education for SD [39]. However, his approach focuses almost exclusively on the function of HEIs as ‘educating the educators’. He does not consider tasks, such as research for SD, which are crucial to HEIs as well.

Authors who also address competencies, but focus on students and (university) courses are Wiek et al. [37], Rieckmann [36], and Lozano et al. [40]. However, with their distinctive perspective, they all remain in the field of Education for SD, even though Wiek et al., as well as Rieckmann, go beyond the ‘shaping competence’, and Lozano et al. bring together competencies and pedagogical methods. Since HEIs do not solely focus on Education for SD, but do conduct research, follow administrative tasks, and disseminate research results into society—just to name a few of their different tasks—university staff working in these areas might need other competencies than those needed in the field of Education for SD. Rieckmann mentions SD challenges for HEIs which concern all their fields of action [36] (p. 129), but does not link his findings to competencies actors would need to solve these problems.

Consequently, HEIs have additional obligations, when it comes to knowledge on and competencies for SD. According to the CASS [35] (p. 21), science is often seen as the ‘authority’ that is supposed to compile these, the above-mentioned knowledge stocks, and to communicate them into society. Furthermore, it is research for SD that should provide the competencies to engage in implementing SD [41] (p. 2). However, two points are neglected in this analysis. First, this understanding clashes with the transdisciplinary understanding of research for SD [42]. We emphasize that the creation and accumulation of knowledge, as well as the teaching of competencies, are not tasks of science alone. Non-university actors, who represent different societal needs and behaves, are important influencers and shapers of such stocks of knowledge and competencies as well. Since we do not perceive the communication of knowledge and competencies for SD as a purely top-down process, it is crucial to equally engage these actors. Second, science—which, in our case, is represented by the University of Tübingen as HEI—is never isolated from society. All members of a university are citizens as well, who are in direct contact and exchange with their societal environment. Additionally, there is a constant fluctuation of knowledge between science and society, e.g., in the form of scientific reports or discussions.

For this reason, universities have to take their role seriously. They are not only providers for certified knowledge, but also key actors in society. They have to be aware of their political and societal relevance and, therefore, have to act as role models and pioneers on behalf of SD. As much as *“knowledge of people involved and their needs and interests at stake have to be taken into account . . .] sustainable development is a socio-political model for societal changes”* [42] (p. 120). Thus, we wanted to understand what kind of knowledge, skills, and competencies are present and especially needed amongst key actors for SD at the University of Tübingen. Additionally, it is crucial to reveal the university’s members further expectations and needs. Only if we know them we are able to plan and conceptualize future activities of the Competence Centre in cooperation with other actors of the university. For this reason, we conducted interviews in order to get insights into the university’s different fields of action. Hence, we now turn the tables and want to know which knowledge and skills are needed to act for SD in the frame of a university.

3. The Tübingen Case: The Competence Centre and its Research Project

3.1. One University, One Centre, Many Activities and Partners—The Competence Center for Sustainable Development

In 2013, the Ministry of Science, Research and the Arts of the State of Baden-Württemberg decided to fund the concept development and installation of a Competence Centre for Sustainable Development at the University of Tübingen as part of a program “Science for Sustainable Development”. The Competence Centre is associated with the International Centre for Ethics in the Sciences and Humanities (IZEW) as one major player for SD, and its main tasks are to bring together all activities in the field of SD at the University of Tübingen, as well as to integrate Education for SD into teaching activities of all curricula. The above-mentioned whole-institution approach (see Section 2.3) provided the starting point for creating the Competence Centre, which addresses researchers, teachers, employees, students, and governance structures at the same time (see Figure 1). The major aim is to combine different actions and measures, which all members of the university carry out and/or implement at all university levels. Additionally, the Competence Centre is the core of an overarching network—not only in the University of Tübingen but also beyond. This approach is based on the idea that a university has a societal responsibility and serves as a role model and blueprint for other societal actors and stakeholders. For this reason, practitioners, for instance from NGOs, are sometimes cooperating in the Centre’s activities. Transdisciplinary approaches are fostered but they are still in their early stages. To strengthen its SD networking activities in the university and beyond, the Competence Centre organizes regular network meetings and provides funding for small SD projects, which are initiated and realized by students.



Figure 1. The Competence Centre in the University's Sustainable Development (SD) structure.

The establishment of the Competence Centre is a result of various bottom-up efforts at the University of Tübingen, especially by student initiatives as well as researchers and teachers [43] (p. 210). The efforts and claims of the student initiative “Greening the University e.V.” led to the installation of the Board for Sustainable Development [44] in 2010. The Board’s work is now coordinated by the Competence Centre. The Board for SD is the main consultant of the president’s office of the University of Tübingen concerning all questions on SD. Furthermore, the student initiative’s efforts gave way to implementing the EMAS audit at the university in 2011 [45]. The University’s Environment and Energy Management section, which is in close contact to the Competence Centre, is responsible for the regularly conducted EMAS audits.

Today, the Competence Centre is active in every field of the University of Tübingen and cooperates with many members of the university. The Centre uses its position to create awareness for topics of SD—within the university as well as for the broader public. The Centre’s employees organize public events such as sustainability slams, clothes-trading events or vernissages, as well as workshops for pupils to transfer ideas of and awareness for SD to practical action. Since students and young scientists are driving forces for change and take things into their own hands [46] (p. 6), the Competence Centre aims at enabling students to take over responsibility, to empower themselves, and to foster SD according to their own interests. For this reason, the Centre mentors students who are planning SD projects or want to write their thesis in a field of SD. However, the most important point in this field are the SD network meetings (“nachhaltig@UniTübingen” [47]) for all university members to create the room they need for developing new bottom-up ideas. One of the last meetings was organized in cooperation with the Competence Centre and the student representatives in the Board for SD [48].

In summary, the Competence Centre is the university’s network nexus point, which brings together people, knowledge, and competencies under the umbrella of SD. It provides contexts and structures to realize SD projects on all university levels and makes people’s ideas shine for a better future.

3.2. The Research Project “SD@UT”

Whether a HEI moves forward to implement measures which lead to SD depends on several conditions. On the one hand, one of those characteristics is its understanding of SD, which is the basis for all activities a HEI carries out in the frame of SD [49] (p. 322). For this reason, it may be considered as crucially important for a HEI to develop a common understanding of SD, if it is keen to contributing its part to a sustainable society. On the other hand, “it is impossible to come up with the right definition” [50], since so many actors and their various perspectives are involved in the discussion

on working for SD in a large institution like a university. It shall be noted that apart from different details in understanding SD, there are also members of the university who would reject the immediate necessity of considerable transformations for SD in the first place.

This sensitive and controversial field is where the activities of the Competence Centre are located. From its starting point in 2013 until now, the Competence Centre has set up, experienced, and analyzed a broad range of different activities. It turned out that members of the University of Tübingen have different understandings of what SD is and of how exactly it should be implemented. Even though “Sustainable Development is not an externally defined goal, but an open searching process with heterogeneous target components” [51] (pp. 16–17, translated by the authors), it is obviously difficult to plan and implement further activities in the field of SD. This problematic situation led to the birth of the Competence Centre’s research project, “Sustainable Development at the University of Tübingen (SD@UT)”. With this project, we want to shed light on the following research questions already mentioned above:

1. What is the understanding of SD of Tübingen University’s actors who are involved in different fields of SD?
2. How and where shall SD be implemented at the University of Tübingen?
3. What kind of knowledge and which competencies do actors need to implement SD in the areas of operations, research, governance, transfer, teaching and education, and sustainability reporting?

3.3. Methods

Since our goal was to include as many actors and their perspectives, insights, and knowledge as possible, a research approach, which is based on a well-differentiated and balanced methodology is appropriate. According to Mikkelsen, “a wealth of information [is] hidden in a variety of sources” [52] (p. 87). For this reason, we based our methodology on three columns (see Figure 2). These are desktop research, questionnaires, and interviews.

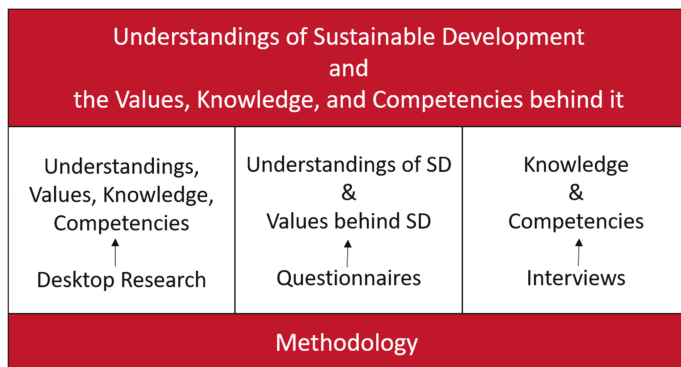


Figure 2. SD@UT—Research methodology and research questions.

3.3.1. Desktop Research

One important part of the desktop research was a stakeholder analysis of the actors who are involved in topics of SD at the university, which we did at the beginning of the research project. Whether “stakeholder” is or should be a proper category for individuals of different groups at HEIs shall not be discussed here. We use it as a technical term in a generic sense of social science research, which, in this case, comprises persons active for SD at our university. We identified all members of the university who have already taken part in any activities of the Competence Centre or with whom the Centre has already cooperated. Additionally, we identified individuals who are involved in certain fields of action, for example, research or administration. However, it was also important to include

university members who work in overlapping fields, such as the University Library, science didactics, or the Foreign Language Centre. Finally, we equally set a focus on student groups who want to foster SD at the university. It was our goal to depict not only the HOCH-N fields of action in our work but equally to include ‘representatives’ for every SDG. With the help of the stakeholder analysis, we could identify university members whose opinions and experiences qualified them to be part of our questionnaire survey. Additionally, a broad literature research and content analysis of these documents supports and informs the discussions and topics revealed in this article.

3.3.2. Questionnaires

In April and May 2019, the Competence Centre identified 76 stakeholders in the field of SD at the University of Tübingen. Student initiatives, professionally active persons, and committed individuals, as well as political groups and representatives of committees were included. Then, the Competence Centre conducted a survey on the understandings and values of SD amongst this wide range of stakeholders. The questionnaire has been developed to obtain an insight on actors’ understandings of and values behind SD. For this reason, we framed two types of questions: First, we directly asked about understandings of and values behind SD. Second, we had the idea to ask, in an indirect way, about both of these issues to obtain even more information. We operationalized “values behind SD” through the reasons to act for SD and “understandings of SD” through activities for SD. In our last question, we additionally wanted to learn how we, as members of the Competence Centre, could support the stakeholders with our own further activities. We sent the questionnaire to 76 members of initiatives and university groups, including students, as well as university employees from the fields of research, teaching and education, sustainability reporting, transfer, governance, and operations, who are all working on SD issues. 30 questionnaires were completed and sent back to the Centre, which corresponds to a return rate of 39.5%. Hence, the Competence Centre is able to provide an overview of the actors’ understandings of SD and the values behind them. For the analysis of our data, we extracted the core statements of the questionnaires’ responses, clustered them, and assigned them to appropriate keywords. We present the results in Section 4.2.

3.3.3. Interviews

In August and September 2019, we conducted six open-guideline face-to-face interviews with representatives of all six HEI areas introduced by the project HOCH-N: sustainability reporting, governance, research, teaching and education, transfer, and operations. We chose our interview partners due to their professional tasks and their personal commitment, as well as their experiences in the field of SD. The interviews consisted of five open questions and gave much room for the interviewees’ own perspectives. They were all recorded and transcribed, and took around 10 to 30 min. Our guideline included questions on the importance and necessity of specific knowledge and competencies for SD for the interviewees themselves, other university stakeholders involved in actions for SD, as well as stakeholders who are not active in any area of SD.

We analyzed our data conducting a qualitative content analysis. Our analysis was summarized in categories which we supported by extracted quotes of our interviewees. With the help of our categories and the quotes, we were able to learn in detail about the interviewees’ perspectives on their own knowledge and competencies, as well as on knowledge and competencies they wished others to have, who (do not yet) act for SD. We present the interviews’ results in Section 4.3.

4. Results

In the following chapter, we first present the status quo of SD actions and institutionalization at the University of Tübingen. Second, we present the questionnaires’ findings and demonstrate how they are connected to the Brundtland understanding of SD. Finally, we explain which knowledge and competencies actors need, who are involved in fostering SD at the University of Tübingen, according to our interviewees.

However, before we do so, we present some results of the stakeholder analysis of the actors who are involved in topics of SD at the University of Tübingen.

4.1. Stakeholder Analysis: Actors Involved in Topics of Sustainable Development

Since the University of Tübingen is one of the eleven HEIs, which are involved in the research project HOCH-N and, at the same time, the Competence Centre is set up to implement SD in all parts of the university—striving for a whole-institution approach—we analyzed the measures, which many stakeholders take at the University of Tübingen, to foster SD. Then, we closely considered future potentials in each field of action for the realization of SD at the University of Tübingen.

An analysis of all the fields of action and activities, which stakeholders carry out on behalf of SD at the University of Tübingen, is a challenge in itself and necessarily demands an own research project. For this reason, our analysis is not exhausted and only represents exemplary activities. Table 1 lists some results of our analysis.

Table 1. SD activities at the University of Tübingen.

Field of Action	Exemplary Activities Carried Out at the University of Tübingen
Research	<ol style="list-style-type: none"> 1. Research project: “GLOBUS—Reconsidering European Contributions to Global Justice” [53]. 2. Institute of Evolution and Ecology: main topics: climate change, invasive species, land use and species diversity et al. [54]. 3. Collaborative Research Centre SFB 923: “Bedrohte Ordnungen” [55].
Teaching and Education	<ol style="list-style-type: none"> 1. ESD certificate program “Studium Oecologicum” [56]. 2. Courses for students of Environmental Biotechnology: “Sustainable Environmental Biotechnology Systems” [57]. 3. Series of lectures “Gender Justice in Muslim-Christian Readings” [58].
Operations	<ol style="list-style-type: none"> 1. Several rewards as “Recycling paper friendly HEI” [59]. 2. University members who come to work by e-bike can charge them for free [60]. 3. The university is using 100% eco-electricity [61].
Governance	<ol style="list-style-type: none"> 1. The Advisory Board for Sustainable Development [62]. 2. Representatives of the student body in the Advisory Board for SD [63].
Sustainability reporting	<ol style="list-style-type: none"> 1. The University of Tübingen is certified and managed according to the EMAS standards since 2011 [64]. 2. The Competence Centre has, together with 11 other German universities, applied a beta version of the HS-DNK [65]. 3. Every year, the university’s environmental manager publishes the environmental declaration [66].
Transfer	<ol style="list-style-type: none"> 1. The university is a member of the “Action alliance for a low-waste Tübingen” and supports the ReCup system [67]. 2. The student initiative “Papierpilz” recycles single-sided printed paper [68]. 3. The Faculty of Humanities has university branches in Kyoto, Seoul, and Peking [69]. 4. Sustainability Lecture and Sustainability Award for Bachelor and Master thesis [70,71].

In summary, different measures to realize SD on the different levels of the university are set in practice. Some are already institutionalized to a high degree (e.g., the university’s EMAS certification

or the Advisory Board for SD) others are project-based activities (e.g., GLOBUS), which will come to an end. All in all, we found that many activities are carried out due to the personal commitment of individual university members. However, to successfully anchor SD on all levels of the university, this commitment has to spill over and every stakeholder of the university has to be committed to SD.

According to Niedlich et al. [72] (p. 3), a HEI needs to change its institutional culture if SD shall be put in practice because SD affects the whole HEI as an organization. They identified four categories of organizational culture as key areas for SD governance at a HEI. We emphasize the fourth, highlighting the importance of a “holistic governance covering all core areas of higher education institutions—teaching, research, operations and outreach” [72] (p. 4). With our findings, we are able to support this argument since it is crucially important for a HEI that the goal to realize SD at the whole university level is commonly pursued bottom-up and top-down.

4.2. The Understanding of Sustainable Development at the University of Tübingen, the Values Behind it, and the Interconnection to the Brundtland Report

4.2.1. Understandings of Sustainable Development at the University of Tübingen

As mentioned above, the Competence Centre has assembled the first university-wide understandings of SD according to the questionnaires’ results. Of course, this understanding needs to be reworked and discussed continuously, since foci could change and perspectives are renewed due to new stakeholders, who will join the area of SD at the university. In its mission statement, the University of Tübingen affirms the “maxim of sustainable development” and “regards sustainability as an integral part of research and teaching” [73] (translated by the authors). Provided with this framework, it is essential for all members of the university to understand what SD means.

The Competence Centre’s understanding of SD is based on the Brundtland Report of 1987, which also was mentioned several times in the questionnaires. For this reason, we will use it as the core meaning. As outlined above, SD means a development, which “meets the needs of the present without compromising the ability of future generations to meet their own needs” [5] (p. 16). At the same time, this development has to and can only happen within the scope of limited technical possibilities and finite natural resources [5]. The three-pillar model of SD is very common and well-known (see Section 2.1), and reasonably criticized by many scholars [13,16,74,75]. As well, in our perspective, it is not suitable for several reasons: (i) It does not depict the complexity of the SD understanding mentioned above, (ii) it ignores exactly those interdependencies between the three pillars of economy, ecology, and society, causing most of the problems and difficulties related with SD, and (iii) it is a static model, which does not demonstrate the process-oriented nature of SD. This theoretical frame of SD has been communicated by the Competence Centre on many occasions, e.g., the networking days “nachhaltig@UniTuebingen”.

During the questionnaires’ analysis, we assigned the core statements of the SD understandings to the key words, which are illustrated in Table 2.

Table 2. Understandings of SD at the University of Tübingen.

Key Word(s)	Number of Different Statements	Key Word(s)	Number of Different Statements
Consumption	5	Others	2
Education, consciousness, sensitization	14	Preservation of resources	16
Infrastructure	3	Protection, avoidance of damages, preservation	10
Justice	10	Structures and processes	4
Levels of SD	14	Theoretical basis	2
Management	7	Transfer, realization	10

In the following, we summarize, categorize, and reproduce the questionnaires' answers on the understandings of SD.

In the questionnaires, stakeholders mentioned several levels of SD; one of them is the personal dimension. At this level, we have the opportunity to change our own lifestyle and influence SD. The societal dimension connects individual and collective actions and brings forward society as well as its processes. Additionally, SD is to be realized on the professional, the institutional, and the political levels where aspects of development politics have to be integrated as well. At the global level, inequalities between humans should be reduced to make the world a better place. Overall, the world should become more just, and inter- and intragenerational interests have to be considered, as well as distributive justice and equality of opportunities. If people pay attention to the environment and all living creatures around them, the highest well-being and the best quality of life for every living being will be achieved.

SD can be realized if people are educated for and sensitive to, as well as conscious of, aspects of SD. These statements are important for HEIs and their research, education, and teaching spheres.

Another important aspect which contributes to SD is the conservation and protection of natural resources. Especially the responsible use of resources, the reduction of pollutant emissions, recycling, and the consequences of livestock farming for the use of resources and human health are important points to consider. The continuous protection of biodiversity and the diversity of species result in resistant ecosystems, which will contribute to the protection of our climate. According to the questionnaires, it is equally important to reduce climate change and to consider the interests of all non-human animals to avoid damages for the environment and nature.

Another aspect is the role of companies, which strive for the common good, and of managers, who use their scope of action for responsible decisions. Furthermore, it is urgent for the economic sector to take its responsibility seriously and to implement CSR strategies such as people, planet & profit (see John Elkington, who introduced the term "*triple bottom line*" in 1994. Further information on what he thinks today are accessible online [76]). The optimization of processes and the consideration of consequences on other regions of the world and future generations contribute to SD, too.

The last aspect, continuously mentioned in the questionnaires, evolves around the individual. Everyone can be a role model, who critically reflects on topics of SD, and thinks of consequences for his/her everyday life, acts responsibly, as well as motivates others. Part of it is certainly to question our own consumption of food and all other products, to live sufficiently, and to avoid a large ecological footprint. Finally, mobility needs to shift from the individual to the public level to create and establish an infrastructure for sustainable actions—not only in the sense of mobility.

4.2.2. Values behind Sustainable Development

The answers, which dealt with the values people associate with SD, were as various as the answers which were given to explain the understandings of SD. Figure 2 gives an overview of the statements on SD values. Some of the values are not values in the classical, philosophical and sociological understandings. For this reason, the key words we assigned them to are not values in this sense. From our perspective, it was crucial not to understand the answers too conceptually because we want every member of the university to find her/his opinion at least partly reflected.

The core value is a "*good life for everybody*". It is the basis for all other values and, at the same time, refers to the Brundtland Report's moral background of SD (see Figure 3). Values, which we assigned to the key word justice, seem to be an important contribution to such a good life. They rank from social justice, to generational and environmental justice, up to global justice and solidarity.

VALUES BEHIND SUSTAINABLE DEVELOPMENT

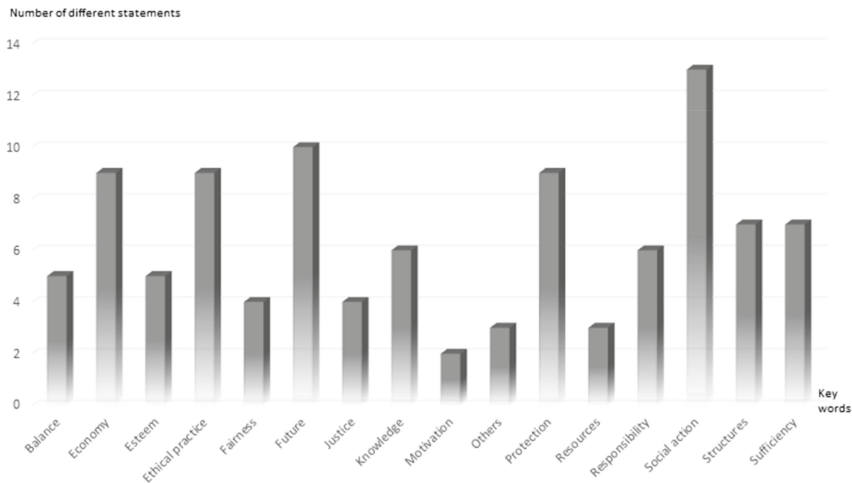


Figure 3. Values behind SD; results of the questionnaires.

The key word fairness summarizes values, such as equality and equal rights for men and women. These values show an overlapping in terms of content with justice and structures, especially social security. Other values we assigned to structures are structural change, processuality, movement, and dynamics. In addition to these values, which are based on change, there were also answers pointing to resilience and consistency.

There is a strong relation between the key concepts justice, structures, and esteem. However, values, assigned to esteem have a broader meaning and include respect for all forms of life and nature. Cultural openness can be attributed to these values as well.

We differentiated values assigned to the key concepts structures, esteem, and future. Here, we include durability, the inclusion of long-term consequences and potential, as well as a future-orientation. Future generations play an important role in this cluster, as do challenges, with regard to the future.

There are also values, which are closer related to social action: solidarity, reciprocity, fraternity, compassion, and peace which show the importance of own behavior towards fellow humans (global, current, and in the future).

Closely related to these values are the ones we assigned to responsibility. The scope of responsibility includes nature, environment, as well as future generations, and equally focusses on the present and the future.

The key word ethical practice summarizes answers which are strongly directed towards reflexive actions and which emphasize specific ethical and moral components of SD. Part of these are truthfulness, the ability to criticize oneself, and reflection, as well as ethics as the capability to include the others' needs and to act ethically. The value "*not live beyond our means*" is equally part of ethical practice and, at the same time, is the link to sufficiency. Here, we included satisfaction, modesty, as well as slowing down. The cluster of sufficiency is closely related to values we assigned to the key word economy. Those emphasize economic aspects and include profitability, public welfare or a full cost accounting for every product. A minimum wage for all employees, as well as fair pricing of loans, link to fairness and justice.

Equally, the concept of "*buen vivir*" [77] has been mentioned several times. "*Buen vivir*" originates in Latin America and is a concept for development, giving nature an intrinsic value and highlighting the importance of togetherness of all living beings. We summarized this life in balance with nature and

society, and added the Western notion “*humankind as part of the ecosystem*” as well as the sustainable protection of all living creatures, due to their own value of life (for their own sake). This value shows the interconnection to the key words of protection.

Answers we assigned to protection include health, the environment, as well as the protection of nature and climate. The preservation of an environment, which is worthwhile to live in and is capable to live for itself, is closely connected to the protection of resources and resource neutrality. These are part of the key word resources.

We summarized other crucial values to the key word knowledge. These values deal with prudence, care, and mindfulness, as well as consciousness of and education for a careful use of natural resources, for instance. In our opinion, key words as ethical practice, resources, and protection can only be rationalized and then realized, if people know the necessary facts. To take a step further and turn this knowledge to action, everybody needs fun and a personal vocation, which we listed with the key word motivation.

4.2.3. What about the Brundtland Concept of SD?

In summary, there are three key words amongst the answers on understanding of SD, which are, as well, reflected in the values behind SD. These red threads are justice, (preservation of) resources and protection (avoidance of damages, preservation). We summarized them in Table 3.

Table 3. Results of the questionnaires, red threads of SD.

Understandings of SD [Number of Statements]	Key Word(s)	Values Behind SD [Number of Statements]
10	Justice	4
16	(preservation of) Resources	3
10	Protection (avoidance of damages, preservation)	9

The statements, which we assigned to these key words, show a high divergence in numbers between understandings of and values behind SD. In the category ‘understandings of SD’, justice, preservation of resources, and protection (avoidance of damages, preservation) include the most (resources) and third most mentioned statements (others). The category ‘values behind SD’ includes the third most mentioned statements on protection. However, justice and resources show the second and third lowest numbers. In the case of ‘justice’, this is due to the fact that we assigned slightly different statements to the key words ‘fairness’ and ‘ethical practice’. Nevertheless, these keywords cover similar statements. If we summed them up to the statements of ‘justice’, this conceptual cloud would include the highest number of statements (17). The same applies to ‘resources’, which have often been associated with ‘future’. If we summed up both numbers of statements, we had the number of 14, which, would be the second highest after the ‘justice cloud’.

Since these keywords are represented in the Brundtland understanding of SD as well, we shortly demonstrate how the UN linked justice, resources, and protection to SD. For instance, humanity shall ensure that development is sustainable to meet “*the needs of the present without compromising the ability of future generations to meet their own needs*” [5] (p. 16). Hence, SD is based on the values of inter- and intragenerational justice. Furthermore, the world’s poor should “*get their fair share of resources*” [5] (p. 16), which clearly links justice to the distribution of resources. Additionally, according to Brundtland, injustice and environmental degradation as well as poverty and conflict “*interact in complex and potent ways*” [5] (p. 240), which illustrates again the importance to protect and preserve nature and environment. Only if both are not exploited to a non-renewable degree can intragenerational justice be realized. Additionally, the normative claim of justice does not go hand in hand with the three-pillar model of SD but demands an integrative understanding of SD, which we want to realize with the whole-institution approach.

For this reason, our research confirms the suggestion to explicitly use the Brundtland understanding of SD for the whole University of Tübingen.

4.3. Which Knowledge and Competencies are Needed to Realize SD in the University of Tübingen? Transfer of Knowledge—Results of the Interviews

The project SD@UT does not merely analyze the status quo of differing understandings (see Section 4.2.1) and the institutionalization of SD in the University (see Section 4.1). The main goal is to identify concrete measures of how SD comes into practice and how these measures can be optimized. One of the core elements in the understanding of Sustainable Development in the scientific and political discourse is the idea that—besides society and politics—each individual can and should take action to change “unsustainable” conditions and behaviors [11,78]. This requirement was also mentioned in our questionnaires on understandings and values of SD. However, from our point of view, it could be a challenge for each individual to actively involve in practicing SD. It is our hypothesis that actors need appropriate knowledge and necessary skills and competencies to act for SD. For this reason, it might be difficult for those who do not possess—or at least think they do not possess—adequate knowledge or competencies to engage in these activities. To learn if our hypothesis was right or wrong and to obtain insights in knowledge and competencies, stakeholders needed to act for SD working in the six different fields of action at the University of Tübingen, where we carried out six interviews, each with one representative of one field of action.

4.3.1. Proof of the Hypothesis

With the help of the interviews, we wanted to gain more and deeper insights into competencies and knowledge, which are needed to actively foster SD in the context of a university.

All six interviewees agreed on our assumption that specific knowledge and competencies are needed to set SD in practice at all levels of a university. Two of them explained that this particular knowledge can be learnt and accumulates over time. One said that a certain (scientific) background would help and ease this learning process. This knowledge depends, on the one hand, on the field of action the person is fostering measures to act for SD. On the other hand, it depends on the goals which are to be achieved.

4.3.2. Knowledge and Competencies for Each Field of Action

There is specific knowledge, which all representatives have, and competencies they need in their individual field of action.

In the area of sustainability reporting, it is important to know the organizational structures of the university to detect connecting and, maybe, leverage points. Another essential competence is communication with different players at the university and networking with local groups and other HEIs, which implies not only psychological but also strategic competencies. Additionally, it is crucial to strengthen the intrinsic motivation of the university’s members and to always keep on maintaining their interest in processes connected to SD. The interviewee feels that these points are important “*that something happens here in the form of concrete projects*” (interview sustainability reporting, min. 04:04, translated by the authors).

The interviewee from the field of governance laid emphasis on the competence to transfer knowledge and to network. It is important to know how to communicate with different stakeholders of the university and to keep on bringing SD topics to the table, which needs courage and diplomatic skills.

In the context of teaching and education, knowledge on topics of SD is essential. For scientific teachers, it is important to be open and to accumulate new knowledge on SD. Another point the interviewee mentioned is to integrate knowledge of the teacher’s own research into the seminars. The interaction with scientific colleagues, who are working on similar topics, is an important aspect as well.

The representative person of the field of operations said it is important to learn from scientific disciplines, especially psychology and empirical cultural studies, how to motivate all members of

the university to feel responsible and to not forget the bigger picture. For this field of action, it is important to have the competencies to initiate bottom-up processes and to be involved with student representatives. They are the ones who are able to influence their fellow students and confront them with their own actions' consequences. For this reason, it is essential to network and see synergies, and especially to cooperate with other stakeholders, who are interested in similar topics: *"Those people are everywhere, and if you join them and you work together you really can achieve something"* (interview operations, min. 16:35, translated by the authors). Another crucial point is to be ambitious and set high goals.

In the field of research, the interviewee told us that it is important to develop an own understanding of SD and to gain knowledge on the planetary boundaries of the earth. Then, there are thematic foci an SD scientist can carry out research for, such as climate change, loss of biodiversity or nuclear disarmament. These topics all have practical implications and have to be worked on since they are crucial for the survival of humanity. For this reason, a researcher has to prioritize to actively work on them and not solely discuss them theoretically.

Finally, the representative of the field of transfer laid emphasis on the knowledge of what SD is, and how structures and contexts of SD work in a university. For transfer, it is important to listen to each other carefully and to bring together different ideas as well as to integrate them into concrete projects. Additionally, there is the point of courage to foster topics, which may not be valued by many other actors in society, and to show an intrinsic motivation for change. In the end, for transfer, it is essential to be able to renounce decent things in life and to enjoy challenging oneself, and trying things out.

All interviewees agreed that the knowledge and the competencies they mentioned are finally not specific for the field of SD. On the contrary, people who own these competencies are able to work more productively because *"these are basic things you need and they are not necessarily related to Sustainable Development. They are connected to SD, but actually these are human and social competencies you have to own in general"* (interview sustainability reporting, min. 06:14, translated by the authors). Another interviewee added that these competencies fit into her desired ideal conception of humans and do not depend on SD.

4.3.3. Knowledge and Competencies to Foster SD in General at a HEI—What Do We Have, What Do We Need?

When we asked the interviewees about the specific knowledge and competencies members of the university involved in fostering SD should have, we received numerous and varying responses.

The person from the field of sustainability reporting emphasized that, on the one hand, a person's interest in support processes is more important than the competencies s/he owns. Especially students need—and do have—motivation to change things. On the other hand, expert knowledge is needed to successfully carry out specific projects.

In the field of governance, it is crucial to find suitable arguments and to know that topics of SD are a red thread, which runs through the whole university. Additional essential competencies are the awareness of other people's needs and interests, as well as the ability to (empathically) deal with other people.

The representative of teaching and education told us that transdisciplinarity is a key aspect of education for SD. People need a sense of responsibility to see and understand the damages their actions are causing: *"People need to understand that it is their business!"* (interview teaching and education, min. 09:07, translated by the authors). On all levels of the university where people make important decisions, they need to understand the financial consequences of non-sustainable management. Additionally, decision-makers need to perceive and understand the responsibility of a university.

In the field of operations, this sense of responsibility is a crucial point as well. However, it is not only the responsibility of the institution university but also a responsibility for the university. For instance, teaching staff should feel positive about being able to use the university's infrastructure, such

as rooms, and should have an interest for their students to leave these rooms clean. Then, all members of the university should feel the task to foster SD in society and to act as key agents for SD.

For the area of research, expert knowledge on topics concerning the environment or ecology is essential. Another crucial point is to include non-scientific actors in the sense of transdisciplinary practice and research.

The representative for the field transfer appreciates the ability to first think in a utopic way and, in a second step, think realistically. All university members should be courageous and think big to not restrict themselves during the search for new ideas and solutions. In discussions, the abilities to focus on the topic and to set back one's own questions and interests are very important. This point is related to the competence of being neutral, having self-regulatory skills, and being disciplined.

The last question dealt with the competencies our interviewees have themselves and wished for others, who are not involved in SD activities (yet).

In the area of sustainability reporting, clearly the competence to network and bring knowledge together is key. The representative of governance mentioned characteristics such as motivation, perseverance, the ability to network, and being open-minded. In the area of teaching and education, others should be able to think things together, to broaden their own horizon, and not to remain in rigid structures. She wishes for every member of the university to know and understand *"that every action [they take] here may have a consequence somewhere else"* (interview teaching and education, min. 16:49, translated by the authors). The interviewee of the field of operations said that she would like all members of the university to get in touch with others to network and to learn continuously. Another wish she had was to recognize the enrichment of the whole process and to experience moments of happiness when they go through this transformation: *"I really wish people that they can integrate this [SD] into their lives and experience what I experience, how nice it can be!"* (interview operations, min. 23:50, translated by the authors). The representative of the area of research mentioned a cooperative and friendly attitude, fairness, as well as the will to work together. He appreciates the exchange with colleagues in order to learn from each other. Finally, the interviewee from the field of transfer wishes everybody to recognize their own privileges and to reflect on the consequences their actions have for planet earth. No member of the university should stay alone and think of how it will be possible to pass on his or her knowledge to others. In closing, she wishes that everybody had the willpower to change something in every area of his or her own life.

4.3.4. Knowledge and Competencies to Foster SD at a HEI—What Do We Learn?

In summary, all interviewees agreed to our assumption that specific knowledge and competencies are needed to set SD in practice at all levels of a university. There is specific knowledge all representatives have and there are competencies they all need in their individual field of action: networking, keeping sight of the big picture, interaction, and cooperation are the red threads through all the fields of action. This finding is supported by Rieckmann [36] (p. 133), who identified a set of twelve key competencies for SD which include (i) the "competency for cooperation in (heterogeneous) groups", (ii) the "competency for systemic thinking and handling complexity", and (iii) the "competency for empathy and change of perspective".

Hence, on the one hand there are basic competencies, which are needed in all areas of a university as well as specific knowledge and abilities. On the other hand, all interviewees agreed on the fact that the knowledge and competencies, which they need for their own field of action, are not specific SD competencies but facilitate work in general and social abilities people need.

As we view it, this is not as surprising as it seems at first sight. First, the goal in SD every interviewee is striving for is a very broad one. The field of governance did not define it (yet) and the University of Tübingen does not own an explicit sustainability strategy. Consequently, all actors, who are involved in the field of SD, follow their own SD understanding. This is not necessarily 'good' or 'bad'—on the one hand, one could easily lose the big picture; on the other hand, every individual has the freedom to engage actively in his or her favorite topic. Since SD is a process of societal transformation,

the interviewees mentioned knowledge and competencies, which “*are somehow helpful for transformation of any kind, or for structural change of any kind*” (interview transfer, min. 15:33, translated by the authors). Recently, Niedlich et al. [72] found out that there are significant differences in the conception of SD at the eleven German HEIs they examined. This is due to the lack or existence of a common understanding of SD and an SD mission statement, the way SD discussions are handled and communicated into a HEI, as well as the focus of the SD definition and the targeted SD dimensions [72] (p. 9). For most HEIs Niedlich et al. studied, it is a major challenge to establish a whole-institution approach to SD governance [72] (p. 10). Therefore, it is not surprising that the University of Tübingen, as one of the HOCH-N collaboration partners, provides an example for a HEI which holds no commonly shared conception of SD, and which seems to struggle to find its way to SD governance.

Additionally, the goals are to connect actors and to think of the big picture, as well as to understand the university structures demand for the necessary system, target, and transformation knowledge. According to our interviewees, they have the necessary system and transformation knowledge, or they know with whom they could collaborate to incorporate it. The necessary target knowledge for the specific actions of individuals or groups is also largely available. What is lacking is the target and, even more so, transformative action knowledge to jointly achieve the big picture—a more sustainable university. It is obviously difficult for all members of the university to acquire this kind of knowledge, if there is no sustainability strategy, which leads to a common goal and roadmap, and no statement to explain the university’s understanding of SD. Hence, the actors cannot acquire the lacking target knowledge. For this reason, it is even more difficult for them to define necessary competencies they would need. Again, especially for HEIs, it is of utmost importance to understand that knowledge alone will not lead to successful action. Consequently, they mention broader transformation competencies, acting within their own scope, and planning their own actions and activities.

It would be the university’s next task to set up an SD-strategy which is (i) explicitly based on the SD understanding following the Brundtland Commission [5], and (ii) will be specified in a participatory process to be organized by the Competence Centre. Then, the university could profit even more from its motivated members, who have the willpower to change something.

5. Discussions and Outlook

We have shown that the understandings of and values behind SD in the scientific and political discourse, as well as at the University of Tübingen, are diverse. However, we were able to demonstrate how actors’ understandings and the values behind them at the University of Tübingen are in accordance with the Brundtland understanding of SD. We also showed that at the University of Tübingen many actors already fill the fields of action to foster SD. Nevertheless, there is much room to strengthen and improve activities and their output, as well as to give actors the support and freedom they need to strengthen SD at the University of Tübingen. Finally, we were able to demonstrate that both knowledge and competencies are fundamental to act for SD. Since the University of Tübingen has not yet made an explicit statement on its understanding of SD, it appears to be difficult for the actors to acquire specific knowledge to reach SD for the whole university. For this reason, they possess broad knowledge and competencies, which are crucial to any process of transformation.

Even though existing scientific studies put their focus on teaching staff and not the whole HEI as a unity fostering SD (see Section 2.2), some of our findings on the understandings of SD match these studies’ results. Two important issues that were raised repeatedly in the literature [17–20,22] were ‘(natural/ecological/environmental) resources’ and ‘(inter- and intragenerational) justice’. In our questionnaires’ responses, these keywords were raised as well. However, the understandings of SD at the University of Tübingen are far more distinct and nuanced. We assume this is firstly due to the fact that we concentrated on stakeholders who are already involved in thematic fields of SD, and secondly, because we included university members of all fields of action carrying out a research based on the whole-institution approach (see Section 2.3).

In general, we are able to assign the understandings of and values behind SD of stakeholders at Tübingen University to the different contexts and levels of politics, philosophy, and personality, as well as to existing models (see Section 2.1). For instance, they refer to the Brundtland Report (political level), the three pillars model (models), responsible behavior (personal level), and thematic issues related to the ‘good life’ (philosophical level).

Existing research on university members’ competencies for SD equally sets a focus on the field of Education for SD (see Section 2.4). Literature on research for SD competencies at the whole HEI, including different fields of action, does not seem to exist yet. With our results, we demonstrate existing similarities in the perceptions of university members of (i) competencies being key in Education for SD and ii) competencies our interviewees mentioned to be important for setting SD in practice at the whole university level (see Section 4.3.4). As we have outlined, we started from the perspective of a whole-institution approach at the University of Tübingen and combined it with a research project that searches for key actors’ understandings and values of SD, as well as the competencies and the knowledge to set SD in practice. With this particular approach, we aimed at looking at the University of Tübingen as a whole. Therefore, our perspective was broad enough to consider all relevant fields of action. At the same time, our perspective was narrow, as we concentrated only on one HEI. For this reason, we cannot simply transfer our results and the approach we chose to other HEIs, although many of our findings resonate very much with shared experiences at other HEIs, e.g., in the HOCH-N network. This is, firstly, because we only asked and interviewed actors at the university that already had a relation to SD. It will be more representative to widen this perspective and include actors who are not yet involved in SD activities. However, this could be the next step for further research.

Secondly, our approach is a special one since, as of now, the University of Tübingen practices SD within ongoing research, education and teaching, and management. Other HEIs emphasize establishing a specific sustainability science or focus on transfer. This means that they act in different contexts with, surely, other settings, opportunities, and results. Thirdly, the German landscape of HEIs is diverse and ranges from comprehensive universities (as Tübingen) and Technical Universities to application-oriented Applied Sciences Universities (Fachhochschulen) and Universities of Teaching (Pädagogische Hochschulen). Following Niedlich et al. [72] (p. 13), and Wals [23] (p. 11) we clearly expect that different orientations of HEIs manifest in different structures. This may result in different foci of knowledge and competencies that the actors at different HEIs have and need, as the relations of the different fields of action may also differ. Further research and comparison of the findings might be very helpful in identifying such differences. As we considered above, the idea of the whole-institution approach is that actors in different areas of an institution can learn from each other. In broadening this approach to a, as we want to call it, ‘whole-institutions approach’, different institutions can learn, likewise, from each other and adopt fruitful measures in fostering SD.

It is also important to point out that not only our research topic is settled on a certain discourse, but also that the whole discourse itself is a rather Western- or even Germany-centered discourse. However, there are, of course, other concepts, which emerged in the Global South that could improve this discourse. Interestingly, even in our questionnaires, some actors referred to such concepts, e.g., “buen vivir”, and integrated these concepts into their own understandings and values of SD. Since SD is a global task, it requires international dialogue [36] (p. 130). Including other concepts broadens the perspective and prevents the danger of a Westernized, or even neo-colonial, point of view, which may include more individual-oriented and technocratic aspects than counter-concepts developed in countries of the Global South. Therefore, these concepts have to be taken into account and the German and Western scientific discourse on SD still lacks a systematic consideration of them.

In the original outline of our research project, we planned to equally integrate perspectives from the Global South and, therefore, sent questionnaires to members of the University of Ghana and the Valley View University in Ghana. Unfortunately, the response rate was very low, so that we could not take these answers into account. However, we managed to get in contact with the “Clean Africa e.V.”, an organization that regularly holds summer schools in the Global South, and is right

now planning a summer school in Ghana with a focus on the whole-institution approach and SD at Ghanaian universities in summer 2020. We plan the Competence Centre's participation in this summer school to get in contact with key actors of universities in Ghana.

Furthermore, the Competence Centre could profit very much from an intense exchange with key actors at Addis Ababa University in Ethiopia, especially in the person of Professor Workineh Golga Kelbessa. He has already visited the International Centre for Ethics in the Sciences and Humanities several times. In October 2018, the Competence Centre and the research project "Energienlabor" have organized a workshop on SD and Environmental Ethics, presenting exemplary perspectives from Africa and Europe, where Professor Kelbessa was one of the keynote speakers.

Additionally, the Competence Centre was involved in a small research project at Lake Kivu, Rwanda, in the summer of 2019 [79]. Together with scientists from the Universities of Heidelberg and Karlsruhe, the Competence Centre examined opportunities to mine methane in Lake Kivu and talked to involved actors on their understandings of SD, and why this form of energy supply was important from their perspective.

Following these different measures, which should just serve as illustrations of how to proceed, we are optimistic that we will manage to integrate perspectives from actors of the Global South in our findings, also in order to broaden the scope of a sustainable University of Tübingen.

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Article

The Role of Environmental Management Performance in Higher Education Institutions

Nicolas Roos ^{1,*}, Xaver Heinicke ^{2,*}, Edeltraud Guenther ³ and Thomas W. Guenther ²

¹ Sustainability Management and Environmental Accounting, Faculty of Business Management and Economics, Technische Universitaet Dresden, 01069 Dresden, Germany

² Management Accounting and Control, Faculty of Business Management and Economics, Technische Universitaet Dresden, 01069 Dresden, Germany; thomas.guenther@tu-dresden.de

³ United Nations University Institute for Integrated Management of Material Fluxes and of Resources Dresden, 01067 Dresden, Germany; guenther@unu.edu

* Correspondence: nicolas.roos@tu-dresden.de or nicolas.roos@tu-drwesden.de (N.R.); xaver.heinicke@tu-dresden.de (X.H.); Tel.: +49-351-4633-3822 (N.R.)

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Abstract: Higher education institutions (HEIs) are influential social institutions which educate future decision-makers and shape society as a whole. Motivated by new public management, the proliferation of business tools, and a rising awareness for responsible acting, environmental management has also become a matter for HEIs. Focusing on performance outcomes and improvement based mechanisms leads to a professionalization through the active management of environmental issues. Therefore, the support of management structures is an essential prerequisite when implementing environmental efforts. Thus far, little attention has been dedicated to environmental management performance and steering processes of environmental issues in HEIs, which marks the research gap of this study. This article presents results of a survey on the concept of environmental management performance (EMP) based on Trumpp et al. (2015) aiming to answer the research question of how HEIs conduct environmental management along the dimensions of EMP, which includes environmental policy, environmental objectives, environmental processes, organizational structures, and monitoring. The results show that, as of now, HEIs pursue no common practice when approaching EMP. Nevertheless, two thirds of the respondents show an orientation towards sustainability with particularly high values regarding issues of environmental policy.

Keywords: higher education institutions; sustainability assessment; environmental management performance; German-speaking countries; survey

1. Introduction

Higher education institutions (HEIs), as important societal pillars, play a key role in shaping future generations and paving the way for sustainable development [1,2]. In their role as educational institutions, the creation of knowledge and the promotion of ideas for society are their major undertakings. Besides the core tasks of teaching and research, environmental efforts concerning the institutions' operational performance have gradually emerged. With the conservation of resources, saving energy, or the reduction of waste [3], an integrated understanding of taking responsibility for their own actions has spread within many organizations, including HEIs.

With increased awareness of one's own social responsibility, the wish to fulfill it and to set a good example also rises [1]. As a result, practices dedicated to the systematic management of these tasks, such as environmental management systems, have been established and promoted.

Despite these instruments originally being designed for the business context, they quickly became useful in public organizations such as HEIs. Over time, these became increasingly common as a tool for

managing environmental responsibility on campuses of various European countries [4]. The associated thinking of improvement-based mechanisms and performance enhancement instigates a general professionalization of organizational processes, including the handling of organizational responsibility with regard to sustainable action [1]. This occurred in the context of a general transfer of business practices to public administration, resulting in a more holistic approach and professionalization of the organizations [4].

In order to meet these growing challenges, and to meet the requirements of a whole-institution approach, the role of management is becoming increasingly important for the professionalization and control of organizational activities.

Management plays a core role in the allocation of resources, strategic alignment, and the planning, implementation, and evaluation of activities [5,6]. This gives HEIs a greater significance in dealing with ecological sustainability aspects by extending their responsibilities from a purely operational level to a more strategic one. Despite expanding to include management functions, the performance of HEIs regarding ecological aspects is largely excluded from management considerations. Concepts that examine environmental management performance (EMP) in the context of HE remain nonexistent thus far.

As the systematic literature review by Roos and Guenther [7] shows, an examination of EMP has so far played a minimal role in the assessment of (ecological) sustainability at HEIs. Although individual aspects of environmental management at HEIs can be assigned to the dimensions of the EMP according to Trumpp et al. [8], no systematic approach based on performance standards is pursued. For this purpose, a step-by-step integration of control mechanisms within the framework of a holistic institutional approach is suggested, which is oriented towards a growing integration of management capacities at HEIs. However, most of the research to date has been devoted to case studies of other topics, such as the investigation of success factors and obstacles or the implementation of sustainability in HEIs [1,8–10], while others examined the assessment of sustainability engagement [3,11,12]. While this research strand mainly draws on case studies, another research strand, which is represented in more recent research, uses surveys to investigate new insights into implementation efforts to generate sustainability. This research direction is increasingly turning to systematic approaches that examine the management of sustainability and environmental aspects at the management level. Although these approaches are aimed at managing sustainability at an executive level, this research is based on general practice-driven implementation efforts with the aim of initiating engagement. However, approaches examining environmental sustainability from a systematic management performance-driven perspective have not yet been investigated [13–15]. This represents a blind spot in the research on controlling sustainability at the management level and thus marks the research gap in the present work.

On the basis of these insights, the present survey study provides first evidence on the management of environmental sustainability in HEIs along the dimensions of EMP according to Trumpp et al. [8]. Trumpp et al. distinguish between environmental management performance (EMP) and environmental operational performance (EOP). We focused our survey on EMP. The associated research question is therefore dedicated to the following topic:

How do HEIs conduct environmental management along the dimensions of EMP, including environmental policy, environmental objectives, environmental processes, organizational structures, and monitoring?

In our view, this shows a major weakness in the efforts to adopt a whole-institution approach. Although the measurement of EMP is an important aspect, without an overall institutional view of the interrelationships in the network of effects with policies, objectives, structures and processes, their long-term significance and effects remain limited. A task will be to anticipate the growing need for forward-looking management and to perceive EMP as an overall institutional task. Thus, it is a management mission to address and combine the necessary tasks of sustainability management.

To answer this research question, the study investigates the present environmental sustainability efforts of HEIs to assess the application of environmental management. Therefore, the survey applied the dimensions of EMP [8] to identify relevant management structures and dimensions. Though the origin of the EMP construct is from the business context, the concept is also applicable for other organizations, such as HEIs [8].

The cross-sectional survey study addressed all public HEIs in German-speaking countries (i.e., Germany, Austria, and Switzerland).

Our study makes two contributions to the literature. First, survey-based research provides the opportunity to investigate relatively complex, multi-faceted phenomena which occur in their natural setting, and surveys are particularly suitable for gathering data on respondents' beliefs, attitudes, and perceptions that drive their behavior [16]. Thus, the survey method allows for mapping current practices in the field, providing insights into intriguing research topics that require further research or that have not yet been studied [16]. The survey study adds to the mostly qualitative research in this area [17,18] reporting on implementation approaches, value-driven behaviors, or discussing factors of success by exploring how HEIs incorporate environmental concerns in their management bodies.

Second, the study expands the existing literature on sustainability in public HEIs by investigating the managerial perspective of engagement. Since current studies on sustainability at HEIs mainly discuss possible pathways of implementation or the assessment of existing practices, the survey contributes to a holistic perspective by examining the management process along the different dimensions of EMP [16]. The study highlights the role of management functions, which enables new perspectives on the often-ignored aspects of systematical internal steering and processing by the top management. This produces a better understanding of objectives and conditions of the successful implementation of sustainability as a cross-cutting function within HEIs.

The remainder of this paper is structured as follows. In the next section, we describe the survey design and the measurement of the constructs. In Section 3, we present the descriptive results. Finally, we discuss our findings and present implications, suggestions for future research, and limitations of our study.

2. Materials and Methods

2.1. Data Collection and Sample

The population comprises all public HEIs in Germany, Austria, and Switzerland with a total number of 339. The HE systems of these three countries are comparable in their composition with a strong state regulation in the HE sector [19]. A standardized questionnaire was developed based on the recommendations of Dillman, Smyth and Christian [20] and pretested with five experienced sustainability practitioners and five experts from the research field. The experts from the HE sustainability practice had recommended a subdivision into "measures" (e.g., energy efficiency) and "fields" of action (e.g., teaching and research). The survey was developed in English to adopt items that had been published in English and afterwards translated into German. The wording of selected items was adjusted to the HE context. In order to ensure consistency in the two languages, an independent translator was asked to back-translate the survey [21]. After revising the questionnaire, we sent it to the person responsible for environmental issues in the individual HEIs in December 2017. We have proceeded, as follows, to select the appropriate respondent. We first tried to contact the person responsible for sustainability. If this was not possible, we searched for a person responsible for environmental issues, then for a person responsible for occupational health and safety or, finally, for a person responsible for public relations with a request to forward the questionnaire to a person responsible for sustainability and environmental issues.

The survey implementation contained the following four steps: (i) initial e-mailing, (ii) first follow-up, (iii) second follow-up, and (iv) third follow-up. The first step involved an e-mail that was sent to every contact person, including a cover letter and the questionnaire as an interactive PDF

form. The first follow-up was a replacement of the questionnaire and contained the same elements as described in the first step but was sent to those who had not answered, while the second and third follow-ups were phone calls.

In total, the survey generated a response of 33 (GER: 27; AUT: 4, CH: 2) usable questionnaires, which were sent exclusively to state HEIs, resulting in a response rate of 9.7%. The response rate is hardly comparable with other studies as surveys in HE on the topic of sustainability are scarce. However, the findings show that sample selection bias is not a major concern [22,23], following the suggestions of Armstrong and Overton [24]. First, in Table 1 we first match the HEI's characteristics of our sample with known attributes of the population (i.e., organizational size, country of origin, and type of HEI). HEIs with less than 7000 students are categorized as small, with at least 7000 and less than 24,000 students as medium, and with at least 24,000 students as large (similar to the classification of Burrell et al. [15]). Using a chi-square difference test, a significant difference in responses is only found for type of HEIs, which means that fewer universities of applied science and more universities responded than expected. Second, in Table 2 we compare latent variable scores between early and late respondents to test for non-response bias following the idea that "less readily" available responses (i.e., late respondents) are equivalent to non-responses. We define early respondents as those who answered at least with the first follow-up. No significant differences were found. For this reason, it is rather unlikely that there is a systemic bias on the basis of differences between early and late respondents. Nevertheless, we are aware of the relative low number of total responses as a limitation of our findings. Response rates around 10% can also be found in other recently published surveys (e.g., Guenther/Heinicke [22] with 11.26%, Bisbe and Malagueno [25] with 13.21%; de Geuser et al. [26] with 9.5%; Libby and Lindsay [27] with 13.6% and 1.5% response rate for two sub-samples). The decline in response rates is also reported in recent methodological papers (e.g., Hiebl and Richter [28]; van der Stede et al. [29]). Thus, we finally decided not to apply statistical tests in our Results section. For the Results section, we use boxplots to display the data of the survey more on an explorative level.

Table 1. Non-response test for organizational size, type of HEI (Higher Education Institution), and country of origin.

Organi-zational Size	Received	Expected	Type of HEI	Received	Expected	Country of Origin	Received	Expected
Large	6	3.6	University	17	10.9	Germany	27	25.7
Medium	8	8.1	University of Applied Science	16	22.1	Austria	4	4.1
Small	19	21.3				Switzerland	2	3.2
Total	33			33			33	
Chi-square test statistic	1.850			5.092			0.459	
df	2			1			2	
p-value	0.397			0.024 **			0.796	

The Table reports the results of the chi-square statistics for the tests of regional distribution and of type of higher education institution (HEI). * Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level; two-tailed tests.

Table 2. Non-response test for latent constructs.

Latent Constructs	Early Respondents	Late Respondents	Mann–Whitney U Test
Environmental Policy	4.15 (<i>n</i> = 22)	3.75 (<i>n</i> = 11)	$Z = -0.860, p = 0.390$
Environmental Objectives	3.76 (<i>n</i> = 22)	3.45 (<i>n</i> = 11)	$Z = -0.748, p = 0.455$
Environmental Processes	4.22 (<i>n</i> = 22)	3.33 (<i>n</i> = 11)	$Z = -1.514, p = 0.130$
Organizational Structure	3.82 (<i>n</i> = 22)	3.55 (<i>n</i> = 11)	$Z = -0.404, p = 0.686$
Monitoring Systems	3.46 (<i>n</i> = 22)	3.10 (<i>n</i> = 11)	$Z = -0.765, p = 0.444$
Overall EMP	3.88 (<i>n</i> = 22)	3.42 (<i>n</i> = 11)	$Z = -0.860, p = 0.390$

The Table shows the construct means of the early and late respondents of our sample for the latent constructs of the structural model. * Significant at the 0.1 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level; two-tailed tests.

2.2. Measures

By addressing persons in charge of environmental management, we aimed to assess the performance of each institution compared to the average of public HEIs of similar size at the public level. Therefore, we refer to the work of Trumpp et al. [8], who define and conceptualize a measurement of environmental management performance that comprises the five dimensions of environmental policy, environmental objectives, environmental processes, organizational structure, and environmental monitoring to pursue a systematization of engagement in order to map the status quo of environmental management performance.

We use 12 items each to measure environmental policy, environmental objectives, and environmental processes; 13 items to measure environmental monitoring; and 2 items to measure organizational structure. All items are based on a seven-point Likert scale with midpoint and endpoints labeled as categories (1 = strongly disagree/not at all; 4 = neither nor; 7 = strongly agree/completely).

In close coordination and cooperation (dialogue, meetings and questionnaire pretest) with experts in operational environmental management at the TU Dresden, a total of four core areas of environmental management were identified in addition to the dimensions according to Trumpp et al., which are important for the investigation of EMP in the context of HEIs and were therefore also considered as independent fields in the questionnaire: (1) Energy efficiency, (2) fresh water consumption, (3) resource consumption, and (4) emission reduction. Furthermore, we developed certain domains within HEIs bearing key management responsibilities in terms of environmental performance. These responsibilities spread over the measures of (5) procurement, (6) facility management, (7) event management, (8) disposal, (9) research and education, (10) mobility, (11) human resource management (HRM), and (12) marketing. With this general structure, the questionnaire portrays the essential fields of action and measures to uncover environmental performance within the dimensions of EMP.

3. Results

For the visualization of our results, we use SPSS 25.0 and MS Excel software programs to create boxplots. Boxplot diagrams allow for a summarization of a dataset along the values of minimum, lower quartile, median, mean value, upper quartile, and maximum. This kind of illustration enables benchmarking and interpreting the results, especially for smaller sample sizes.

The box describes the lower and upper quartile, with the vertical line crossing it as the median. The whiskers connect the quartiles with the minimum (left) and maximum (right). The position of the triangle displays the mean value (see Figure 1). This shows if performance is below or above average. If a value is located within the light grey area or even above, the performance is between the median and the upper quartile. If a value is located in the dark grey area or even below, the opposite is true. The interquartile distance defines the range of the box, whereas the size of the whole boxplot represents the range of all answers given on the question.

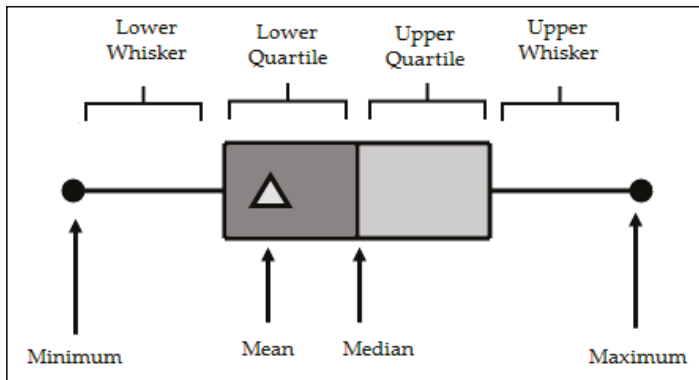


Figure 1. Description of boxplot diagrams (own illustration).

For the analysis, we divided the questionnaire into different sections following the dimensions of EMP. For each question, within the sections, we generated a boxplot diagram. The following section describes the results based on the fields of action and measures proposed above.

The first boxplot addressing environmental policy (see Figure 2) shows that energy efficiency is, on average, the most elaborated field of action (mean = 4.64). Policies concerning the reduction of emissions show a slightly below average level. The examination of water consumption and resource utilization deliver average patterns (mean = 4.15 and 4.21, respectively). Turning to HEIs' environmental performance, policy issues concerning waste management show an above mean value (4.79). Considering also the median, disposal policy appears to be a well-elaborated topic. This may be due to legal requirements regulating such matters in German-speaking countries. Concerning mobility, the mean value is 4.21, which is below the median of 5, though the average performance is below average.

When it comes to environmental policies for the case of marketing or HRM, the results tend towards a lower level (1st quartile starts with a value of 1, which means strongly disagree), which is also confirmed by low mean values (3.03 and 3.25, respectively).

For the dimension of environmental objectives (see Figure 3), the measures of energy efficiency (3.94), water consumption (3.58), resource utilization (3.67), and emission reduction (3.48) show a level slightly below average. Consulting the median confirms the trend of a generally only medium adoption in practice. Finally, objectives on energy efficiency show the best average outcome, although the interquartile distance covers a broad range (values between 2 to 6). However, environmental objectives appear to be remarkably well-elaborated concerning disposal (mean = 4.36), as we can see the median reaching a high level (=5.00) compared to the other fields of action. Mobility objectives show a pattern similar to that of the policy dimension, since a mean value of 3.72 lies slightly below the median of 4.00. As was already observable for the dimension of environmental policy, marketing and HRM consistently show a low level of agreement (mean = 3.00 and 3.03, respectively). This becomes even clearer, since the lower quartile starts with the lowest value of 1 (=strongly disagree). Remarkably, event management shows almost similar values of agreement (mean = 3.13).

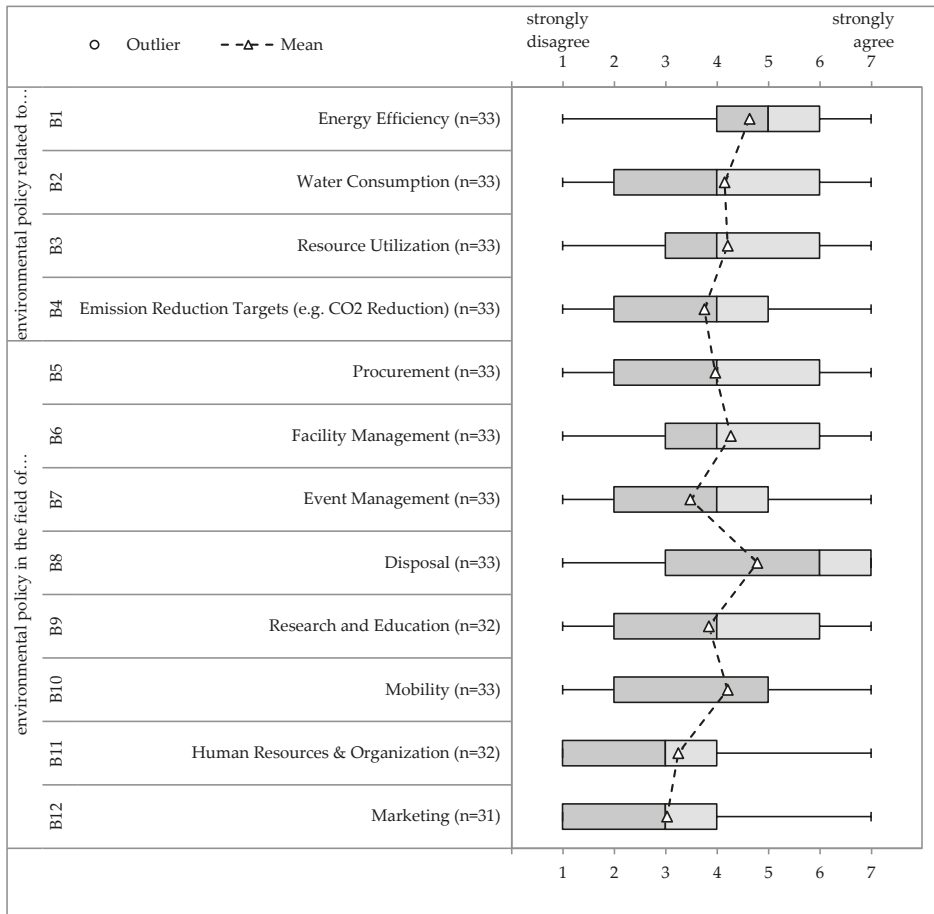


Figure 2. Results for the dimension environmental policy.

From the boxplot for environmental processes (see Figure 4), we can observe the highest approval rates for energy efficiency improvements (mean = 4.27), although only at a slightly better value. Processes improving the consumption of water (3.91), improving resource efficiency (3.85), or reducing emissions (3.79) show an average agreement. Looking at processes concerning environmental performance, they show a similar level of assessment. The mean values are located between 3.34 (event management) and 4.63 (disposal), which provide no considerable indications corresponding with our observations for the dimension of environmental objectives. The higher mean value and median for waste management again results from legal requirements which regulate mandatory waste disposal. The processes of mobility show a mean value of 4.03 corresponding to the median (value = 4.00). In terms of marketing and HRM, the low values (mean for both = 3.26) reveal a weak level of consent.

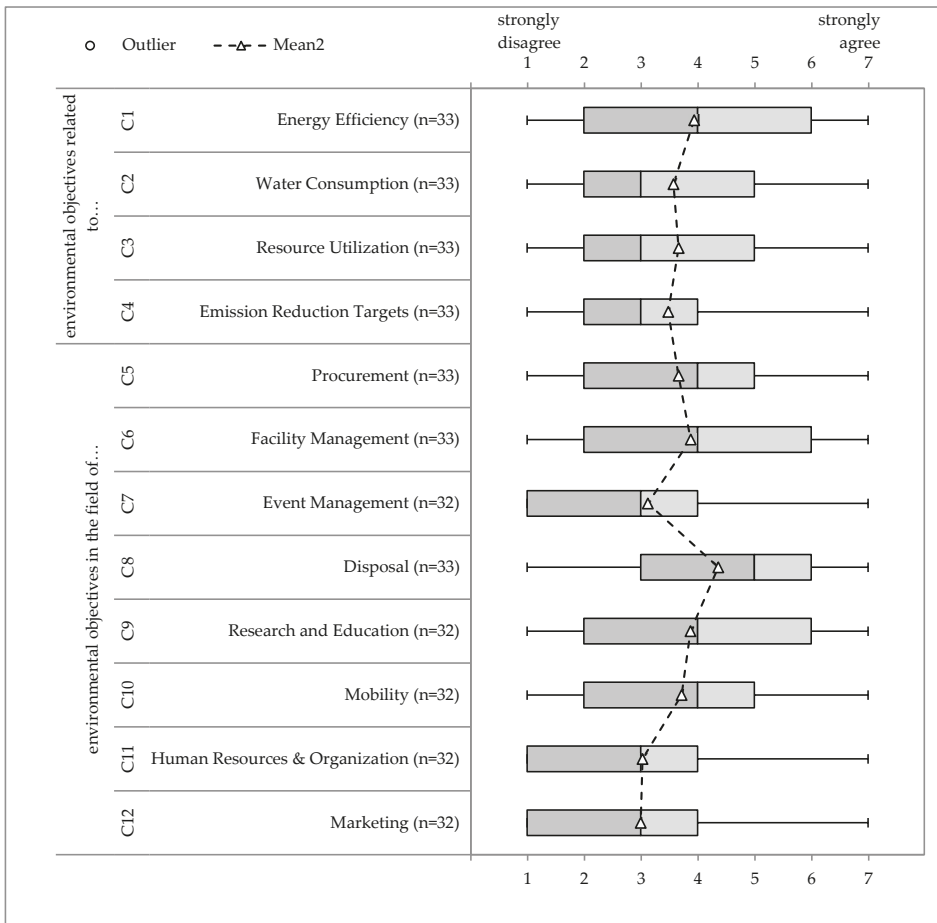


Figure 3. Results for the dimension environmental objectives.

The exploration of the organizational structure (Figure 5) follows an alternative design diverging from the interrogative form of the other dimensions. Since this section asks about implementation efforts of HEIs with the aim of revealing certain structures related to environmental topics, the standardized question pattern is unsuitable for providing appropriate results. Therefore, the dimension for organizational structures captures items on training and internal communication. The results show that trainings for employees on environmental topics are generally perceived below average (3.39). The application of adequate internal communication tools for an improved management of environmental topics centers around a mean value of 4.06. Remarkably, the interquartile distance covers a broad spectrum ranging from 2 (=disagree) to 6 (=agree).

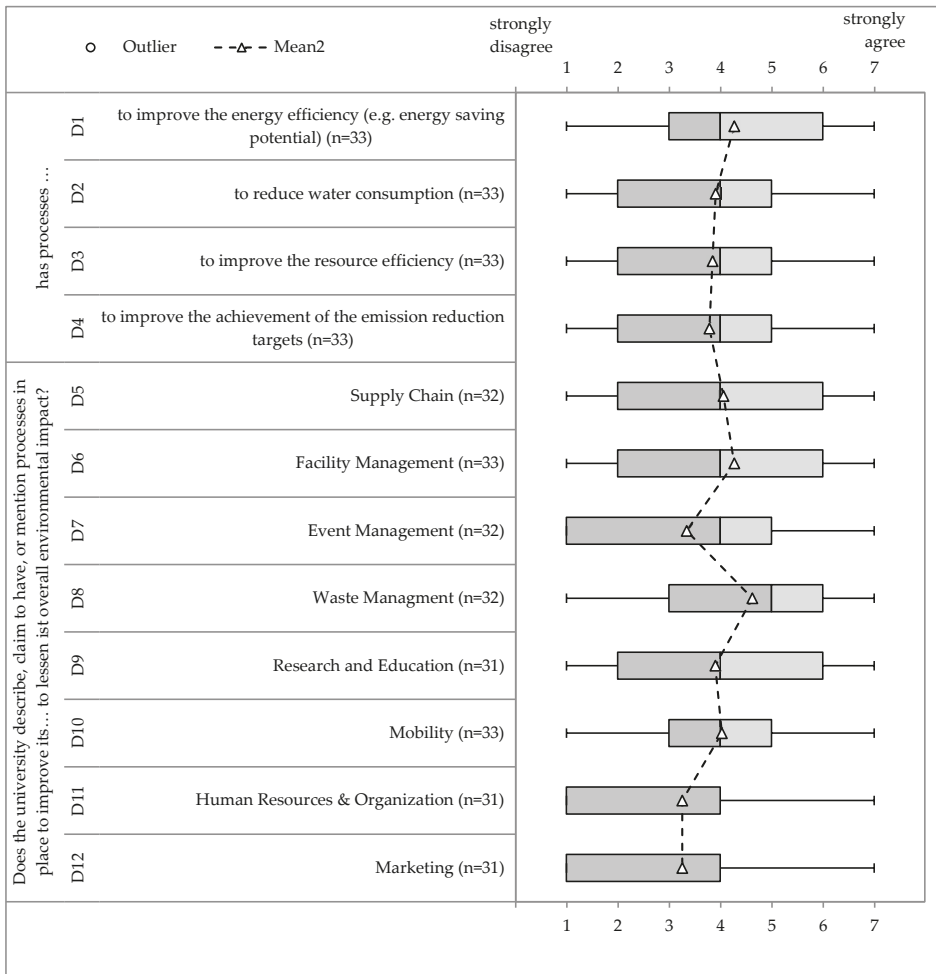


Figure 4. Results for the dimension environmental processes.

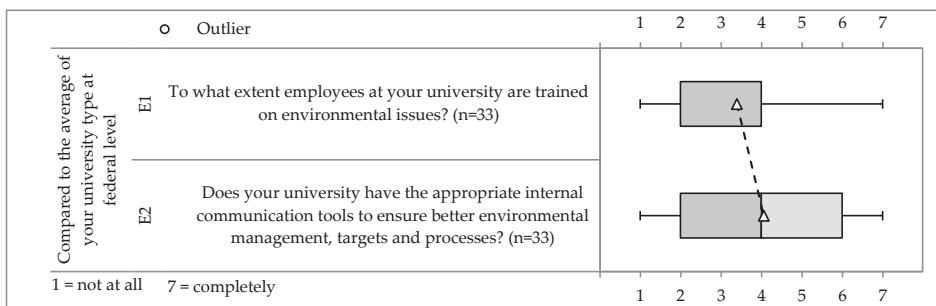


Figure 5. Results for the dimension organizational structure.

The boxplot in Figure 6, for the dimension of monitoring systems for environmental management performance, indicates that HEIs mainly apply measurement tools for the case of energy efficiency (mean = 4.27). Here we can observe a slightly higher mean value than in other fields of action (water use: 3.67; resource use: 3.24; emission reduction: 3.09). The efficient use of resources, which includes tools for the reduction of emissions and the application of monitoring systems, appears to be slightly underrepresented. In both cases, the lower quartile starts with the value of 1 (=strongly disagree). Regarding the fields of action, HEIs, on average, perform best concerning disposal aspects. With a mean of 4.19 and a median of 5, again this appears to be the topic with the most emphasis, since regulatory requirements force HEIs to adopt certain disposal procedures. Interestingly, measurement tools for green procurement are obviously not in use, as the mean value of 3.00 indicates a general below average adoption. Similar to the low levels of agreement for the dimensions of policies and objectives, the assessment of monitoring for mobility issues is below average (mean = 3.45), which again is below the median of 4.00. Finally, event management (mean = 3.06), marketing (mean = 2.57), and HRM (mean = 2.65) consistently show the same below average performance as the other dimensions. In all these fields, the lower quartile begins with the value of 1 (strongly disagree) and ends with the value of 4 (partly agree). Especially for the case of marketing, the median shows a considerably low level (value = 2.00). The final question on environmental monitoring systems for other relevant fields of HEIs shows a low mean of 2.79.

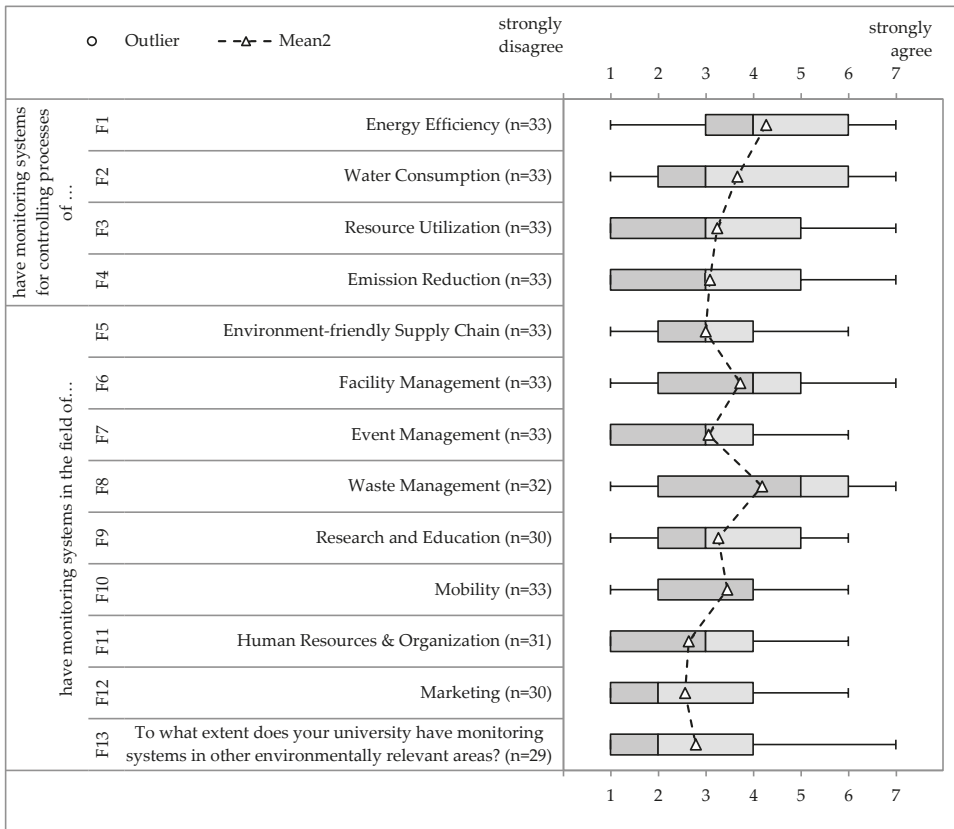


Figure 6. Results for the dimension monitoring systems.

In summary, the analysis allows deeper insights into the performance dimensions of EMP for HEIs. In the next step, our study examines the mean scores over all items for each EMP dimension (Table 3), which allows for implications on the performance of each single EMP dimension for the HEIs.

Table 3. EMP (Environmental Management Performance) mean scores for the EMP dimensions.

Dimension of EMP Score	Environmental Policy	Env. Objectives	Env. Processes	Org. Structures	Monitoring Systems
Mean Value	4.0	3.6	3.9	3.7	3.3

Apparently, the dimension environmental policy shows the highest mean value of 4.00. This shows the general commitment of HEIs to proclaim sustainability engagement on an institutional level. A similar value can be found for the dimension environmental processes (mean = 3.9). This supports a certain anchoring of the environmental engagement within the institutions. The organizational structures with a mean of 3.7 are directly interrelated to these processes and objectives (mean = 3.6), consequently followed by monitoring systems (mean = 3.3). In sum, the relative moderate commitment for EMP of HEIs may be due to different emphasis of the HEI's top management for environmental issues in general over other issues at the HEI as well as individual commitment within the HEI's top management.

A further split of the results for the different EMP dimensions by size in Table 4 delivers an even more detailed picture of the performance of the HEIs.

Table 4. EMP mean scores and HEI Size.

Dimension of EMP Size	Environmental Policy	Env. Objectives	Env. Processes	Org. Structures	Monitoring Systems	Total EMP
Small Size	3.79	3.44	3.59	3.76	3.08	3.52
Medium Size	3.90	3.43	4.20	3.69	3.69	3.78
Large Size	4.88	4.65	4.67	3.67	3.70	4.28

Evidently, large institutions perform, on average, better than small or medium ones. Going from large to small, the study observes a slope of mean values in almost every dimension, whereas the gap between large and medium-sized institutions shows to be more considerable than between medium and small ones. Not surprisingly, the mean value of total EMP also reflects these size effects.

Furthermore, when dividing the sample into two groups of high and low performers, we examine what makes the difference between good and bad performance in terms of EMP. For this case, the mean EMP scores for each EMP dimension are taken and aggregated to one total EMP score of each HEI. We classify HEIs as high performers when the mean score value is greater than 5.00 and as low performers for mean score values of less than 3.00. Cases between 3.00 and 5.00 are categorized as medium [30].

In total, the study identified 7 high performers, 11 low performers, and 15 medium performers. Based on this categorization of HEIs, an additional in-depth analysis of each category was conducted.

Publicly available information on the integration of environmental topics in HEIs' policies, as well as objectives, structures, processes or monitoring on the websites of the HEIs, was examined for further information on environmentally relevant performance characteristics in order to enrich the existing data from the survey to find out more about further efforts on (environmental) sustainability within the curriculum, research projects or voluntary self-obligations. Furthermore, the study sought proof of institutional anchoring within management bodies or formal commitments in the published statements on mission, values, or strategy. In addition, this information was matched with a possible assignment within the EMAS register to see if an institution's performance is based on external validation.

For the case of high-performing HEIs, the study identified a continuous orientation towards sustainability in research and teaching programs. In approximately 70% of the cases, we could find

evidence for institutionalization within the institution's structures, resulting in a mean value of 5.7 for this specific EMP dimension. The strongest mean value could be observed for the dimension environmental policy (6.3), followed by environmental processes (5.9) and environmental objectives (5.8). Interestingly, environmental monitoring appears to be an outlier, since the mean value of 5.1 lies noticeably below the other dimensions. Four of these seven institutions are also registered with EMAS. Differing from this pattern, two cases have high total EMP scores but no publicly available information on certain activities is provided. The mean value of high performers over all EMP dimensions is 5.8.

In the case of low-performing HEIs, the examination on the publicly available information delivered no further information on sustainability activities, neither in research and teaching, nor for the institutional context. Remarkably, almost two-thirds of the low performing HEIs are rather small, with only 10% of low-performing institutions being large. As was already observable within the high-performing HEIs, structures (2.2) show the highest adoption, followed by policy (2.0) and processes (1.9). Unlike the high-performer group, the mean monitoring performance (1.8) of low performers exceeds the performance on environmental objectives (1.7). Interestingly, we also found evidence for engagement in research or teaching or even both, which obviously did not result from an increased environmental management performance of the institution as such (cases 15 and 18). The mean value of low-performing institutions over all EMP dimensions is 1.6.

In the group of medium-performing HEIs, the results show a heterogeneous picture. Almost two-thirds of the medium-performers show an orientation towards sustainability, at least in research and teaching, in institutional bodies, or even both. The mean value for policy shows the highest value (4.4), followed by processes (4.4) and objectives (4.0). In contrast to the other performing groups, organizational structures (3.9) seem to be underdeveloped, while monitoring (3.6) appears to be relatively less common. Remarkably, in two cases, the study found no indication for actual engagement, which could explain the average results (cases 21 and 24). In contrast, the study also finds cases showing activities in research and teaching and in institutional anchoring (cases 1, 22 and 33). Surprisingly, none of the medium cases have undertaken EMAS registration. The mean value of medium performers is 4.0, congruent with the median value of our scale.

4. Discussion

This survey study examines the incorporation and operationalization of environmental issues in HEIs' management and answers the research question of how *HEIs conduct environmental management along the dimensions of EMP, including environmental policy, environmental objectives, environmental processes, organizational structures, and monitoring*. The empirical data provide insights into the status quo of adoption and examine HEIs' environmental performance along the EMP dimensions of policy, objectives, structures, processes, and monitoring. The results show that environmental sustainability issues in fact play a role within HEIs' management, though the distribution across the different dimensions differs noticeably. The difference in performance levels between environmental objectives and environmental policy indicates a gap in the translation of (voluntary) commitments into clearly defined environmental objectives. The decoupling of these two aspects shows that although there is a basic awareness of the need to take environmental concerns into account, this awareness remains stuck on an abstract level and thus calls into question the actual will to commit oneself more, which ultimately leaves the impression of lip service. When looking at a whole-institutional approach, it becomes clear that although there is a willingness to assume responsibility at management level, this does not appear to be perceived as a core task of HEI action. In this understanding, efforts to establish supporting structures, processes or control mechanisms, in an effort to improve EMP, seem less promising in the long term.

Including the low average performance in terms of monitoring systems, a possible misfit with regard to effective management becomes noticeable (You cannot manage what you do not measure), which might be due to mutual reinforcement in conjunction with weak goal setting.

Despite great efforts with a total of five rounds, only a relatively low response rate could be achieved among the HEIs surveyed. Although we exhausted all possibilities from a methodological point of view [28], we were not able to increase the response rate significantly. This may be due to the fact that there are no central contacts in the HEIs with regard to EMP. Since this survey was developed together with practical experts from the HE environmental management along the usual cascade of responsibilities for environmental issues in HEIs, the usual persons in charge seem only partially informed about the surveyed topics for the cross-section of HEIs. This leads to the conclusion that concrete contact persons, if any, are difficult to identify for the broad field of sustainability management. This may be due to a lack of consent on the managerial level, suggesting that holistic responsibility has not yet been regulated within the organization. This leads to the assumption that the spread of the cross-sectional function of sustainability management in HEIs has so far been low and a silo thinking (e.g., facility management, operations, focus on environmental or waste topics) according to defined responsibilities prevails.

With regard to the adoption of ecological sustainability in HEIs, another reason may be the lack of consent at the management level, which can be derived from a lack of relevance to the topic. There is some competitive pressure on HEIs with regard to integrating sustainability in research and teaching performance, but sustainability aspects, so far, are of minor relevance. Possible reasons could be that the public financing of HEIs through target agreements contains few or no sustainability targets. This means that the ministries do not tie any sustainability goals to the general budget of the public HEIs, thus the topic of sustainability plays a subordinate role. A similar result is reported in Heinicke and Guenther [31] for the implementation of management control systems. The authors argue that the fulfillment of political and legal requirements is of highest priority in order to secure funding for the HEI and it suppresses the adoption of management systems if not explicitly demanded or connected with funding.

Another reason for the relatively low and rather diverse adoption rates in our survey may be that sustainability management in HEIs is driven by the individual engagement of single players within the HEIs. This is confirmed by experiences of the authors in the research project HOCH-N. The HOCH-N project consists of a research network of 13 German universities as well as a number of committed institutions, organizations, and individuals from the academic environment who are dedicated to the question of sustainable development in the HE context. Respondents that are part of this network show a markedly sharper ecological sustainability profile in terms of policies, goals, structures, processes, and monitoring compared to HEIs that are not involved.

Our study *contributes* to the discussion of sustainability in HEIs in two ways. First, the study provides a survey-driven empirical approach for the systematization and relevance of environmental management aspects for determining the EMP of HEIs.

The vast majority of studies on environmental aspects of sustainability at HEIs, to date, have investigated success factors for the implementation of sustainability in the institution on a case-by-case basis. Due to the high contextual specifics, a generalization of the results has been possible only to a limited extent. The investigation of the introduction of sustainability from the ground up follows different development paths, mostly relating to the voluntary commitment of motivated actors. The present study allows to exceed the limitations of institutional specifics and to achieve a degree of generalizability. Furthermore, the study is oriented towards mechanisms of control as they are established in the corporate context as well as in new public management. Thus, the approach ties in with existing management structures and allows adopting a whole-institution approach from a management perspective. In addition to the examination of general success factors, the study shows where, from an organizational perspective, challenges for the implementation of sustainability can exist, and provides indications of how these can be mastered with the help of a performance-oriented approach.

The present study expands existing empirical research by investigating, by way of a broad survey, the occurrence of EMP in the context of HEIs. To the best of our knowledge, there are

currently no other survey studies which have assessed the EMP of management bodies for the case of HEIs. Based on our full sample of HEIs from German-speaking countries, with no major concerns of response bias, the study expands the relevant literature by clarifying the importance of environmental management performance as a holistic (management) approach across the dimensions of EMP and its relevance to the measurement and management of environmental aspects at HEIs. It is evident that an organization-wide approach to managing environmental performance cannot be viewed solely at management or operational level, but must be implemented as a bipolar flow, flanked by voluntary engagement and stakeholder participation bottom-up and top-down in the organization if it is to be successful.

In view of the results of the study, it may also be useful to include aspects of organizational culture in the consideration. As Niedlich et al. [32] have shown in their study, organizational culture plays a crucial role in HEI's governance for the implementation of sustainability aspects. Cultural orientations at management level can thus act as a stimulus or barrier to the success or failure of implementation. With regard to EMP, it might be useful to consider these aspects of organizational culture.

In summary, the analysis shows an average moderate level of EMP and an interrelation between an increased EMP and ambitions for sustainable research and/or teaching.

Environmental policy shows, on average, the strongest emphasis, whereas monitoring systems tend to have received lesser attention. Furthermore, according to our results, the study discloses an association between the environmental performance level for EMP and an institution's size. Analyzing distinct fields of action and measures of environmental performance shows a moderate performance on disposal topics (mean value 4.49), energy efficiency (4.10), and facility management (4.04) issues. On the downside, the results show weak performance for marketing (2.96), HRM (3.05), and event management (3.25) topics.

A stronger performance in the field of waste disposal topics might be caused by the presence of distinct legal requirements regulating the waste management of (public) organizations and firms.

High performance levels in both functions of energy efficiency and facility management might result from a remarkable overlap in their practical execution. Since energy efficiency may also be included in an environmentally sustainable facility management, their mutual affection under the lens of practical operations appears to be evident. Another reason for these results might be due to low thresholds for taking action. In both cases, the implementation and operation of optimization potentials requires relatively short decision-making processes or top management commitment, but mainly personal engagement and willingness to contribute from the person(s) in charge of the function.

Remarkably, there is a missing entanglement with procurement issues (3.67) since maintenance requires appropriate supplies of operating resources. This actually contrasts with the performance results in the dimension of environmental processes (see Figure 6). Interestingly, more than half of the responding institutions have staff in charge of environmental (sustainability) issues (regardless of their size). According to our results, it seems that those functions are predominantly assigned to the HEI's facility office, since the study measured a strong EMP centered on central functions (especially facility management and disposal). However, this shows that an institutionalization of engagement does not lead automatically to an increase of the HEI's overall environmental management performance, since distinct fields of action and measures appear to perform weaker than others. This might also arise from a general lack of comprehensive systems of sustainability objectives, which require a holistic approach that includes all EMP dimensions.

As a second contribution, the study expands the current literature on sustainability in public HEIs by exploring the role of management for the implementation of (environmental) sustainability efforts. The application of EMP enables a new perspective for the understanding of aims and conditions of the successful implementation of a holistic sustainability approach within HEIs.

With a moderate adoption of environmental policies, processes and organizational structures, and a low dissemination of monitoring systems, EMP does not seem to have supported the change of perspective from an output orientation (e.g., reduction of waste and energy) to an outcome orientation

for societal welfare (role model for students and researchers). With a general willingness to become active at the top management level, the operational practice (so far) is not sufficiently capable of fulfilling this commitment.

As the results show, environmental management is an emerging issue for HEIs in their endeavor to fulfill their social mission and reduce negative impacts of research and teaching. With the apparent willingness of management bodies to adapt environmental sustainability into their policies and structures, a first step towards the implementation of environmental management has already been made. However, the existing structures also must cover operational practices to pursue a holistic approach to implementing sustainability across the institution, thereby ensuring the lasting success of these efforts.

5. Concluding Remarks

Based on these findings, the study proposes distinct *implications* for both decision makers (e.g., administrators, environmental management officers, and the HEI's top management) and researchers. First, the pledge of engagement within the policy must be translated into certain goals guiding environmental officers and enabling the assessment of activities through monitoring systems, including the distribution of (financial) resources for the appropriate allocation of means to implement sustainability. Importantly, measuring the allocation and use of means is crucial for building long-term structures enabling continuous (improvement) processes. Applying monitoring systems in that context not only contributes to assessing the EMP, but also enhances transparency and broadcasts information on the progress of implementation and improvement, improving the social credibility needed to pursue the intended policies and objectives.

Second, the results suggest the charge of environmental sustainability within HEIs is complex. It seems that the success of certain efforts depends on the setting of the person(s) in charge of these issues. Apparently, environmental sustainability seems to be located within the facility division in most cases. This may be a logical consequence of the importance of this field of action, which, however, likewise neglects other fields. A possible solution might be the implementation of cross-sectional posts that can manage and control all relevant fields of action and measures of environmental sustainability simultaneously. Another option describes participatory approaches supporting existing structures to implement policies and objectives by voluntary engagement or shared governance. Since distinct stakeholder groups, such as students or staff members, are directly affected by HEIs and therefore have a legitimate claim to participate, their involvement on a voluntary basis could have the potential to foster environmental engagement and integrate relevant target groups into decision-making processes.

The aforementioned points to the third implication on continuity and impact. Since our study observes a weak anchoring of environmental objectives and an even weaker embedding of monitoring and control mechanisms, the measurement and assessment performance of environmental issues under the lens of EMP remains limited to short or mid-term effects. Generating impacts should actually be the standard for engagement, but appropriate indicators or measurement tools are still missing. Nevertheless, the fact that HEIs have established structures suggests a positive development and shows their willingness to contribute and shoulder responsibility. Turning to impact measurement, the question arises as to how HEIs can pursue purpose through their actions.

As many other surveys, our study also has *limitations* providing avenues for future research. One major limitation in the generalizability of the results lays in the fact that only German-speaking and state-run HEIs are taken into account. Public sponsorship and state funding are a decisive differentiating factor in comparison with other countries and also in contrast to private HEIs. Future research may assess whether our findings also hold for other regions and HEI settings. Another major limitation is the relatively low total number of responses which does not allow for statistical testing of our findings. Thus, interpretation of results has to be conducted carefully. In addition, the unit response tests indicate that the sample contains more universities than universities of applied science than expected, which could bias our findings. Therefore, future research could examine the EMP for other

countries or HEI cultures (e.g., UK or US). Furthermore, future researchers could draw a comparison between private and public institutions. A replication of our HE setting in other global regions, as well as a comparison with other educational systems (e.g., North America, Australia, and Asia) could also be an interesting endeavor. It is also conceivable to expand our survey to performance issues in teaching and research in relation to the operational performance of an HEI to assess the overall sustainability performance of an HEI.

Another future task will be to define an HEI's responsibilities to planet and people beyond the core business of teaching and research. This opens the field of whether the terms sustainability and responsibility can be regarded as complementary or as competing terms associated with different functions. Thus, a future research question could cover whether it is useful to introduce an overarching sustainability (performance) management on all dimensions of the triple bottom line or if treating each dimension (i.e., environmental and social sustainability) separately is more appropriate. Based on the results, HEIs are moving in the right direction, even though there is a considerable potential for institutions to improve further, and ensure this progress continues long into the future.

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Article

Bridging Intellectual Capital, Sustainable Development and Quality of Life in Higher Education Institutions

Eugénia de Matos Pedro ^{1,*}, João Leitão ^{1,2} and Helena Alves ¹

¹ Faculty of Human and Social Sciences, NECE—Research Center in Business Sciences, University of Beira Interior, 6200-001 Covilhã, Portugal; jleitao@ubi.pt (J.L.); halves@ubi.pt (H.A.)

² CEG-IST and ICS, University of Lisbon, 1649-004 Lisboa, Portugal

* Correspondence: eugenia@ubi.pt

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Abstract: This paper analyses the relationship between the intellectual capital of higher education institutions (HEIs) and their sustainable development practices, and assesses whether higher education institutions' sustainable development practices are related to their stakeholders' quality of life. Using a structural equation model, two model specifications are estimated, gathering primary data from a convenience sample composed of 738 full-time students and 587 teachers/researchers at seven Portuguese higher education institutions. The findings reveal that intellectual capital influences sustainable development practices directly and positively, whereas sustainable development practices influence students' quality of life in a significant way, although the same is not verified for teachers/researchers. These findings provide insightful implications for policy-making and intellectual capital management for practices in higher education institutions; firstly, by showing that the sustainable development concept is associated with HEIs' practices of economic, environmental, social and organisational sustainability; secondly, by concluding that public Portuguese HEIs need to improve the social dimension of their sustainable development practices, and here there may be room for improvement in the institution through better and more proficient social engagement that is more directed to the challenges of sustainability and social change; and thirdly, by showing that the inclusion of better sustainable practices has repercussions on the quality of life of all stakeholders.

Keywords: higher education institutions; intellectual capital; performance; quality of life; sustainable development

1. Introduction

The different ways in which organisations, cities, regions and countries manage and introduce intellectual capital (IC) practices have been found to be a decisive factor, not only for their reputation, competitiveness and wealth, but also in raising their sustainability, focusing on citizens' quality of life (QoL) and contributing to a more sustainable and balanced society [1]. Despite the remaining gap and lack of information in the literature about how intellectual capital and sustainability influence each other from the practitioners' perspective, researchers' theoretical perspectives have shown how IC and sustainability are closely related [2]. For example, it was revealed that a country's knowledge assets and intangible assets have significant implications for its future value, inasmuch as they represent a source of skills and competences considered essential for national economic growth, the development of human capital and promotion of QoL [3]. Adding to the previous statements, knowledge, creativity and innovation have become the main factors stimulating social and economic development, reinforcing the role of IC in generating sustainable growth and development [4].

IC plays an important role in determining regional competitiveness, being even more important in regard to sustainable regional competitiveness, and it is assumed that the most important intellectual resources are those that contribute to the creation of a competitive advantage and so result in an improved economic situation of a region [5]. For example, Dal Mas [6] demonstrated the relationship between IC and sustainability from a practitioner's point of view, supporting the interlink between IC and sustainable regional competitiveness. In addition, it increases society's awareness of sustainability, defines a region's legal and institutional environment, expresses relationships between the various stakeholders and, as a whole, creates the basis for forming sustainable competitive advantage. According to Malhotra [7], the intangible assets of a country have significant implications for the future national value, because they represent a source of the skills and competences considered essential to national economic growth, human development and QoL.

Higher education institutions (HEIs) are also part of this premise, as they are experiencing the challenges of sustainability, which is increasingly recognised as an essential driver for the development of sustainable societies [8], and also contributing to the QoL of their stakeholders and the populations where they are located [9]. Several challenges have been faced by HEIs, namely regarding budget reductions, which imply the implementation of efficiency and cost reduction logics, as well as adopting new community welfare promotion practices to improve their own quality of academic life (QAL). In this way, HEIs reinforce the attractiveness and retention of human and financial resources, which will positively contribute to the sustainability of these institutions. HEIs have shown a growing commitment to sustainable development (SD) through their mission statements, support and agreements, as well as through the effective implementation of the initiatives and practices of SD [10]. In recent years, some studies have been carried out regarding HEIs' involvement in the implementation of SD practices, e.g., [10–12]. These practices are linked to different dimensions (e.g., economic, environmental, social and organisational) and are integrated into the main activities of HEIs, namely teaching, research, operations, social commitments and culture [10].

Bearing in mind the publication by UNESCO [13] for education institutions, including HEIs, it is recommended that all their processes should be based on sustainability principles. In specific terms, for SD practices in HEIs to be more effective, according to UNESCO, the institution as a whole has to be transformed. Such a whole-institution approach aims at mainstreaming sustainability into all aspects of the education institution, which involves rethinking the curriculum, campus operations, organizational activities, culture, student participation, leadership and management, community relationships and research [14].

In the literature, the concepts of sustainability and SD are commonly considered interchangeable, and sometimes as equivalent, e.g., [15,16]. This study, in the same line as stated in [17], assumes that sustainability is a principle, while SD relates to a social process involving choices and decisions towards sustainability. In other words, SD is the means to achieve sustainability, which is the final, long-term objective [16]. Therefore, HEIs have a fundamental role to perform in implementing and leading SD initiatives through the institutions' internal policies and practices.

Following this line of research, having as a vision the whole-institution approach mentioned above, the objective of this study is to fill this research gap in the perceptions of the stakeholders of Portuguese HEIs in relation to their SD practices, and, in turn, investigate how these practices can contribute to these stakeholders' QoL. Regarding HEIs' IC, there is still room and a need to understand how the management of IC can be articulated according to the existing SD practices in these institutions, so that the latter can function as mechanisms to identify existing gaps in HEIs' strategic reports and plans to be filled in the short and long-term.

Considering the above and the stakeholders' perspective, this study aims to fulfil the following objectives: (i) ascertain whether there is a direct, positive and significant relationship between HEIs' IC and their SD practices; and (ii) check whether HEIs' SD practices are directly, positively and significantly related to their stakeholders' QoL, thereby shedding light on a new perspective of the ongoing research on IC.

Considering the importance of IC, and having found no studies so far relating HEIs' IC with their own SD practices and QoL, considering stakeholders' perception, this study proposes to analyse SD practices, through economic, social, environmental and organizational dimensions, and the QoL of HEIs' stakeholders (students, teachers/researchers) through: (i) students' quality of academic life (QAL); and (ii) through the quality of work life (QWL) of teachers/researchers. This approach is of interest to both the scientific community and to HEI managers, as it is an innovative and relevant subject, never before studied, and may lead to better results for students and greater motivation among their collaborators.

To fulfil these aims, there is, first, a brief overview of the evolution of the literature; firstly, on IC in HEIs and the relationship with SD practices, and secondly on the relationship between SD practices in HEIs and QoL. Then, two models are presented and tested through quantitative analysis, gathering primary data from students and teachers/researchers at seven Portuguese HEIs, using a structural equation model (SEM) and the partial least-squares (PLS) method in order to verify the robustness of those relationships. Finally, the conclusions, implications and limitations of the study are elaborated.

2. Intellectual Capital of HEIs and Sustainable Development Practices

As entities involved in the creation and spread of knowledge, HEIs have been taking on a more entrepreneurial role, involving networking and international collaboration, and are increasingly more articulated in regard to critical issues of sustainability and social change, as stated by [18]. These authors highlight the fact of this idea being in line with the perspective of the fourth stage of IC, i.e., the creation of knowledge focused on the ecosystem. Studies related to this stage defend a change in approach to understanding the drivers of wealth creation, based on a balance of intellectual and financial measures, in order to create a more holistic vision of the national innovation capacity and the renewal of society and politics [19].

Therefore, monitoring IC is a way of measuring and controlling intangible and fundamental elements for these organisations [7], at the same time as ensuring SD. Similarly, the management of IC and its importance in HEIs are examples of issues studied by various authors, e.g., [20], as well as the association between HEIs' IC and sustainability [7], and how SD can be integrated into HEIs' practices [21].

Many HEIs have begun to incorporate SD practices into their systems and a variety of sustainability assessment tools have been developed to support HEIs in systematically measuring, auditing, benchmarking, and communicating SD efforts to their stakeholders [22]. As an example, it may refer to the Association for the Advancement of Sustainability in Higher Education (AASHE), which began in 2006. AASHE empowers higher education faculties, administrators, staff and students to be effective change agents and drivers of sustainability innovation [23]. This association developed the Sustainability Tracking, Assessment and Rating System (STARS), which is a framework for colleges and universities for measuring their own sustainability and it is the product of an extensive stakeholder engagement process. This approach fits also with the key elements for whole-institution approaches mentioned by UNESCO [13], as it allows the HEI, together with its stakeholders (e.g., teachers/researchers and students), to jointly develop the vision and strategic plan to implement SD practices in the whole institution.

However, despite the role played by HEIs in promoting SD being recognised as essential, e.g., [24,25], with examples of SD practices in different dimensions (e.g., environmental, economic, social and organisational) worldwide and integrated in HEIs' main activities (e.g., education, research, operations, social involvement and governance/culture) [26], some articles, e.g., [10,21,27] have pointed out that SD practices vary considerably from one HEI to another, and as for results found for SD practices implemented in Portuguese HEIs specifically, this is still at an early stage.

The potential impacts on HEIs' SD are based on practices related to economic growth, changes in social and business practices, social cohesion, contributions to climate change, sustainable human behaviours and urban development [22]. The most explored dimensions related to SD, in the HEI

context, are environmental, social/cultural, economic and organisational/educational/political. These dimensions are integrated into activities related to teaching, research, campus operations, community actions, assessment and the drawing up of reports [10]. Some authors identify three fundamental dimensions of SD: economic, social, and environmental [11,28]. However, it is increasingly common to find other dimensions, such as organisational, e.g., [29,30] and cultural, e.g., [29,30]. In the specific case of HEIs, the following dimensions were proposed in regard to the implementation of SD practices: environmental, economic, social/cultural, and organisational/educational/political, e.g., [10,24,31]. This study considers that SD practices operate in the following four dimensions: economic, social, environmental, and organisational.

In the same vein of [10], the economic dimension of SD involves practices of economic viability and considers economic needs (e.g., concern about economic performance, plans and actions to improve energy efficiency, and budgeting for practices that promote sustainable development). The social/cultural dimension concerns the actions of an organisation's human resources or the surrounding community (e.g., policies to promote equality and diversity, developing and participating in recreational, cultural or sporting activities, concerns and initiatives regarding social inclusion and scientific initiatives directed towards the outside community). The environmental dimension proposes including environmental concerns and practices in the institution's strategy (e.g., constructing sustainable buildings on campus, separating waste and sending it for recycling and equipment to generate renewable energy). Finally, the organisational dimension concerns how institutions mould their behaviour and values, and how the different stakeholders perceive and if they are satisfied with approaches and objectives related to sustainable development (e.g., declarations and statements on the HEI's views and formal documents on values, strategy, transparency in governance and ethical commitments).

Some authors highlight the importance of stakeholders' perceptions in research related to HEIs' SD, e.g., [12,32]. The discussion on sustainability is based on stakeholder theory [17]. Stakeholder theory aims to analyse the relationship between an organization and the economic and social actors (individually or collectively) that affect, are affected by, and have interests in the procedural and substantive aspects of corporate activities. The management principles of stakeholder theory are reflected in the new model of HEIs' governance through the presence of different internal and external stakeholders in the various management organs [33]. In addition, the stakeholder satisfaction affects organisations' competitiveness and image, with stakeholders' needs and expectations affecting the organisation's management system [34]. The same author concluded that a wide understanding and incorporation of these needs in the management system can contribute to achieving the objectives proposed and increasing stakeholders' QoL.

HEIs' IC can be one of the key elements in promoting SD [7], and in its generalized expression, the SD concept represents an evolutionary coordination of various concerns linked to well-being, such as social, cultural, economic and environmental concerns [35]. Furthermore, these authors emphasize that sustainable behaviour is conceived as actions that contribute to the QoL of current and future generations. HEIs' IC is identified in various studies as a composite of human capital, structural capital and relational capital, e.g., [36,37]. This capital approach differentiates from the one presented in the scope of the theory of capital developed by Pierre Bourdieu, since the latter considers other types of capital, such as economic capital, cultural capital, social capital and symbolic capital [38]. In this scope, it deserves to be outlined that, in the case of social capital, Bourdieu [38] refers to networks as a form of social capital, but also incorporates the nature of culture and how it is reproduced and transformed, as well as how it connects to social stratification and the reproduction and exercise of power, which is connected with the mode of how human capital evolves in the scope of social systems, as a heritage and a reproductive mechanism of social stratification. In this study, HEIs' IC stems from the triad of capitals; human, structural, and relational, having as reference the studies of [36,37].

In the HEI context, human capital is the sum of explicit and tacit knowledge held by all the human resources existing in the institution (teaching, research and development, management, directing

and administrative staff in all services), acquired through both formal and non-formal education and the training processes included in their activities [20,39,40]. According to the vision expressed in [41], human capital can play an important role in SD practices, through the intermediation between the various stakeholders and regional actors, through the demonstration of good practices such as developing management activities, strategic planning, construction projects, minimizing waste and practices of energy efficiency and sustainability, and responsible purchasing programmes, and through good, environmentally-friendly initiatives with an impact on the campus. Leaders can offer incentives to recognise and reward staff for becoming involved in groups leading SD in the academic and regional community. Notably, [10] concluded that, in general, Portuguese HEIs value and stimulate professional and personal development (e.g., vocational training, academic training), in order to ensure the adoption of good practices within the institution.

Additionally, in the HEI context, structural capital includes all explicit knowledge interrelated with the internal processes of the promotion, communication, and management of scientific and technical knowledge in the organisation, which spans both organisational aspects (operating environments derived from the interactions between research management and the organisation of processes, organisational routines, corporate culture and values, and internal procedures, within the scope of quality and information systems, among others), and technological aspects (technological resources available in the university, such as bibliographic and documentary resources, archives, technical developments, patents, licenses, software, and databases, among others) [39,42]. For example, in [43], the structural capital was related to the SD practices towards the improvement of some organisational processes and practices, such as structural improvements based on new technologies (databases, intellectual property) and organizational culture based on the management of environmental sustainability practices. However, in [10], it was stressed that, until now, in Portuguese HEIs the focus has been on processes related to the separation of waste and its forwarding for recycling and plans to reduce the production of waste (e.g., paper, plastic, metal, oils, batteries), so as to ensure SD.

Concerning relational capital in the HEI context, this reflects the extensive collection of economic, political and institutional relationships that have been built up and maintained between HEIs and their non-academic partners (companies, non-governmental organisations, local government and society in general), as well as the perceptions others hold of the institution in terms of its image, attractiveness, trustworthiness and security, among others [40,42].

Relational capital is the connector between the HEI and its various stakeholders, partners, firms, institutions, etc. In [44], the importance of relational capital for SD was revealed, in that it stimulates people's participative and cooperative capacity and makes them responsible for community development, through promotion and interaction between people, structures and institutions, sustained by mutual trust, tolerance and cooperation, as well as mutual respect, civility and participation. Initiatives related to SD in education, research, operations and the outside community help HEIs to respond to various challenges, attracting resources, lowering costs, promoting more effective management and tackling new challenges in society [45]. All this will also contribute to a more positive image of the HEI, attracting more students, promoting quality and excellence, and thereby contributing to the HEI's internationalization.

Considering the above, the following research hypothesis is formulated:

Hypothesis 1 (H1). *HEIs' IC has a positive and significant influence on the institution's sustainable development practices.*

3. Sustainable Development Practices and Quality of Life

The idea that economic development must be sustainable implies recognising the basic idea that natural resources are scarce and limited, therefore accepting that different socio-economic activities must be restrained [46]. However, according to the same authors, the concept extends ideologically to

the cultural and social relations involved in SD processes, including those affecting social well-being and QoL.

The concept of sustainability emphasizes the idea of human behaviours that allow individuals in the present and future to satisfy their needs without exceeding nature's capacity to recover the resources extracted from it [47,48]. These human behaviours involve psychological tendencies and behaviours that show concern about conditions in the physical environment and the completeness of the social environment [46].

In turn, QoL covers a number of indicators portraying various environmental, social, economic and subjective factors [49]. Therefore, a better QoL can be achieved in societies that enjoy a well preserved and constructed natural environment, as well as good governance and good levels of physical health, economy and subjective well-being, as highlighted by [46]. The same authors conclude that, consequently, the interactions between human beings and their physical and social environment should create high levels of satisfaction with these factors, besides well-being and happiness, if these interactions are pro-sustainable—that is, if they are committed with aspects concerning sustainability issues in their daily lives, such as shared value, social welfare and environmentally friendly practices. Furthermore, Moser [50] claimed that a pro-sustainable relationship with the social and physical environment results in satisfying humans' needs and conserving that same environment. Taking care of the environment, conserving and preserving it, is a commitment that all organizations will be urged to make in the short term because it raises the QoL of individuals in the workplace (microenvironment) and those who inhabit the global space (macroenvironment) [51]. SD practices imply the improvement of QoL through satisfaction with many aspects of life, such as education, justice, community participation and recreation [52]. Thus, environmental, cultural and economic factors can interfere with the degree of satisfaction with life, especially if biological needs, safety aspects, social aspects, and psychological aspects have been minimally affected [53].

HEIs contribute to SD through their teaching, research, extension and management practices [54]. Following the statements of [55], a sustainable HEI is one that values the quality of teaching, implements practices aimed at improving the quality of academic life (QAL) and is concerned about managing the use of natural resources. Therefore, in the perspective expressed in [56], HEIs should integrate the principles and practices of sustainability, as that vision and institutional orientation is revealed to be important in undertaking a necessary process of awareness among the academic community and to help decision-making, planning and operational processes.

The psychology of sustainability and SD [57] looks at sustainability not only in terms of the ecological and socio-economic environment, but also in terms of improving everyone's QoL, as mentioned in [58]. In this line of thought, the same authors highlighted that it is essential to analyse the quality of working life (QWL), as professional activity plays a fundamental role in determining employees' physical and mental health and well-being. Similarly, in [59] it was claimed that SD can only materialize in work environments that promote employees' well-being.

As an indicator of well-being, QoL is, today, also an extremely important factor [9], as in its wider sense it involves the components of individuals' lives related to their financial situation, health, interaction with the environment, social relations, affective life, leisure, satisfaction with life and other aspects. QoL is a concept that has inspired much research in the last few decades and had a strong influence on social and political trends applied to various fields, such as urban and regional planning, health promotion and also in social and economic investigation [60].

The literature available in this field can be divided into two types of studies: (i) the studies that consider QoL as a set of purely economic factors (GDP per capita, cost of living, employment, scale economies, etc.), determinants of the growth, decline and competitiveness of organisations [61]; and (ii) as a set of non-economic factors, as a subject of research in the quality of academic life of students (QAL) (satisfaction with services, emotions felt in campus, etc.), e.g., [62–68], or as a factor for assessing quality of work life (needs for satisfaction in a physical and emotional line) (QWL) [69–73].

Some studies demonstrate the relationship between HEIs' IC and SD [7,22,74], and between HEIs' IC and QoL [9,75], but after checking some recent literature reviews regarding IC [19] and searching the most renowned databases (e.g., Web of Science and Scopus), there were no studies which aimed to simultaneously analyse IC, SD and QoL in HEIs, considering their stakeholders' perceptions.

The SD practices can be related to QoL. For example, the social dimension of SD in the HEI context is associated with the quality of work and the quality of life in the academic community [10]; SD in HEIs is a type of development that ensures individuals' QoL through the conservation and preservation of the environment [54]. For example, in [50] it is stated that problems related to noise and environmental pollution are frequently mentioned by individuals as threats to their QoL [76]. If HEIs promote SD practices on campus, such as noise reduction, diminishing the use of paper and recycling campaigns by providing containers for this purpose, they can contribute to greater satisfaction among students.

Recent years have witnessed an exponential increase in the number of studies on QoL in educational environments in relation to the different individuals and groups therein [63,67,68,77–79], more specifically in the areas of students' QAL, e.g., [64–68] and the QWL of teachers and researchers [70,71]. QAL can be assessed in terms of feelings of global satisfaction with the student's experience of life at university [80]. QAL concerns the degree of need for satisfaction and the experiences that create positive emotions in the context of university life experienced by students [81]. Furthermore, the QAL corresponds to a sub-domain of QoL in general, expressed through the satisfaction revealed with the domain of university life [63,80]. These same authors conceptualized QAL as students' general feeling of satisfaction with the experience of university life through the presence of positive sentiments and the absence of negative ones.

QAL has also been measured as a composite of cognitive assessment, i.e., satisfaction of needs in life in the HEI, and affective assessment, referring to positive and negative affective experiences occurring throughout the period of studies at the HEI [64–68]. This study adopts the view proposed in [80] regarding QAL, for whom this is defined according to the global feelings of satisfaction a student experiences in relation to university life. As QAL is measured through the determinants of satisfaction with HEI life [68], these SD practices are expected to contribute positively to students' QAL.

According to some studies, SD has a relationship with QoL [46], and with QAL [10]. If QAL measures students' QoL in the HEI context, then QAL can supposedly be affected by HEIs' SD practices. As mentioned, no studies are known to relate HEIs' sustainable development to students' QAL. For greater understanding of this connection, the following research hypothesis is formulated:

Hypothesis 2 (H2). *Sustainable development practices in HEIs have a positive and significant influence on students' QAL.*

QWL considers the organisational environment according to a wide range of needs for staff well-being at the workplace [69,82]. QWL has a multi-layered, dynamic structure covering different concepts such as safety at work, reward systems, workflows, opportunities for educational and work development, and participation in decision-making processes [70].

In [69], it was stated that QWL describes human resources' satisfaction of seven principal needs, namely health and safety, economic and family, social, esteem, self-updating, knowledge and aesthetic needs. However, in [80], these measures were conceptualized for updating QWL in terms of satisfaction composed of two sets of needs. Firstly, we have the composite of satisfaction of lower order needs, which includes satisfaction of health and safety needs, as well as satisfaction with economic and family needs. Secondly, we consider the composite of higher order needs, which includes satisfaction of social, esteem, self-updating, knowledge and aesthetic needs. These authors argued that the examination of the relative effectiveness of higher and lower order needs helps to prioritize the satisfaction of workers' needs. This method was also validated in [71].

QWL has been studied and defined by various authors e.g., [69,80,83,84]. However, the present study focuses specifically on HEIs, using the definition proposed in [85] for conceptualizing QWL—that

is, the staff’s satisfaction with a variety of needs through resources, activities and results arising from participation in the workplace; and for measures of QWL, the updated needs proposed by the first authors were stated in [86]. Various studies in the field of QWL dealt with HEI teachers/researchers [70,71,73], but so far no studies are known to have dealt with the relationship between sustainable development practices in HEIs and the QWL of teachers/researchers, and so this is an innovative approach with potential interest for both researchers and HEI managers.

As already stated, SD affects QoL [46]. For example, recycling paper and other office material can make people feel that they are contributing to improving the state of the planet, and, as such, feel prouder of the place they work in, i.e., greater satisfaction and, therefore, a better QWL. A similar feeling is hoped for when the HEI contributes proactively to the balanced development of society through actions of social responsibility. A widely used definition of social responsibility for SD is that of the World Business Council [87], according to which corporate social responsibility is organisations’ continued commitment to behave ethically and contribute to economic development, improving the QoL of the workforce and their families, as well as that of the local community and society in general. For example, in [88], the social dimension of SD was positioned as a motivational factor for the staff working in the organisation. Therefore, teachers and researchers’ involvement in actions to help the community will make them feel better and consequently have a better QWL.

If QWL is people’s response or affective reaction to the organisational system [89] and measures teachers and researchers’ QoL in the HEI context, then QWL can supposedly be affected by HEIs’ sustainable development. To deepen the understanding of this connection, the following research hypothesis is considered:

Hypothesis 3 (H3). Sustainable development practices in HEIs have a positive and significant influence on the QWL of teachers and researchers.

Considering the literature review and the research hypotheses formulated, two models of analysis are proposed in Figure 1. Model 1 is concerned with students’ perceptions, and Model 2 relates to teachers and researchers’ perceptions.

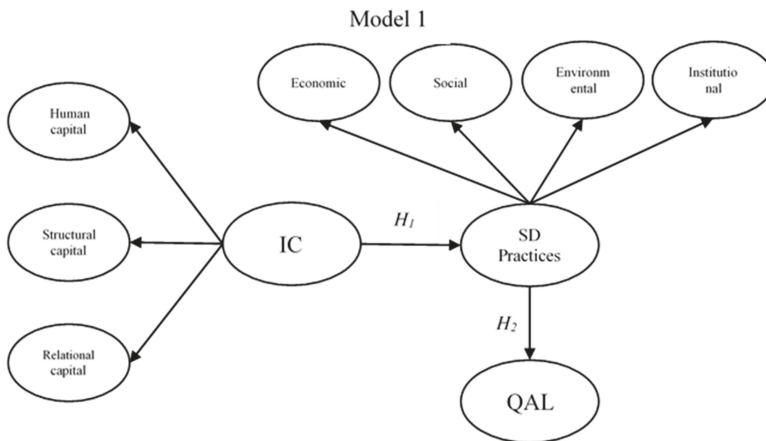


Figure 1. Cont.

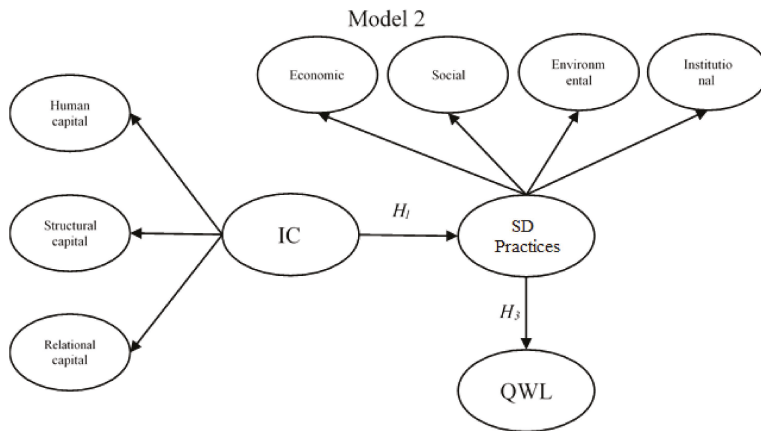


Figure 1. Influence of higher education institutions' (HEIs) intellectual capital (IC) on their own sustainable development practices and on students' quality of academic life (QAL) and teachers/researchers' quality of working life (QWL). Source: Own elaboration.

4. Research Methodology

With the motivation of accomplishing the objectives, this study was analytical and correlational, because it sought to explore the variables and the relationships between them, and it was cross-sectional because the samples were taken in a single period. The purpose of the study was descriptive because it aimed to discriminate the determining factors possibly associated with the phenomenon under study [90]. Through a quantitative, objectivist and, therefore, deductive approach, this research was supported by models built on results and previous research, with quantitative indicators collected through a questionnaire.

4.1. Unit of Analysis

The subject of study corresponded to the entirety of the diverse internal and external stakeholders of Portuguese State HEIs. Based on [91], students and teachers/researchers were selected for this study, given their importance and relevance for the study objectives. The selection of this population was justified as it ensured a diversified sample with the representation of one HEI per region NUTS II level (The Nomenclature of Territorial Units for Statistics (NUTS) is developed by Eurostat, and employed in Portugal for statistical purposes (<https://ec.europa.eu/eurostat>) and considered the entirety of these seven HEIs as a suitable laboratory to test the effects of IC on QAL and QWL. Due to limitations, in terms of data access, the sample's design incorporated seven HEIs, for the total number of seven NUTS II regions in Portugal, in order to ensure the total geographical coverage of Portugal, including five regions from continental Portugal: North, Centre, Metropolitan area of Lisbon, Alentejo, and Algarve, and also two autonomous regions: Madeira and Azores.

The Portuguese higher education system (public and private) is a binary system, where we can find the university education that is oriented towards the supply of solid scientific formation, joining efforts and competences of teaching and research units and the polytechnic education that is concentrated especially on applied sciences, vocational training and advanced, professionally-oriented technical training. In the current study, the decision was taken to focus on public university education, since they correspond to the dominant share of institutions providing higher education and research services in Portugal; this option facilitated the comparative analysis and representativeness of the results.

4.2. Instrument for Data Collection and Variables

Quantitative data were collected through a Questionnaire A, for students, and a Questionnaire B, for teachers/researchers, resorting to structured, closed questions. A seven-point Likert scale was used for the answers. This scale seems to be the most correct in this study as the respondents build acceptance levels according to their experiences and social influences, giving the opportunity to give clear answers instead of neutral or ambiguous answers. This type of scale has already been used in similar studies related to IC, e.g., [20], QAL, e.g., [68], and QWL, e.g., [71].

Both questionnaires were pre-tested to ensure that all the questions were understood and accepted in the same way by all respondents. Subsequently, some of the items of both questionnaires were adapted to improve comprehension.

4.2.1. Variables for IC

IC was measured considering the dominant triad formed of human capital (HC), structural capital (SC) and relational capital (RC), in line with the multidimensional analysis suggested in [19]. To determine the type of IC indicators, the methodological design proposed in [92] was followed. The 32 key indicators used for IC are presented in Supplementary Materials Annex 2.

4.2.2. Variables for Sustainable Development

The variables to measure the SD practices in HEIs are based on the study developed in [10]. The dimensions used are economic, environmental, social and organisational (see Supplementary Materials Annex 2).

4.2.3. Variables for QAL

Concerning QAL, as mentioned in the literature review, previous studies such as [64,65,68] were the cornerstones.

For the cognitive component, the scale proposed in [64,65] was adopted; and for the affective component, the criterion adopted in [64,65] was used, resorting to the scale proposed in [93]. Both criteria (cognitive component, affective component) have already been used and validated in previous studies, such as [67,68] (see Supplementary Materials Annex 2).

4.2.4. Variables for QWL

As for QWL, several studies were considered, e.g., [69,71,80], incorporating the correspondent adjustments (see Supplementary Materials Annex 2).

4.3. Sample and Data Collection Procedure

The definitive sample was collected between November 2017 and February 2018, in two phases. In the first phase, the questionnaires were sent by e-mail to seven Portuguese HEIs (see Table 1), via the Communication and Image Department at the University of Beira Interior. This e-mail, containing a link to the questionnaire, explained the purpose of the study, ensuring that participation was voluntary, anonymous and confidential.

In the second phase, as the first phase did not result in a representative sample, some paper questionnaires were administered in the classroom. The potential bias of students' non-response was assessed through *t*-tests, with no significant differences being observed between the two groups.

The participants in this study were 749 students and 587 teachers/researchers, having eliminated eleven student questionnaires as they were not correctly completed. The final sample comprised 738 students and 587 teachers/researchers (Supplementary Materials Annex 3 shows the sample characterisation with distribution of respondent students and teachers/researchers by HEI, area of study, gender and age group).

Table 1. HEIs, geographical area of location, weight by HEI, total of students (S) and teachers/researchers (T/R) samples.

HEIs	Region (NUTS ID)	Weight HEIs (%)		Total Sample Collected		Optimum Sample Size *	
		S	T/R	S	T/R	S	T/R
ISCTE-Instituto U. Lisboa	Metropolitan Area of Lisbon	16.67	13.1	118	77	109	70
U Açores	Autonomous Region of Açores	5.29	6.6	48	39	35	30
U. Algarve	Algarve	14.61	10.7	98	64	96	64
U. Beira Interior	Centre	12.86	17.6	132	105	84	105
U. Évora	Alentejo	12.16	13.8	88	82	80	83
U. Madeira	Autonomous Region of Madeira	5.27	6.8	35	41	35	41
U. Minho	North	33.14	31.4	219	179	217	173
Total		100	100	738	587	656	566

Legend: S = Students; T/R = Teachers/Researchers. * The optimal sample size to be collected at each participating HEI was determined for a confidence level of 99% and considering a sampling error of 5%, as proposed by [94]. Source: Own elaboration.

5. Presentation and Discussion of the Results

Prior to the analysis of the evidence provided by Model 1 and Model 2, the descriptive statistics of the variables studied were contemplated, as well as the distribution of the mean values in relation to students and teachers/researchers, which was found to be quite homogeneous in both models. The correlational relation between the control variables was also analysed. The results, presented in Table 2, show that the distribution of the mean values is quite homogeneous and all the correlations are statistically significant ($p < 0.01$), with values below or very close to 0.750, not indicating potential problems of autocorrelation.

Table 2. Descriptive statistics and correlation between variables Model 1 and Model 2.

Model 1	Human Capital	Structural Capital	Relational Capital	Economic	Environmental	Social	Organisational	QAL
Human capital	1							
Structural capital	0.716 **	1						
Relational capital	0.729 **	0.835 **	1					
Economic	0.584 **	0.731 **	0.731 **	1				
Environmental	0.560 **	0.618 **	0.651 **	0.627 **	1			
Social	0.492 **	0.594 **	0.582 **	0.650 **	0.591 **	1		
Organisational	0.694 **	0.742 **	0.804 **	0.697 **	0.690 **	0.572 **	1	
QAL	0.586 **	0.532 **	0.577 **	0.444 **	0.468 **	0.407 **	0.609 **	1
Average	4.836	4.752	4.905	4.634	5.240	4.890	5.119	4.836
Variance	0.560	0.962	1.005	1.145	1.430	1.542	1.470	0.560
Model 2	Human Capital	Structural Capital	Relational Capital	Economic	Environmental	Social	Organisational	QWL
Human capital	1							
Structural capital	0.736 **	1						
Relational capital	0.688 **	0.824 **	1					
Economic	0.652 **	0.737 **	0.796 **	1				
Environmental	0.473 **	0.619 **	0.698 **	0.678 **	1			
Social	0.435 **	0.545 **	0.603 **	0.582 **	0.528 **	1		
Organisational	0.422 **	0.569 **	0.586 **	0.610 **	0.582 **	0.565 **	1	
QAL	0.349 **	0.391 **	0.391 **	0.398 **	0.404 **	0.228 **	0.284 **	1
Average	4.256	4.187	4.450	4.802	5.040	4.600	4.377	4.736
Variance	0.705	0.995	0.931	1.133	1.782	2.036	1.321	0.929

** The correlation is significant at the level of 0.01 (2 extremities). Source: Own elaboration.

The data were analysed using a selected specification of a structural equation model (SEM), using the partial least squares (PLS) method, SEM-PLS. Considering the statement presented by Hair et al. [95], the PLS assumes no distribution to the data and is relatively robust against distribution deviations. However, the same authors stated that researchers should still examine PLS-SEM results

carefully when distributions deviate substantially from normal. In accordance with this, absolute skewness and/or kurtosis values of greater than one are indicative of non-normal data. Taking into account what was mentioned by Hair et al. [95], in this case, regarding skewness and kurtosis statistics, they do not provide evidence of a non-normal distribution. In both models, the kurtosis and skewness values of the indicators are within the acceptable range of -1 and $+1$. The only exception is the ORG indicator, in M1, which has a skewness of -1.113 and a kurtosis of 1.365 , and thus exhibits a slight degree of non-normality. However, as the degree of skewness and kurtosis is not severe and because ORG is one of four indicators measuring the (reflexive) SD construct, this deviation from normality is not considered a problem and the indicator is retained.

The variance inflation factor (VIF) was also used to diagnose collinearity, and it was found that the variance value of each indicator is no higher than 2.7 , signalling no potential multicollinearity issues.

5.1. Model Estimation

According to the procedures defined in [95], SEM-PLS is used mainly to develop theories in exploratory studies focusing on explaining the variance in dependent variables when examining the model. SmartPLS (v 3.2.7) software [96] was used to estimate the parameters, using bootstrapping of 5000 samples to obtain their significance [95].

The PLS model was assessed in three stages: (i) assessment of the global model was determined; (ii) the reliability/validity of the measurement model was checked; and (iii) the meaning of the paths (relations between constructs) within the structural model was assessed [97].

The initial measurement model of this study denotes reflexive characteristics (see Supplementary Materials Annex 2), containing two multidimensional constructs (second-order constructs) and nine latent variables (first-order constructs) that cannot be observed or measured directly, and can only be inferred through their observable variables, i.e., the forty-five indicators (see Supplementary Materials Annex 1).

After determining the values and adjusting the constructs of QAL and QWL, considering the literature review, the two models proposed were analysed. As in both models there is a second-order construct, this analysis will follow a two-step approach as recommended by [98], that is: (i) treatment of M1 and M2 only with the first-order constructs (models M1a and M2a); and (ii) treatment of the models incorporating the aggregate scores as an indicator of the second-order constructs (Models M1b and M2b).

Stage 1: Treatment of Models M1a and M2a. In this stage, the global model and measurement model will be analysed.

Assessment of the global model requires the use of quality adjustment measures. After estimating the two models (M1a and M2a) using SmartPls [96], it was found necessary to adjust both models, since the values presented did not agree with recommendations in the literature of reference. It was found adequate to drop the indicators with the smallest loading values that were detracting from the result. The models were estimated until the standardized root mean square residual (SRMR) value in both models reached the cut-off value of >0.08 [99]. Regarding M1a, the indicators of HC3, HC5, HC6, HC7, HC8, HC9, SC7, RC2, RC3 and RC8 were withdrawn; and from M2a the indicators of HC1, HC3, HC4, HC5, HC7, HC8, HC9, HC10, SC1, SC2, SC3, SC7, SC8, SC10, RC1, RC2, RC3 and RC4 were withdrawn. Figure 2 shows the final M1a and M2a models.

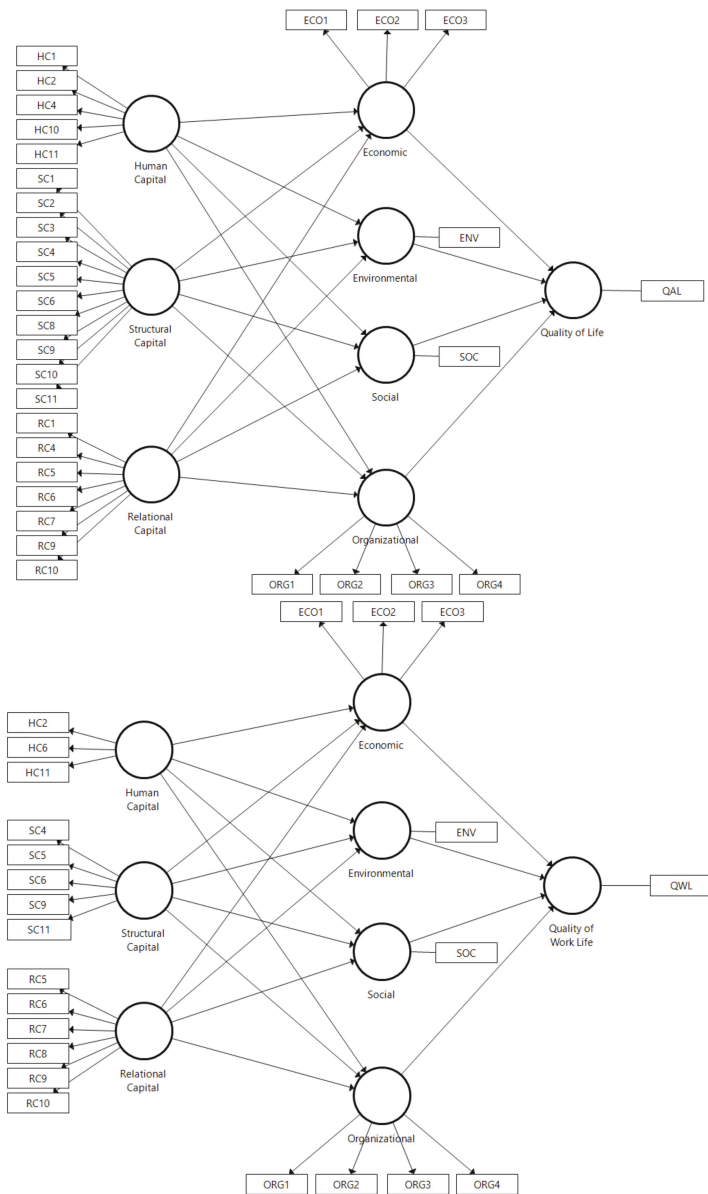


Figure 2. Models M1a and M2a adjusted only with the first-order constructs relations. Source: Own elaboration.

As observed in Table 3, the original SRMR value in both models was <0.08 [99] and all the deviations were insignificant because 95% of the bootstrap quantile (HI95) of the value of the three measures were greater than the original values [97].

Table 3. Quality of adjustment (estimated model and saturated model).

Fit Measures	Original Value		HI95	
	M1a	M2a	M1a	M2a
SRMR	0.059	0.069	0.064	0.077
dULS	1.866	1.444	2.171	1.790
dG	0.630	0.825	0.703	0.893

Legend: SRMR: Standardized root mean square residual; dULS: unweighted least squares discrepancy; dG: geodesic discrepancy. Source: Own elaboration.

In the assessment of the measurement model, only the reflexive indicators will be analysed, because the models do not have formative indicators. All the measures have as reference the recent studies of [100,101].

In the analysis of reflexive indicators, consideration should be given to: (i) reflexive indicator loadings; (ii) internal consistency reliability; (iii) convergent validity; and (iv) assessment of discriminant validity.

Regarding the loading values (see Table 4) of M1a and M2a, all the indicators are seen to present values above 0.70, as recommended, except for one indicator from M2a. However, as this indicator is close to 0.70, we decided to retain it, in agreement with the recommendation present in [102,103] by considering that it is necessary in the model.

Table 4 also presents the results of the analysis of internal consistency reliability, as well as the Cronbach alpha value. Interpretation of the coefficients of these analyses should also not present values under 0.70 (or 0.60 in exploratory research). All the variables also satisfy the requirements of the Dijkstra–Henseler indicator (ρA) (ρA), since the values obtained by calculating the indicator are above the reference of 0.70.

The assessment of convergent validity is through the average variance extracted (AVE), which must be equal to or above 0.50. The result, presented in the same table, shows that the AVE value agrees with the literature of reference, i.e., above 0.5.

The discriminant validity is better detected through the calculation of the heterotrait–monotrait (HTMT) ratio, which for conceptually similar constructs must be $HTMT < 0.90$, and, for conceptually different constructs, $HTMT < 0.85$. Table 5 confirms that the result of this last analysis also agrees with the authors' recommendation, except for two values in both models that are very close to 0.90. In addition to these guidelines, to complement this result, researchers can formally test whether the HTMT value is significantly lower than unity (1) using bootstrapping, and in both cases Table 6 confirms that the result of this last analysis also agrees with these authors' recommendations, i.e., no interval has the value of one.

Table 4. Analysis of the measuring model (loadings, internal consistency and reliability, Dijkstra–Henseler indicator, composite reliability and average variance extracted (AVE) of models M1a and M2a.

		M1a					M2a				
Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	pc	AVE	Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	Pc	AVE
HC		0.815	0.830	0.870	0.573	HC		0.727	0.734	0.848	0.654
HC1	0.742					HC2	0.869				
HC2	0.729					HC6	0.679				
HC4	0.733					HC11	0.863				
HC10	0.820					SC		0.852	0.855	0.895	0.631
HC11	0.757					SC11	0.747				
SC		0.910	0.912	0.925	0.554	SC4	0.821				
RC1	0.781					SC5	0.834				
RC10	0.774					SC6	0.854				
RC4	0.720					SC9	0.705				
RC5	0.801					RC		0.862	0.867	0.897	0.591
RC6	0.791					RC10	0.799				
RC7	0.801					RC5	0.814				
RC9	0.804					RC6	0.771				

Table 4. Cont.

M1a						M2a					
Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	pc	AVE	Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	Pc	AVE
RC		0.894	0.896	0.917	0.612	RC7	0.755				
RC1	0.729					RC8	0.703				
RC2	0.701					RC9	0.768				
RC3	0.780					ECO		0.760	0.807	0.861	0.674
RC4	0.702					ECO1	0.797				
RC5	0.735					ECO2	0.894				
RC6	0.760					ECO3	0.767				
RC7	0.745					ENV	1.000				
RC8	0.810					SOC	1.000	1.000	1.000	1.000	1.000
RC9	0.749					ORG					
RC10	0.724					ORG1	0.864				
ECO		0.820	0.838	0.892	0.734	ORG2	0.841				
ECO1	0.882					ORG3	0.884				
ECO2	0.885					ORG4	0.805				
ECO3	0.801					QWL	1.000	1.000	1.000	1.000	1.000
ENV	1.000	1.000	1.000	1.000	1.000						
SOC	1.000	1.000	1.000	1.000	1.000						
ORG	0.921	0.922	0.944	0.808	0.921						
ORG1	0.908										
ORG2	0.907										
ORG3	0.897										
ORG4	0.883										
QAL	1.000	1.000	1.000	1.000	1.000						

Source: Own elaboration.

Table 5. Heterotrait–monotrait (HTMT) ratio of models M1a and M2a.

M1a	HC	SC	RC	ECO	ENV	SOC	ORG	QAL
HC								
SC	0.905							
RC	0.854	0.925						
ECO	0.776	0.844	0.852					
ENV	0.555	0.652	0.685	0.694				
SOC	0.526	0.870	0.608	0.720	0.591			
ORG	0.715	0.814	0.623	0.801	0.719	0.597		
QAL	0.238	0.263	0.280	0.186	0.220	0.168	0.300	
M2a	HC	SC	RC	ECO	ENV	SOC	ORG	QAL
HC								
SC	0.901							
RC	0.888	0.906						
ECO	0.565	0.676	0.689					
ENV	0.672	0.709	0.738	0.673				
SOC	0.559	0.563	0.640	0.652	0.527			
ORG	0.818	0.835	0.883	0.754	0.731	0.626		
QWL	0.059	0.065	0.093	0.068	0.116	0.033	0.092	

Source: Own elaboration.

Table 6. Heterotrait–monotrait (HTMT) ratio of models M1a and M2a using bootstrapping.

Variables M1a	Original Sample (O)	Sample Mean (M)	2.5%	97.5%	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
HC -> ECO	0.103	0.105	0.018	0.197	0.103	0.105	0.002	0.016	0.195
HC -> ENV	-0.039	-0.040	-0.139	0.061	-0.039	-0.040	-0.001	-0.139	0.061
HC -> SOC	-0.009	-0.008	-0.114	0.098	-0.009	-0.008	0.000	-0.114	0.098
HC -> ORG	0.000	0.000	-0.080	0.076	0.000	0.000	0.000	-0.081	0.075
SC -> ECO	0.341	0.342	0.229	0.450	0.341	0.342	0.001	0.227	0.447
Structural Capital -> Environmental	0.306	0.307	0.177	0.434	0.306	0.307	0.001	0.173	0.430
Structural Capital -> Organisational	0.292	0.293	0.179	0.410	0.292	0.293	0.001	0.177	0.406
Structural Capital -> Social	0.379	0.380	0.232	0.521	0.379	0.380	0.001	0.227	0.518
Relational Capital -> Economic	0.374	0.372	0.269	0.476	0.374	0.372	-0.002	0.274	0.480
Relational Capital -> Environmental	0.422	0.421	0.303	0.541	0.422	0.421	-0.001	0.305	0.542
Relational Capital -> Organizational	0.548	0.547	0.442	0.650	0.548	0.547	-0.001	0.444	0.650
Relational Capital -> Social	0.266	0.265	0.132	0.396	0.266	0.265	-0.001	0.134	0.399
ECO -> QAL	-0.081	-0.080	-0.208	0.052	-0.081	-0.080	0.001	-0.211	0.049
ENV -> QAL	0.056	0.056	-0.039	0.152	0.056	0.056	0.000	-0.039	0.152
SOC -> QAL	0.017	0.018	-0.072	0.106	0.017	0.018	0.001	-0.074	0.104
ORG -> QAL	0.297	0.297	0.184	0.408	0.297	0.297	0.000	0.184	0.407
Variables M2a	Original Sample (O)	Sample Mean (M)	2.5%	97.5%	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
Economic -> Quality of Work Life	-0.005	-0.005	-0.102	0.094	-0.005	-0.005	0.000	-0.103	0.093
Environmental -> Quality of Work Life	0.120	0.120	0.015	0.226	0.120	0.120	0.000	0.016	0.226
Human Capital -> Economic	-0.122	-0.121	-0.227	-0.020	-0.122	-0.121	0.001	-0.229	-0.022
Human Capital -> Environmental	0.038	0.039	-0.061	0.140	0.038	0.039	0.001	-0.061	0.138
Human Capital -> Organizational	0.090	0.091	-0.002	0.184	0.090	0.091	0.001	-0.003	0.182
Human Capital -> Social	0.066	0.067	-0.053	0.188	0.066	0.067	0.001	-0.055	0.186
Organisational -> Quality of Work Life	0.034	0.034	-0.084	0.152	0.034	0.034	0.000	-0.084	0.152
Relational Capital -> Economic	0.379	0.380	0.270	0.489	0.379	0.380	0.001	0.267	0.486
Relational Capital -> Environmental	0.461	0.462	0.372	0.547	0.461	0.462	0.001	0.370	0.546
Relational Capital -> Organisational	0.522	0.522	0.438	0.599	0.522	0.522	0.000	0.434	0.596
Relational Capital -> Social	0.471	0.469	0.355	0.572	0.471	0.469	-0.001	0.358	0.574
Social -> Quality of Work Life	-0.047	-0.047	-0.158	0.066	-0.047	-0.047	0.001	-0.160	0.065
Structural Capital -> Economic	0.360	0.360	0.240	0.477	0.360	0.360	0.000	0.239	0.476
Structural Capital -> Environmental	0.266	0.265	0.156	0.370	0.266	0.265	-0.002	0.158	0.371
Structural Capital -> Organisational	0.241	0.241	0.139	0.345	0.241	0.241	0.000	0.140	0.345
Structural Capital -> Social	0.100	0.100	-0.024	0.228	0.100	0.100	0.001	-0.025	0.227

Source: Own elaboration.

Stage 2: Treatment of Models M1b and M2b. As the proposed model adopts a different nomological structure, as suggested in [98] after calculating the results of the first order model (Models M1a and M2a), the measurement model of the second order models needs to be tested (Models M1b and M2b). The second order constructs (intellectual capital and sustainable development) incorporate the respective score of the first order dimension produced by SmartPLS [96]. After this stage, the structural model can be estimated [103].

For the measurement model, the procedure is exactly as in Stage 1. Analysis of Table 7 confirms that all the values are within the established parameters (>0.70) or very close to that value. The same table presents the results of the analysis of internal consistency and reliability, as well as Cronbach’s alpha and AVE values. According to the literature of reference mentioned in Stage 1, all the values are within normality.

As for the heterotrait–monotrait (HTMT) ratio, the values are also within normality (see Tables 8 and 9).

Table 7. Measuring model (loadings, internal consistency and reliability, Dijkstra-Henseler indicator, composite reliability and AVE) of models M1b and M2b.

M1b						M2b					
Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	pc	AVE	Variable/ Indicator	Loading	Cronb. Alpha	Rho_A	Pc	AVE
IC		0.889	0.896	0.931	0.818	IC		0.879	0.890	0.925	0.805
HC	0.879					HC	0.876				
SC	0.926					SC	0.917				
RC	0.908					RC	0.897				
SD		0.858	0.870	0.903	0.700	SD		0.848	0.866	0.897	0.686
ECO	0.859					ECO	0.812				
ENV	0.823					ENV	0.853				
SOC	0.796					SOC	0.768				
ORG	0.869					ORG	0.876				
QAL	1.000	1.000	1.000	1.000	1.000	QAL	1.000	1.000	1.000	1.000	1.000

Source: Own elaboration.

Table 8. Heterotrait–monotrait (HTMT) ratio of models M1b and M2b.

M1b	IC	SD	QWL	M2b	IC	SD	QWL
IC				IC			
SD	0.887			SD	0.881		
QWL	0.282	0.259		QWL	0.070	0.100	

Source: Own elaboration.

Table 9. Heterotrait–monotrait (HTMT) ratio of models M1b and M2b using bootstrapping.

Variables M2a	Original Sample (O)	Sample Mean (M)	2.5%	97.5%	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
IC -> SD	0.786	0.786	0.752	0.817	0.786	0.786	0.000	0.750	0.816
SD -> QAL	0.245	0.246	0.175	0.315	0.245	0.246	0.001	0.172	0.312
Variables M2b	Original Sample (O)	Sample Mean (M)	2.5%	97.5%	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
IC -> SD	0.779	0.779	0.753	0.803	0.779	0.779	0.001	0.751	0.802
SD -> QWL	0.097	0.097	0.032	0.160	0.097	0.097	0.000	0.031	0.159

Source: Own elaboration.

With no formative indicators to analyse, the structural model is assessed below.

5.2. Assessment of the Structural Model

Primary assessment of the structural model is carried out considering two assessment criteria, namely the determination coefficient statistic (R^2), which measures the degree of model adjustment, and the statistical significances of the path coefficients [100,101]. As analysing structural equations through the PLS method consists of maximizing the value of the explained variance of the endogenous latent variables, the R^2 value of the constructs should present a high value [100,101].

Regarding the estimation of the effect size (f^2), according to [104] the reference values are: $0.02 \leq f^2 < 0.15$: small effect; $0.15 \leq f^2 < 0.35$: moderate effect; $f^2 \geq 0.35$: large effect.

The Stone–Geisser (Q^2) test is used as a criterion to measure the predictive relevance of the reflexive dependent constructs [105]. As in f^2 , values of 0.02, 0.15 and 0.35 indicate that an exogenous construction has small, moderate or large predictive relevance in a given endogenous construction.

Analysing the values presented in Table 10, the results confirm that the structural model of both models presents acceptable predictive relevance (R^2) for SD and weak for QAL and QWL, and that the values, also presented in this table for f^2 and Q^2 , are in accordance with the above-mentioned criteria.

Table 10. Determination coefficient (R^2), estimate of the size effects (f^2), and predictive relevance (Q^2) of models M1b and M2b.

Variables	R^2		f^2		Q^2	
	M1b	M2b	M1b	M2b	M1b	M2b
IC			1.617 ***	1.541 ***		
SD	0.618	0.606	0.064 **	0.009 *	0.403 ***	0.388 ***
QAL/QWL	0.060	0.009			0.054 *	0.008 *

Legend: * $0.02 \leq f^2/Q^2 < 0.15$: small. ** $0.15 \leq f^2/Q^2 < 0.35$: moderate *** $f^2/Q^2 \geq 0.35$: large. Source: Own elaboration.

Concerning the robustness of the path coefficients, the reference value is above 0.2 [103,106]. The observation of Table 11 reveals that all the coefficients present a value above 0.2, meaning that there is robustness in the relationships tested, except for SD -> QWAL ($p = 0.097$). Considering the estimated values of the coefficients and corresponding t values, there is good adjustment of the data used to estimate the model and test the hypotheses studied, in terms of structural relations. The final models are presented in Figure 3.

Table 11. Robustness of the coefficients and level of significance of the structural relations of models M1b and M2b.

Structural Relations	Estimated Value		Sample Mean		Standard Deviation		t-Value	
	M1b	M2b	M1b	M2b	M1b	M2b	M1b	M2b
H_1 : IC -> SD	0.786 †	0.779 †	0.786	0.779	0.017	0.015	47.328 ***	51.124 ***
H_2/H_3 : SD -> QAL/QWAL	0.245 †	0.097	0.246	0.097	0.036	0.039	6.804 ***	2.473 **

Legend: † = Robustness of the coefficient because the value obtained is above 0.2. ** = level of significance 5% (>1.96) *** = level of significance 1% (≥ 2.58). Source: Own elaboration.

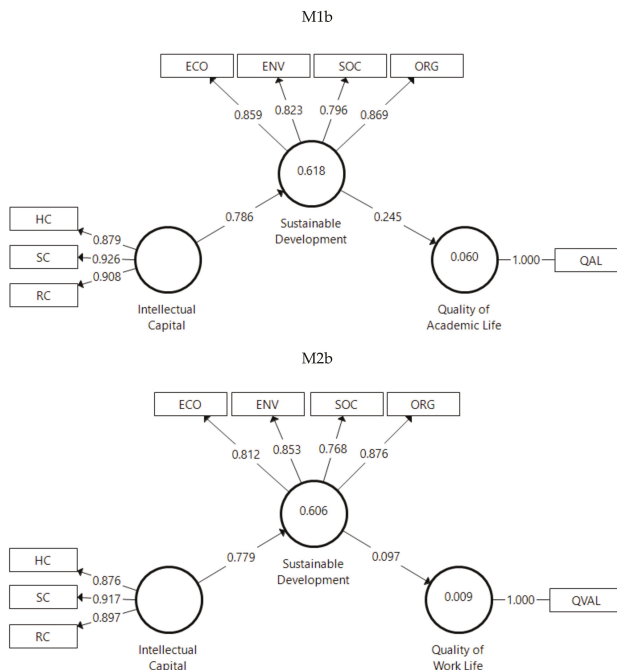


Figure 3. Complete final structural models of M1b and M2b, and the respective weights and loadings. Source: Own elaboration.

5.3. Contrasting Literature and Empirical Findings

Regarding hypothesis 1, HEIs' IC has a direct and positive influence on HEIs' SD practices, and so this hypothesis is not rejected in either model (M1: 0.786; and M2: 0.779). Indeed, HEIs' IC is found to promote SD through the different dimensions of sustainability studied (economic, environmental, social and organisational), which is in line with the global idea proposed in [8] that HEIs are agents of change for sustainability, being associated with the pressing challenges society faces related to accelerated environmental changes, the shortage of resources, increased inequality and injustice, as well as rapid technological change and social change. These results are also in line with other studies [24,25] that recognised HEIs' IC as essential in promoting SD, with examples of SD practices in environmental, economic, social and organisational dimensions being integrated into activities related to education, research, operations, social involvement and governance/culture worldwide [26].

Concerning the dimensions of IC, these are very balanced, finding a higher value in both models for SC (M1: 0.926; and M2: 0.917). The perception of SC, linked essentially to physical structures and the campus, seems to be the one both students and teachers/researchers give most importance to. This result coincides with those of other authors, e.g., [107], for whom SC is the most important part of IC because it serves as a vehicle to convert staff's personal knowledge into value. In addition, HC has the lowest value (M1: 0.879 and M2: 0.876). This difference, and also considering that the HC indicators presented the greatest problems in the models, with some of them being withdrawn, can mean that neither students nor teachers/researchers may be sufficiently well informed about their HEI's human resource system, and there may be inefficient management of these resources if it does not reveal their importance and staff's competences for the institution's good functioning.

As for the dimensions of SD, these results are in line with the state of the art, e.g., [10,22], which shows that the SD concept is associated equally with HEIs' practices of economic, environmental, social and organisational sustainability. Strangely, the social dimension, for both students and teachers/researchers, is the least robust one (M1: 0.796 and M2: 0.768), although positive and quite significant. Recovering [10], which found that Portuguese HEIs are mainly engaged in the social dimension of SD practices, contradicts the result obtained here somewhat, inasmuch as this study was made considering the perception of students and teachers/researchers. Perhaps HEIs are not sending out the right image in relation to the social dimension and/or respondents are giving greater importance to the other dimensions. This fact may be associated with the SD practices still in phases closely linked to planning, as previously advocated in [45].

Regarding hypothesis 2, according to which SD practices in HEIs have a direct and positive influence on students' QAL, this was not rejected either (M1b: 0.245). There is evidence for the presence of SD practices in HEIs that interact in students' lives, inasmuch as they are perceived by the latter and are part of their concerns. As mentioned by [46], sustainable behaviours contribute to quality of life in more instances than expected and students' perceptions of the dimensions associated with SD practices are very important for them to feel secure in both the present and future. These results strengthen the idea that SD practices are related to QAL, through the satisfaction with the experiences that create positive emotions in the context of university life experienced by students [62–68]. These satisfaction can be observed, as mentioned by [50], through several improvements in the campus environment (noise reduction, less use of paper, recycling campaigns, etc.), and in this way HEIs can contribute to greater satisfaction among students.

Concerning the result found for hypothesis 3, HEIs' SD practices have a direct and positive influence on the QWL of teachers/researchers. Despite this influence being positive and significant, for a 5% level reason the associated hypothesis is rejected. This result partially contradicts some authors, e.g., [46], who argued that SD affects QoL. Bearing in mind that QWL is a more specific construct, related to needs for satisfaction in the workplace, and not in a general way, this analogy must be done carefully because more evidence found in the HEI work context is needed.

The difference found between hypothesis 2 and hypothesis 3 sheds new light on the interesting fact that young people are more aware of, and perhaps more concerned about, matters related

to sustainability, and consequently about the future, compared to what is found in teachers' and researchers' perceptions. Therefore, the formers' perception of what is done in relation to SD in their HEI is revealed to be greater.

All in all, the results now obtained can be applied to the practice by HEIs managers through more visible sustainable efforts, building bridges within HEIs between IC, SD and QoL that will lead stakeholders to recognise the institution's sustainability efforts. For this they need, as mentioned in [23], to generate new ideas, to engage the HEIs' human resources in sustainability, promoting a better QoL, to create a baseline for continuous improvement, to inform strategic planning and budgeting, to integrate sustainability into the curriculum, to make real progress towards sustainability, and to be part of a global community involved in sustainability purposes.

6. Concluding Remarks and Future Research

This paper focuses on the influence of HEIs' IC (HC, SC, RC) on HEIs' SD, and on the influence of HEIs' SD on stakeholders' QoL (QAL of students and QWL of teachers/researchers), formulating three hypotheses for test purposes. To respond to the proposed objectives, after determining the state-of-the-art, a quantitative analysis was performed by collecting primary data and using a structural equation model and the PLS method. SEM-PLS supported two of the three previously formulated hypotheses.

The results obtained are important contributions to the literature on IC through the ratification of new evidences for theory, as they confirm empirically that, firstly, a positive and significant relationship exists between HEIs' IC and HEIs' SD, and secondly, a positive and significant relationship exists between HEIs' SD and students' QAL. Regarding the influence of HEIs' SD on teachers/researchers' QWL, no empirical evidence was found of a robust relationship between these two constructs, suggesting there may be other variables that are not being considered and which could possibly change this result, and so new, more thorough research in this field is suggested. Therefore, this type of relationship, never before studied, opens new theoretical horizons and new perspectives for further study and research in this area. The results indicate that IC (HC, SC and RC) has a positive and significant influence on HEIs' (economic, environmental, social and organisational) SD, since hypothesis 1 was not rejected in either model. That is, through the perception that students and teachers/researchers have of the IC and SD of their HEI, it is concluded that IC is directly and positively related to that institution's SD. These results are consistent with previous evidence [7]. HEIs should approach their IC as a whole, since all dimensions are revealed to be important. However, attention is drawn to the fact that HC is the one where there may be more room for improvement, since it had least weight in IC. Considering the results obtained in this study, for IC to produce an even greater impact on SD, HEIs should create and implement strategies towards continuous improvement of their human resources, as by devoting more attention to their human resources they can have greater empowerment and thereby influence HEIs' SD even more. This conclusion ratifies [108], which stated that human capital is an indicator of value creation that can be used to help formulate organisational strategy, provide a basis for evaluation and allocate some resources in the HEI context.

The results of this study are also in line with the previous concluding remarks found in [10], who revealed that Portuguese HEIs are beginning to give relevance to all the dimensions of SD and include them in their strategic plans, communication strategies and various policies. Nevertheless, it stands out that the social dimension has the lowest value (M1: 0.796 and M2: 0.768), and there may be room for a better positioning of HEIs through better and more proficient social engagement, as mentioned in [10], oriented towards the increasingly urgent challenges of sustainability, associated with rapid change and increased complexity and social unrest.

As for the relationship between HEIs' sustainability and QoL, there is evidence of its existence, supported by finding a positive and significant relationship between HEIs' SD and QAL. It is, therefore, underlined that HEIs have a fundamental role in promoting SD and their leaders' efforts are vital in achieving the goals associated with SD. HEIs must recognise their importance and responsibility,

not only in terms of pro-sustainability education but also by including measures of SD that have repercussions for the QoL of their stakeholders and that of the region's population and the country. As demonstrated in several studies, notably in the Spanish context, e.g., [31], it is important to develop policy statements, in order to increase sustainability practices in Portuguese HEIs [10].

HEIs should pay attention to how they manage their IC, creating value not only for the institution itself through the contribution to SD but also creating value for the QoL of their students and teachers/researchers, developing these points that may possibly be more connected to the latter's QWL. In addition, the efforts of HEI leaders should focus on achieving SD goals, and the actions promoted by these institutions should be in line with the perceptions of all their stakeholders.

Referred to as an implication, given the importance of transforming the education institution as a whole, the priority action areas undergo transformations at the level of information, because more and better information should be given about what happens in SD practices in HEIs, providing information which is accessible to all. However, and from the results obtained, perception is seen to be different depending on the stakeholder, and so SD practices should be monitored on a regular basis and the reports should be provided in such a way that everyone understands their content, using simple and accessible language. As noted by UNESCO [13], education institutions are encouraged to implement sustainability strategies and plans with institution-wide approaches, taking into account some key elements such as inter-institutional networks that facilitate mutual support, such as peer-to-peer learning on a whole-institution scale, and increase the visibility of the approach to promote it as a role model for change and adaptation.

This study also provides practical implications for stakeholders: (i) HEIs must satisfy students' needs and emotions, fostering QAL through a better engagement in sustainability activities, by integrating sustainability into the academic curriculum, and by giving more information at a higher quality about what is happening within the HEI concerning SD; and (ii) HEIs must develop some support infrastructures that allow managers to track which sustainability satisfaction needs (QWL) teachers/researchers may have, so that institutions can develop strategies leading to SD while enhancing human resources' satisfaction needs within the employer institution. For example, those needs may be related to social responsibility, and so can be addressed through the greater dissemination of the activities that the institution develops and/or intends to develop, and through specific educational training, that can contribute to both personal enrichment and a greater competence in knowledge transfer to their peers and/or students.

Regarding the limitations of this study, firstly the fact that various indicators from the initial model were eliminated, especially concerning HC, and this elimination may have limited our results. However, despite this, the final model presented very significant and conclusive results, allowing for very useful conclusions to be drawn and the non-rejection of two research hypotheses.

Secondly, the sample was confined to Portuguese HEIs and, therefore, these results cannot be generalized to HEIs in other countries.

Another aspect associated to the representativeness is the fact that the sample is related only to public university education. As Portugal has public and private HEIs and a binary system, as mentioned before, it would be worthwhile to have selected private HEIs and the polytechnic institutions. Therefore, representativeness is limited, and the results of the study cannot be generalized to the entire Portuguese higher education system. Nevertheless, based on the Portuguese public university education system, the sample was representative of the reality under study, since each institution was located in a different region at the NUTS II level.

Thirdly, HEI stakeholders were represented by only students and teachers/researchers. However, in studies made in other HEIs, the top management and/or leadership are almost always the ones surveyed.

As mentioned, the difference in the results found for QAL and QWL is a serious, sustained warning based on new empirical evidence, that young people are more aware of issues related to sustainability than teachers and researchers, since the former denote an high level of perception concerning sustainability issues, due to previous engagement in education programmes, which raised

their social consciousness on the need for change and addressing sustainability issues associated with climate change, social inequality and common well-being, which they tend to value as change mechanisms that can contribute to improving their quality of life, including the academic context and society as a whole. Here, the age factor may have some relevance, in that young people have been found to show greater concern about sustainability and the future of the planet. Nevertheless, the role attributable to pro-sustainability education from an early age can no longer be ignored, including the economic, social, environmental and organisational dimensions, as this can make all the difference in the inter-related cycles of learning and performance throughout life.

With this final motivation, a window of opportunity opens to make future comparative studies based on the age factor and pro-sustainability education factor, since we believe that both can be determinant for the development of successful SD practices, in the HEI context in particular, and society in general. Future research avenues can be explored by developing studies focusing especially on HC, aiming to test disaggregated measures and indicators of this critical asset. Adding to this, cross-country comparisons are suggested in light of the whole-institution approach, in order to assess the role played by “organisational inertia”, in terms of potential resistance to change involving the adoption of a whole-institution sustainability vision and the implementation of SD practices at the institutional level. It would be also of interest to deepen the scarce knowledge on IC in HEIs by contrasting the perceptions of the governance board and the students concerning the different activities of this type of knowledge institution, which play a significant role in educating proactive citizens regarding sustainable development and quality of life, with a clear vision of social impact.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/12/2/479/s1>, Table S1. List of constructs and respective indicators referring to models 1 and 2.

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Article

‘A Nut We Have Officially yet to Crack’: Forcing the Attention of Athletic Departments Toward Sustainability Through Shared Governance

Martin Barrett ^{1,*}, Kyle S. Bunds ², Jonathan M. Casper ², Michael B. Edwards ²,
D. Scott Showalter ³ and Gareth J. Jones ⁴

¹ Department of Kinesiology and Recreation, Frostburg State University, Frostburg, MD 21532, USA

² Department of Parks, Recreation and Tourism Management, North Carolina State University, Raleigh, NC 27695, USA; ksunds@ncsu.edu (K.S.B.); jmcasper@ncsu.edu (J.M.C.); mbedward@ncsu.edu (M.B.E.)

³ Poole College of Management, North Carolina State University, Raleigh, NC 27695, USA; dsshowal@ncsu.edu

⁴ School of Sport, Tourism and Hospitality Management, Temple University, Philadelphia, PA 19122, USA; gareth.jones@temple.edu

* Correspondence: mbarrett@frostburg.edu

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Abstract: In many ways, intercollegiate athletics represents the ‘sustainable’ front porch of higher education. The high-visibility, high-impact nature of elite-level college athletics make athletic departments a central player in the sustainable development journey. However, not all athletic departments respond to this responsibility, nor are all responses uniformly successful. According to national reporting frameworks, an increasing number of universities in the United States are choosing to involve their athletic departments in university-level sustainability governance structures, but the benefits and limitations of this remain unclear. Using the theory of loosely coupled systems, and more specifically, the voice of compensations (which views loose coupling as an unsatisfactory state), the purpose of this paper is to explore perceptions of athletic department engagement in shared sustainability governance, and, thus, a whole-of-institution approach. Semi-structured interviews with sustainability office personnel were conducted and analyzed, and the findings imply that shared sustainability governance has the potential to focus the attention of athletic departments toward sustainability, as well as to reaffirm shared values. Yet, to maximize the impact of athletic departments toward the sustainable development goals of a university, sustainability office personnel suggest the deployment of additional change levers, in a multi-dimensional fashion, as supplementary coupling mechanisms. These would include more rigorous sustainability goals (top-down), continued collaboration on ‘low-hanging fruit’ initiatives (lateral), student-athlete engagement (bottom-up), and the development of an internal sustainability framework (inside-out).

Keywords: athletic departments; higher education; sustainability; loose coupling; shared governance; United States

1. Introduction

Executing strategy in universities is a complex matter, as the institutions themselves are likened to “multi-headed monsters, each with unique recipes for success” [1] (p. 28). Moreover, basic units within universities have fairly independent decision-making power over their activities [2], and freedom to self-determine policies and priorities [3]. In essence, complex organizations like universities display varying levels of coupling across a number of domains where interdependent elements vary in the number and strength of their interdependencies [4]. In fact, formal structures in educational

organizations are understood as being decoupled from technical activities and outcomes as a means of maintaining support in a pluralistic environment [5]. Accordingly, some decisions in universities requiring specialized expertise (e.g., teaching and research) can only be made by individual professors, while others can come from central administrators as well as from collective and interactive processes [6]. Unsurprisingly, an extensive body of literature in higher education has focused on the contentious relationships between university administrators and faculty [7–10].

As an alternative and more contemporary example of coupling in United States higher education, a number of scholars note the widening financial and strategic chasm between universities and intercollegiate athletic departments [11–14]. For example, on one hand, universities who compete at the highest level of intercollegiate athletic competition regard their athletic departments as “‘auxiliary activities’, responsible for generating most of the revenue to cover their costs through ticket sales, licensing, and broadcasting contracts” [15] (p. 87). On the other hand, five out of every six of the top athletic departments successfully secure scarce general funding to intercollegiate sports through student fees [16]. On one hand, the very nature of intercollegiate athletics means athletic departments embody values and work towards goals that are different from academic units [15]. On the other hand, administrators leverage athletic programs to serve as the highly visible ‘front porch’ of universities [17]. Such antagonistic examples depict what Orton and Weick [4] define as a loosely coupled, rather than decoupled, context. As such, athletic departments, for all of their perceived autonomy, simultaneously demonstrate responsiveness and distinctiveness with the university writ large across multiple domains.

In the sustainability domain, previous empirical work has supported the willingness of athletic departments to prioritize [18,19] and adopt greener practices [20]. This greening movement within intercollegiate athletics follows an increasing number of universities worldwide that are recognizing the importance of sustainable development [1,21] and aligning themselves with the principles of sustainability [22]. As such, sustainability in intercollegiate athletics demonstrates a level of responsiveness with the university more generally. Conversely, athletic departments are also utilizing their unique resources, such as high profile status and marketing platforms [18], to develop a more distinctive approach to sustainability efforts in comparison with other university departments and units. As a result, the simultaneous responsiveness and distinctiveness of athletic department sustainability action implies that the university–athletics relationship is, again, loosely coupled.

Loose coupling is often perceived as an unsatisfactory state that must be reversed, and this perspective is referred to as the voice of compensations [4]. In terms of corporate social responsibility more generally, Asif, Searcy, Zutshi, and Fisscher [23] suggest that managing stakeholder interests in isolation places pressure on organizational resources (e.g., personnel, time, and money), and leads to an ineffective use of such resources. Therefore, sustainability delivery is most effective within functionally integrative organizational structures [24], or tightly coupled systems. To compensate more generally for a lack of integration, calls for greater accountability in higher education have facilitated a move toward tight coupling and narrow control [25], which has been accompanied by frequent shifts in governance arrangements [26]. In the sustainability domain, it is at the organizational level where the charge is to create and establish campus-wide policies, objectives, and targets as well as prove the main decision-making function [27], and, thus, compensate for the lack of integration across the institution as a whole. To this end, Adams [28] puts forward a framework for managing sustainability in higher education, and these governance arrangements include a number of essential elements, including an empowered senior person responsible for sustainability, and a collaborative approach across senior leaders.

Athletic departments look to compensate for a lack of a coordinated and organized approach to sustainability through the creation of cross-functional ‘green teams’ [18,19,29,30]. Green teams are voluntary and formal collaborative arrangements between relevant internal and external stakeholders that can help advance an organization’s sustainability initiatives [30]. Moreover, a green team is a planning and policy making team whose impact extends into organization operations and the external world of its stakeholders [29]. However, previous research suggests the capacity in which athletic

departments serve on green teams as well as the exact mission of these teams remains unclear [18]. To date, there is a scarcity of research focusing on athletic department involvement, specifically in university-level sustainability planning and coordination. As a result, an opportunity exists to understand the perceived benefits of athletic department contributions to shared governance models.

The purpose of this study is to describe athletic department involvement in shared sustainability governance. Furthermore, the purpose of this study is supported by two specific research questions:

Research Question 1. *How are universities forcing the attention of athletic departments toward sustainability through engagement in shared sustainability governance?*

Research Question 2. *How is athletic department engagement in shared sustainability governance compensating for loose coupling with the university overall?*

Accordingly, this study examines sustainability governance at universities across the United States through semi-structured interviews with sustainability office personnel. The result is a better understanding of how governance mechanisms compensate for the loose coupling between athletic departments and the wider university system. The remainder of this paper is organized as follows. First, the context and background of strategic sustainability management in higher education and intercollegiate athletics is summarized. Then, the theoretical foundations are built through the perspective of loosely coupled systems and the role of shared governance as a coupling mechanism. The methods are then explained before a combined findings and discussion section is presented. Finally, the study concludes with practical implications and suggestions for future research.

2. Research Context

2.1. Sustainability Management in Higher Education

Universities are integrating sustainability as a core strategic principle across campuses [31] through the development and implementation of comprehensive plans for setting sustainability goals [32]. Arguably, this strategic commitment began in 2006, when 12 college and university presidents initiated the American College and University Presidents' Climate Commitment (ACUPCC) [33]. The ACUPCC ignited a sustainability movement with 400 schools making the commitment in the initial period of charter membership between December 2006 and September 2007 [34]. The commitment itself made clear the role higher education has in leading climate and sustainability action for the sake of students and society [33].

Universities and colleges have since taken significant green strides in demonstrating sustainability in practice, thanks in part to the 2008 Higher Education Sustainability Act and the establishment of the University Sustainability Grants Program [35]. More recently, the Association for the Advancement of Sustainability in Higher Education (AASHE), through their 2018 annual conference titled 'Global Goals: Rising to the Challenge', began championing the critical role higher education must play in achieving the United Nations Sustainable Development Goals. Accordingly, the role of universities in advancing sustainability is twofold: as an institution that needs to be changed and/or as a potential change agent [36]. For example, universities are adopting a number of infrastructural and operational business practices to reduce their ecological footprint. Such efforts include waste management strategies like recycling and composting [37] and the reduction of greenhouse gas emissions [38]. Additionally, universities are operationalizing their potential as sustainability change agents by integrating sustainability into the curriculum, student and faculty life, and the wider community [39]. However, in higher education's twofold sustainability responsibility, a tendency exists for universities to focus more so on how higher education can change internally [36]. Dyer and Dyer [40] claim this tendency is reinforced by the ACUPCC, which creates a framework wherein institutions commit to future successes in the form of climate neutrality, then backcast to the present before creating plans to move toward the desired future state. Salviono, Franzoni, and Casnna [41] consider university governance with such a limited propensity towards sustainability as an inefficient condition to promote

change. In fact, while universities recognize their role in leading societal change toward a more sustainable world, many have not implemented whole-institution change [42].

To address limitations in university sustainability strategy, a number of frameworks exist to encourage best practice approaches to sustainability management in the higher education context. Adams [28] put forward a framework for managing sustainability in universities that includes a number of essential and desired elements. Among the essential elements are the visible support of a president/vice-chancellor and governing body, pro-active senior leadership, an empowered senior person responsible for sustainability, and a collaborative approach across senior leaders. Additional desirable elements in Adams' framework include an advisory board of external expertise, policies that incorporate sustainability, a stakeholder engagement strategy, and alignment with existing national quality frameworks. Epstein's [43] Corporate Sustainability Model considers drivers of sustainability performance (inputs), actions managers can take to affect performance (processes), and consequences of those actions (outputs). In terms of managerial actions, Epstein advocates the importance of committed leadership, strategy development, organizational design that embeds sustainability across all units, and the alignment of systems to coordinate activities and motivate employees. Such frameworks are warranted due to the proliferation of strategic approaches to sustainability at the university level, which is evidenced through emerging green campus indexes like The Princeton Review's 'Top 50 Green Colleges' and the Sierra Club's 'Cool Schools' ranking for the greenest colleges and universities.

2.2. Sustainability Management in Intercollegiate Athletics

In intercollegiate athletics, sustainability decision-making is highly differentiated between institutions. At the lower levels of intercollegiate athletic competition (i.e., Division III), sustainability decision-making is a function of an athletic director [19], whereas, at the elite level (Division I), decision-making occurs predominantly through associate athletic directors [18]. Yet, athletic department personnel can lack the environmental skills or training to make effective decisions [44], which necessitates a process of resource exchange in order for athletic departments to, at least, initiate sustainability projects. Often, and without a direct mandate from a higher administrative power, collaborative relationships develop through outreach from sustainability office personnel to the athletic department [44]. Such collaborative efforts are particularly effective in developing sustainability initiatives focusing on public external events (e.g., tailgate and facility/stadium recycling) [44]. Accordingly, not only are athletic departments somewhat reactive in their commitment to sustainability, but these collaborative efforts are predicated on interpersonal relationships as opposed to institutional commitments.

Where athletic departments are involved in structures beyond dyadic interpersonal ties (e.g., in green teams), the scope and remit of these groups show considerable variation. For example, of the two athletic departments involved in environmental committees in the Pfahl, Casper, Trendafilova, McCullough, and Nguyen [44] study, one is involved in a working group that "makes recommendations that are then filtered up to the athletics administration" (p. 40) and the other is a higher-level council comprising 20–25 campus units. Such variation is likely pervasive across the higher education sector. Casper, Pfahl, and McSherry [18] found 41% of Division I institutions had athletic department representation on campus-wide sustainability teams, while Casper and Pfahl [19] found 28% of Division III institutions with similar involvement. Nevertheless, McCullough et al. [30] suggest that green teams provide a bridge with university-wide goals through formal, joint decision-making processes.

3. Theoretical Background

3.1. Loosely Coupled Systems

Any location in an organization, be it a department, unit, office, or working group, contains interdependent elements that vary in the number and strength of their interdependencies [4]. Moreover, these interdependent elements represent shared variables that influence the degree of interaction, or

coupling, between specific locations within an organization or broader systems [45]. In other words, coupling refers to “the degree to which events within one part of a system are felt by other parts of that system” [46] (p. 245). Glassman [45] suggests that with coupling, two qualifying variables are necessary. First, coupling requires time to be isolated as a special variable, as any judgment on an organization or system is relevant only during a given interval of time. Second, provision must be made for the presence of interactions between variables of varying strengths. So, as opposed to being a dichotomizing concept, coupling has the flexibility to reflect complexity of organizations as living systems. For example, Orton and Weick [4] suggest that organizations can be tightly coupled (i.e., where they demonstrate responsiveness without distinctiveness), decoupled (i.e., where they demonstrate distinctiveness without responsiveness), or loosely coupled (i.e., where they demonstrate distinctiveness and responsiveness simultaneously).

Loose coupling allows organizations to “follow their idiosyncratic learning processes while retaining some degree of responsiveness” [47] (p. 1028). Importantly, Weick [48] presents educational organizations as loosely coupled exemplars and, in doing so, demonstrates the process by which soft structures guide the loose assemblages of diverse educational organizations (e.g., schools) to develop similar meanings across time. Specifically, Weick [48] depicts the relationship between a counselor’s office and the principal’s office, both of which retain some level of identity and separateness, but remain attached under the overarching umbrella of the school. Yet, Goldspink [49] suggests that educational reform within a loosely coupled context is incompatible with formal or bureaucratic control, and that different forms of management are necessary to realize their distinct advantages. As a result, higher education experiences frequent shifts in governance arrangements, including the reshuffling of authority and responsibilities [26]. In the context of United States higher education, calls for more accountability have contributed to a move toward tight coupling with narrow control [25].

The main advantage of loose coupling as a durable concept is summarized by Orton and Weick [4] in the following passage:

... loose coupling allows theorists to posit that any system, in an organizational location, can act on both a technical level, which is closed to outside forces (coupling produces stability), and an institutional level, which is open to outside forces (looseness produces flexibility).
(p. 205)

However, Orton and Weick [10] suggest that the application of loose coupling is often confused. Specifically, organizational theorists succumb to not distinguishing between dialectical interpretation (i.e., based on the degrees of responsiveness and distinctiveness, organizations are either non-coupled, tightly coupled, or loosely coupled) and the unidimensional interpretation of loose coupling (i.e., loose coupling is the end point of a sliding scale between tightly coupled and loosely coupled).

3.2. Shared Governance as a Compensation for Loose Coupling

In response to the varied use of the concept, Orton and Weick [4] present a reconceptualization of loose coupling by identifying five distinct voices in the related literature. The voice of compensation suggests that loose coupling is an unsatisfactory condition that should be reversed [4]. Tierney and Minor [50] suggest attempts to tighten loose coupling within university settings centered around effective governance. Therefore, using a voice of compensation, governance arrangements present an opportunity to rectify loose coupling as an unsatisfactory condition through enhanced leadership, focused attention, and shared values [4]. Specifically, Orton and Weick [4] refer to the role of leadership (strong or subtle) in unifying goals, the role of targets in focusing attention, and the role of reaffirming shared values in rectifying losses in control.

Governance gives overall direction to an organization, and oversees and controls management actions through accountability and regulation [51]. As such, shared governance allows various groups of people a share in these key decision-making processes [52]. Shared governance also allows certain groups to exercise primary responsibility for specific areas of decision-making [52]. According to

Lechuga [53], shared governance is a unique characteristic of the United States higher education system. Cramer and Mozlin [54] suggest the modern roots of shared governance in higher education stem back to the 1966 Joint Statement on Government of Colleges and Universities. More specifically, the joint statement defines the main campus constituents as the governing board members, administrators, faculty members, students, and other persons. Therefore, shared governance in higher education refers to the structures and processes through which these constituents participate in the development of policies, and in decision-making that affects the institution [55]. Bejou and Bejou [56] offer a similar definition and suggest that shared governance must focus on informed decision-making, transparency, and open lines of communication between and among all components of the university community, while highlighting the important need for accountability, mutual respect, and trust within this participatory system.

Lapworth [57] claims models of shared governance fall under one of two categories: corporate models, with a focus on governing bodies, and consensual models, which focus on the roles of others. Alternatively, Yanko, Hardt, and Bradstock [58] have identified four different models of shared governance: unit-based, councilor, administrative, and congressional (see Figure 1). In unit-based shared governance models, each unit establishes its own system, which therein creates multiple models within a single institution. In councilor models of shared governance, a coordinating council directs activities on a more aggregate, departmental level, and the unit councils replicate the coordinating council structure. In congressional models of shared governance, all staff belong to a congress, which draws direct comparisons to the federal government. Furthermore, in congressional models of shared governance, committees submit work to a ‘cabinet’ for approval. Finally, in administrative models of shared governance, separate practice and management structures exist, and a forum integrates the work of the councils overseeing these parallel structures.

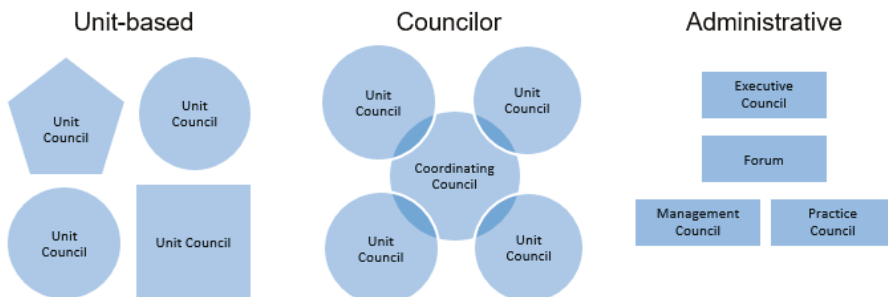


Figure 1. Models of shared governance (adapted from Yanko et al. [58]).

Importantly, models of shared governance operate at different organizational levels, which influences extent of authority, decision-making, and participation [59]. Unit-based governance, intuitively, operates at the unit level. The unit level does, however, hold different meanings across varying organizational contexts. For example, for an institution such as a university or college, the unit can often denote the department, as opposed to an institution such as a hospital where the unit can be interpreted as a functional area or team. Yet, when governance is restricted to the unit-based level it is incompletely shared [60]. Alternatively, councilor and administrative models of shared governance operate at a more organizational level. Specifically within the context of higher education, it is at the organizational level where the charge is to create and establish campus-wide policies, objectives, and targets as well as to prove the main decision-making function [27]. The challenge with shared governance models is that organizations are complex and dynamic, which means that for these models to be effective they need to be diverse and flexible where individual institutions can adopt models to suit their character and needs [57].

Evidence exists to support the effectiveness of shared governance across various settings. Generally speaking, shared governance can reduce information asymmetry [61], promote a common understanding of goals, help prevent misunderstandings [62], and assist in coordinating goals and skills between partners [63]. Additionally, Bstieler, Hemmert, and Barczak [64] suggest that shared governance can be a bonding mechanism that helps partners to adapt to new circumstances—for instance, in the context of this study, an emerging organizational priority such as sustainability. In the context of nursing, which is where much of the literature of shared governance exists, outcomes of moving to a governance model include improved financial performance, employee satisfaction, and retention [65]. For university–industry partnerships, evidence points to the importance of shared governance and intellectual property policies as significant facilitators of trusting relationships and successful outcomes [66]. Moreover, Bstieler et al. [63] interpret trust formation as an outcome of parties collectively working through challenges, negotiating mutual adaptations, and making project-related decisions.

Considering how sustainability delivery is most effective within functionally integrative organizational structures [24], an opportunity exists to deductively combine the theory of loosely coupled systems and the concept of shared governance in the context of higher education sustainability. Adams' [28] framework for managing sustainability in universities posits effective sustainability integration as an outcome of a collaborative approach. Adams' framework also posits effective sustainability integration as dependent on the senior person responsibility for sustainability being empowered to lead. The juxtaposition of a collaborative approach with the empowerment of individuals to make decisions renders Adams' framework consistent with how Olson [52] understands the role of shared governance in decision-making. Together, shared governance and effective sustainability integration provide a relevant analytical framework to understand the exact types of sustainability governance structures to which athletic departments are involved. Shared governance also yields a number of benefits such as reducing asymmetry [61], promoting common understanding [62], and facilitating coordination [63], which are all means by which systems become increasingly coupled. Therefore, in understanding shared governance as a compensation for loose coupling, these concepts offer a basis for analyzing the benefits of involving athletic departments in such structures.

4. Methods

4.1. Research Design

This study applied a descriptive research design to establish a “relatively concrete description” [67] (p. 1) of athletic department involvement in organizational-level models of shared sustainability governance. The uncertainty surrounding athletic department involvement in models of shared governance beyond the unit level justified a descriptive research design with the multi-faceted goal of describing situations and events, examining why patterns in these situations and events exist, and determining what these patterns imply [68]. Participant interviews were used as the primary research method. Specifically, the participant interviews followed a semi-structured format, which allowed for interviews to cover the same topics along with some flexibility to probe other related topics [69]. The semi-structured interviews enabled the elicitation of subjective experiences relating to athletic department involvement in shared sustainability governance.

4.2. Study Population

For this study, the population comprised degree-granting institutions in the United States committed to advancing sustainability, which also included a National Collegiate Athletic Association (NCAA)-affiliated athletic program. To access this population, sampling was restricted to universities participating in the AASHE Sustainability Tracking, Assessment and Rating System (STARS), which is a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. Furthermore, STARS is considered “the singular consensus-based tool for use by colleges

and universities" [70] (p. 100), and all completed reports are publicly accessible online. In December 2018, at the time of sampling, 228 universities out of a total of 1027 active STARS participants met the inclusion criterion of having an active report at the Bronze level or higher and a NCAA affiliated athletic program. A further review of STARS reports identified the number of universities who involve their athletic departments in organizational-level models of shared sustainability governance. Specifically, involvement was understood through responses within the 'PA-1: Sustainability Coordination' credit category where universities were asked to list sustainability committee members, to which a total of 32 institutions emerged. Figure 2 outlines the steps taken to arrive at a target population. [71]

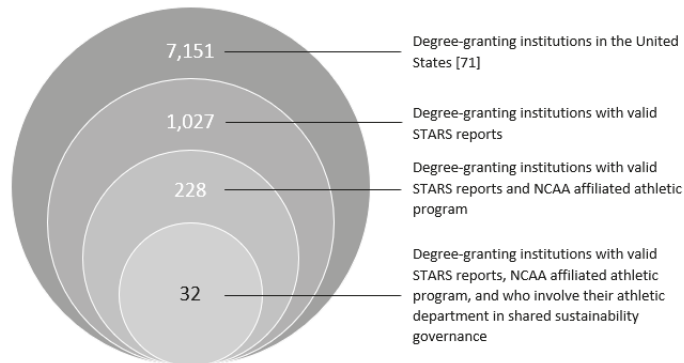


Figure 2. Target Population.

Furthermore, the target population included a majority of public institutions (22 public and 10 private) with NCAA Division I athletic programs (28 Division I, two Division II, and two Division III) and STARS certification at the Gold level (19 Gold and 13 Silver).

4.3. Data Collection

Semi-structured interviews were conducted with university sustainability personnel from 12 of the 32 universities identified in the target population. The sample of 12 universities was approximately representative of the target population with a majority of public institutions (10 public and two private), NCAA Division I athletic programs (11 Division I and one Division II), and STARS certification at the Gold level (seven Gold and five Silver). The institutions were sampled using non-specific emphasis with an opportunistic strategy [72]. First, the researchers took advantage of the network of sustainability practitioners at their host institution and sought participants by asking these practitioners to facilitate introductions with peers at institutions within the target population, which yielded five research participants. Second, the researchers made contact with all of the remaining institutions by phone or e-mail with a view to securing additional research participants. The recruitment of research participants conformed to a number of protective principles, which were vetted by the institutional review board at the lead author's host institution, including the right to participate and cease participation, the full disclosure of the study context, and the right to privacy [73]. Ultimately, the sample of 12 enabled a point of data saturation in which the ability to obtain additional new information was attained [74].

The justification for using sustainability office personnel as interview participations was based on their knowledge of and experience with the phenomenon of interest [75]. Specifically, the frequent interactions of sustainability office personnel with shared sustainability governance furnished them with the subjective knowledge from which to construct a descriptive understanding of the situation. While 12 institutions were sampled, 13 participants agreeing to be interviewed (i.e., two representatives from the same institution agreed to participate in a joint interview). Of these 13 participants, seven held positions at the director level, three at the coordinator level, one at the manager level, one at the officer level, and one held a title of assistant to a senior administrative officer. Interviews were

conducted via telephone and lasted on average 25 minutes each. All interviews were conducted over a four-week period across the months of February and March 2019.

The interview guide was developed using the literature on sustainability management in higher education, loosely coupled systems, and shared governance. Specifically, the interview guide was separated into two parts in line with the two research questions. For example, the essential and desired elements of Adams' [28] framework for managing sustainability in higher education guided a number of questions in the interview guide relating to exactly what structures athletic departments were engaged in. Similarly, the benefits of shared governance (see [48–51]) guided the questions relating to how the interview participations perceived athletics to benefit from engagement in shared sustainability governance structures, which were also framed using the voice of compensations [4]. As such, the interview guide made use of direct and indirect questioning. The use of indirect questioning was seen as a key strategy for ensuring data credibility through informant honesty [76], which helped mitigate the effects of social desirability bias [77] by asking the participants (sustainability office personnel) to respond from the perspective of another group (athletic department). Furthermore, credibility was sought through a process of early familiarity with the culture of participating organizations [76], which included a broader review of each institution's STARS report and other relevant strategic documents posted online.

4.4. Data Analysis

Interviews were transcribed by the researchers and converted to a text format, which generated 41 single-spaced pages of data. Data analysis was guided by an analytical framework derived from literature on sustainability management in higher education, loosely coupled systems, and shared governance. To start, the researchers used the two primary research questions as a basis for structural coding, which allowed for further coding based on comparable segments [78]. Next, both data segments underwent a process of thematic analysis in keeping with Braun and Clarke's [79] methods, which allowed for the researcher to play an active role in the creation of themes in the data. For the first data segment, elements of Adams' [28] framework for managing sustainability in higher education along with Olson's [52] characteristics of shared governance were used as a coding frame from which to categorize athletic department involvement in shared sustainability governance structures. For the second data segment, the coding frame was derived from the literature on loosely coupled systems as well as the benefits of shared governance (i.e., trust, bonding, reducing asymmetry, goal coordination, etc.). Finally, the data segment relating to the second research question underwent descriptive coding, which was intended to augment and build off the deductive analytical framework to capture any unexpected topics.

The coding of transcripts was conducted using NVivo 12 software.

5. Findings and Discussion

The findings and discussion section is divided into four sub-sections. First, the shared sustainability governance engagement is discussed, which not only covers how athletic departments come to be involved, but also what systems of shared sustainability governance athletic departments are becoming involved in specifically, why they are involved at this level, and who is representing athletic departments on shared governance coordinating councils. Second, the compensatory outcomes of athletic department involvement in shared sustainability governance are discussed with a particular focus on how shared governance is facilitating tighter coupling. Third, the limitations of shared sustainability governance as a coupling mechanism are presented. Fourth, the limitations of the study are discussed.

5.1. Engaging Athletics in Shared Sustainability Governance

The respondents described shared sustainability governance within higher education mostly as interactions among and between either departments or subunits of departments. For example, one

respondent described the coordinating council for sustainability as having “representation from across the institution” and “every department and business unit”. However, what is also evident is interactions between departments and individuals who represent ideas and intentions. Specifically, in referring to the representation of the coordinating council for sustainability, another respondent stated:

It’s primarily staff, facilities, campus planning and development, academic affairs, so the deans of all of the colleges on campus or their designate is represented, and then a representative from housing and residential life, and then those students who are designate environmental senators serve on the committee along with a handful of other students that have various roles on campus.

Shared sustainability governance appears to reflect departmental interactions through the interactions between individuals who represent those departments. On one hand, shared sustainability governance calls for representative involvement, rather than total, which is a logistical necessity considering the vastness of university campuses. However, on the other hand, the presence of individuals representing ideas and intentions also appears to be a matter of organizational structure and hierarchy. As an example, one respondent described how the coordinating council included a president, directors, faculty, and students. In other words, the president and directors represent their particular position and directorates by way of seniority, whereas faculty and student members of the shared sustainability governance system likely represent their colleagues and peers through a personal or professional interest in the subject matter.

Further context provided by the respondents into the decision-making authority of the coordinating council reveal some variation in committee purpose and function. Some sustainability office personnel discussed their coordinating council as an entity that drives campus sustainability strategy through the identification of very specific areas for the university to target, which is consistent with Orton and Weick’s [4] claim that a careful selection of targets can compensate for loose coupling. As an example, one respondent shared how the coordinating council “weighed in heavily” on a number of campus issues, which also highlights how the coordinating council leverages an enhanced leadership status to influence other organizational levels and components [4]. Furthermore, another respondent shared how the university has been using the coordinating council “as governance for decisions as we move forward,” which involved having input into changing university-wide goals as well as making changes to the campus sustainability plan.

However, some coordinating councils play a less authoritative role in campus sustainability matters. For example, one respondent described the purpose of the council as a “sounding board and a vetting entity” for the initiatives of the office of sustainability, while another described the role of the council to advise the administration on what can be done around sustainability. As a result, some shared sustainability governance systems reflect a more typical definition of shared governance that includes a balance between corporate and collegial approaches [53], and between participatory and primary decision-making responsibilities [52]. Alternatively, other systems appear to have less of an orientation around accountability, whereby efforts simply look to facilitate purposeful behavior towards the attainment of a goal or final state [80].

First and foremost, the justification for including athletic departments in shared sustainability governance is a matter of visibility. For example, according to one respondent, athletics is “the public face of the university”. More specifically, another respondent claimed athletics to be “one of the most visible activities for any university that has Division I athletics”. The high visibility of athletics in these universities presents an opportunity for sustainability to engage new audiences, which, according to one respondent, includes a “broad brush of stakeholders that traditionally the university research outcomes would not necessarily reach”. As such, intercollegiate athletics occupies a unique position as a university department, which another respondent made clear by suggesting how “people have an affinity to the university as a result of athletics” and that “if anyone is going to help with promoting sustainability and creating outreach and awareness, athletics is a big component of that”.

Subsequently, athletics provides a very public gateway for various stakeholders to gain a sense of the university's commitment to sustainability. As one respondent stated, "athletics has become the face of sustainability in many ways". This respondent further elaborated on this connection with the following statement:

I liken this to a job I had in the private sector where we were committed to sustainability, but it didn't have a face until we tied it to one of the more popular products. Once we tied sustainability to athletics that gave us a front door to open conversations with a number of different stakeholders.

Skyttner [81] contends that the introduction of an input that is both unique and time critical may permit a semi-organized system to organize itself and to grow. In essence, the introduction of athletics as an input into the sustainable development journey of the university has had a similar effect. Furthermore, the majority opinion of sustainability office personnel suggests how athletic departments possess the potential to leverage their position as the 'front porch' of the university [17] to become the 'sustainable front porch'. As one respondent stated that "certainly how the public sees us it's really vital", and continued on to elaborate that, proportionately, "... even a smaller initiative in athletics could make a big difference". Ultimately, athletic departments serve in a sustainability ambassadorial role on university campuses.

Second, some shared sustainability governance systems involve their athletic departments, and simultaneously exclude other departments on campus, due to athletics' status as a high-impact partner. For example, one respondent considered intercollegiate athletics to be "a major function of the university". More specifically, another respondent claimed:

Athletics has two primary areas where they overlap with sustainability—one is greenhouse gas emissions, and the other is materials. ... So by engaging the Athletics Director we are reaching an important subset of campus that is having an impact in those sustainability areas.

Moreover, this impact according to another respondent includes a "big role" within waste production and resource consumption. As such, combining high visibility with a high impact as grounds to include athletics in shared sustainability governance helps universities in their quest to meet their twofold sustainability responsibility, which Stephens, Hernandez, Román, Graham, and Scholz [36] describe in terms of sustainable operational change and sustainability change promotion.

Despite the compelling case for the inclusion of athletics in coordinating councils, much variation exists in exactly who represents the athletic department at this level. At one university, the sustainability office representative identifies the Athletic Director as the coordinating council appointee for athletics, but, in the same breath, explains how appointees are free to delegate who actually attends the formal meetings. A number of other sustainability office personnel have shared how coordinating council representation sits with the Director of Athletics, which is somewhat contradictory to how Casper et al. [18] present sustainability decision-making within Division I programs as occurring predominantly at levels below that of the Athletics Director. However, in other cases, athletic department representation has taken the form of a more facilities-based approach (e.g., Director of Facilities, Director for Internal Operations, Stadium Manager, etc.). In the case of the latter, athletic department representation in shared sustainability governance potentially falls foul of how Stephens et al. [36] claim universities often focus disproportionately on the way higher education can change internally, rather than realizing the potential of higher education as a sustainability change agent.

While athletic department representatives appear to vary across campuses in title, seniority, and role, the rationale for appointment or identification of representatives shares much similarity across different contexts. Specifically, personal interest, experience, and passion for sustainability often provide a justifiable means for inclusion in the coordinating council. For example, one respondent described how "a personal interest in sustainability" is useful "no matter what role you have". Likewise, another respondent described their athletics representative as someone who "was familiar with LEED

[Leadership in Energy and Environmental Design, green building rating system] and sustainability initiatives in general” and who “came in a few years ago, kind of charged, fired up about those kinds of ideas”.

In terms of how these athletic department representatives become involved in shared sustainability governance, some athletics representatives are appointed, while others become involved voluntarily. As an example, one respondent described the process of appointment, and stated that “every year the executive vice president comes up with a list of new [coordinating council] members and we do that in conversation with the committee co-chairs”. Another respondent discussed how the appointment of representatives helps create a routine, which, in turn, “helps to make sure they are attending our meetings and are engaged in our sub-committees and working groups”. Yet, such efforts demonstrate what Orton and Weick [4] consider to be focused attention, whereby sustainability office personnel who are empowered by senior accountable officers are forcefully creating orderly contingencies among university departments and campus constituents.

Alternatively, athletic department representatives are sometimes groomed for voluntary coordinating council involvement through their prior involvement in on-the-ground sustainability initiatives. For example, one respondent described the following scenario:

So we did have someone within athletics two years ago who had more experience working with green athletic programs at other universities. He helped us to implement green soccer games, we connected him with our composting and catering on campus, and worked really hard to make sure there was as little waste at games as possible.

Therefore, the typical approach appears to focus on engaging representatives who already have a basic knowledge and awareness of sustainability. Furthermore, just as Pfahl et al. [44] identify how collaborative processes are initiated by sustainability office personnel, the identification of suitable coordinating council representatives from within athletics often lies with the sustainability office.

Regardless of the nature of the forceful attention applied by systems of shared sustainability governance, sustainability office personnel emphasize the importance of formalizing the commitment beyond the level of the individual. For example, as one respondent claimed that “it is very important to find ways to institutionalize what we’re doing so that when people leave everything doesn’t fall apart”. Similarly, another respondent described how informal commitments are problematic, especially when coupled with a perceived high staff turnover within athletics, stating: “You’re making a little bit of progress in terms of getting some people on board, and then again, unfortunately he left athletics.” Additionally, the interviews suggest not all of what is disclosed on the STARS report is the case in practice. Specifically, three of the 12 institutions included within the sample referred to the athletic department no longer being a member of their university-wide sustainability committee whether that be due to personnel changes or a shift in the approach of the coordinating council.

The sample of 12 universities included within this study also implemented different variations of shared governance. While all 12 universities convened a coordinating council, only seven universities implemented a subcommittee structure that fed into the coordinating council, thus adopting a true councilor model of shared governance. Additionally, seven of the 12 universities implemented an appointee system for shared governance representatives, while six preferred to secure shared governance representation through voluntary commitments. Most of the university-level councils were coordinating councils, while others were advisory councils. Similarly, most of the councils involved athletics within the coordinating council, while others were involved within thematic subcommittees. On one hand, these findings reify previous research (see [20]), which provides evidence of the varying scopes and remits of environmental committees. On the other hand, however, the variation in shared sustainability governance systems supports Lapworth’s [57] proposition that effective models of shared governance require diversity and flexibility to suit context-specific character and needs.

5.2. Shared Sustainability Governance as a Compensation for Loose Coupling

Sustainability office personnel share a number of benefits to engage athletic departments in shared sustainability governance. Functionally, even at the university level, shared sustainability governance serves as a conduit for collaboration whereby a diverse group of people and departments come together to create sustainable solutions. One respondent explained how the functional capability of the coordinating council and the resulting diverse thinking, in many ways, encapsulates the very notion of sustainability “in a nutshell”. Other practical examples have also been shared. For example, one respondent was able to draw on scenarios where the athletic department had tabled possible solar and stormwater management projects through the coordinating council, which sparked a number of possible inter-departmental collaborations. In essence, this respondent felt that engagement in the coordinating council was helping the athletic department with their future sustainability plans. Again, the fact that university-level models of governance provide opportunities to table department-specific problems is another example of the varying scopes and remits of environmental committees [18,44]. Furthermore, the fact that sustainability problems are being tabled in strategic-level meetings provides evidence of the loose coupling of sustainability practices across university departments.

Beyond the direct effects of collaboration, shared sustainability governance is seen as critical to mitigating the loss of control that the decentralized, loosely coupled structures within higher education promote. Specifically, one sustainability office representative stated:

A lot of times athletics can feel like its own separate world because they are funded differently and all that. But they are still a part of the university. So I think having them be a part of a larger sustainability committee helps them realize being bold and savvy should translate over to athletics as well.

Accordingly, these findings reify the work of McCullough, Kellison, and Wendling [30], who suggest cross-functional sustainability teams provide a bridge with university-wide goals through formal, joint decision-making processes. Similarly, shared governance provides an opportunity for universities to operationalize sustainability as a legitimate bonding mechanism, which Bstieller et al. [64] suggest is made possible by how shared governance enables organizations to adapt to new circumstances. After all, as one respondent claimed, athletic departments are “not a separate wing that can go off on their own”.

Athletic department involvement in shared sustainability governance enables, as Orton and Weick [4] suggest, a genuine reaffirmation of shared values. As an example, one respondent claimed how securing commitments from the athletic department to the coordinating council “shows that they value the campus values” and are “trying to support a larger vision of the university”. Moreover, another respondent described the sense of having “a unified presence” where all major functions of the university were “on the same page” as the main benefit of engaging the athletic department within the coordinating council. Subsequently, shared sustainability governance likely creates assumptions among non-athletic department staff that attendance is in some way indicative of Meyer and Rowan’s [82] notion of “the logic of confidence and good faith”, which creates the assumption that departments are performing their tasks and responding to their responsibilities correctly.

Sustainability office personnel also consider how a shared vision helps athletic departments, and other university departments for that matter, in identifying the potential synergies and leverage points of sustainability. In turn, these opportunities foster a sense of motivation toward sustainability action, which one respondent summarized as an emergent perspective on the “direction for how and what type of action to take”. Furthermore, another respondent suggested the coordinating council provides the athletic department with the drive to “get ahead and stay ahead” with peers on campus, which leverages the competitive edge that is synonymous with athletics competition. As such, shared sustainability governance in this context is active in promoting a common understanding of goals [62], as well as coordinating goals and skills between partners [63]. Additionally, reaffirming shared values

is critical to creating a level of responsiveness to sustainability, which, in this domain, supports coupling across the university.

Sharing values and perspectives is not one-directional. In fact, a number of respondents discussed how having the athletic department represented in the coordinating committee facilitates a deeper appreciation of the unique challenges faced by athletic programs. The following passage from one of the respondents embodies this mutually beneficial process:

We understand athletics has special needs and concerns, but we might not fully understand what those concerns are. So to have them at the table, it's great. So for example, just turf, our baseball fields are turf. So for sustainability it reduces water I guess and pesticide use because it's not real grass. But that wasn't their only reason for getting it, it was because we can't compete with southern schools because it's cold and shitty, you know, up here in spring. So we have to have artificial turf in order for our fields not to flood.

Similarly, another respondent discussed how a lack of involvement by several campus constituents with the athletic department, including students, faculty, and staff, often leads to misinformed perceptions of decision-making within athletics, to which this same respondent claimed:

Perhaps there may be an actual reason why the stadium lights are on all night long and there's no game. Maybe there's an actual reason. Like they're doing construction in there or something like that. And those kind of things come up in meeting and people were actually getting an answer, and they were like 'Right. OK. That makes sense.'

Accordingly, shared sustainability governance is active in reducing information asymmetry [61] and helping to prevent misunderstandings between governance members [62]. As one respondent summarized, "it makes the athletic department more personable", which provides a platform from which to build trusting relationships and, potentially, successful outcomes [66].

Yet, overall, shared sustainability governance appears to compensate for the decentralized nature of university structures, which makes sustainability a discretionary endeavor. To do so, shared sustainability governance enhances leadership around specific targets by reaffirming with the athletic department the value of sustainability.

5.3. 'A Perfect Storm': Supplementing Shared Sustainability Governance

Despite athletic department involvement in shared sustainability governance furnishing a number of compensatory benefits, the benefits are neither uniform nor absolute. As an example, collaboration was understood as a benefit by some, but by others collaboration was mostly one-sided. On the topic of collaboration between the athletic department and other university departments or campus constituents, one respondent replied that most of these collaborations are "people reaching out and engaging them [the athletic department] and it's not happening the other way yet". Furthermore, another respondent expressed their frustration by stating how they were "getting participation on a campus-wide basis from athletics, but not seeing a whole lot within the athletics department just yet". So, there is a sense that athletic departments are, in some ways, honoring the commitment to attending coordinating council meetings, but not necessarily converting this commitment into action. In this sense, the shared sustainability governance structures represent an epistemic community where actors share basic causal beliefs and normative values [83]. However, as Newig, Günther, and Pahl-Wostl [84] argue, participation in these communities does not necessarily involve the same level of interest in the problem at stake, which in this case is sustainability.

Similarly, the coercive nature of appointment-based engagement in shared sustainability governance is likely a step too far for some athletic departments. As one respondent explained:

They see the benefit, but I think it's still at the point where we're making them do something. So I think it's been a long time where I think that's where we're perceived as we're telling them to do something rather than working with them.

Herein lies one of the challenges presented by forcing attention toward specific targets or goals within a decentralized system. By forcing athletic department attention toward sustainability, athletics personnel perhaps feel constrained to operate within the parameters of the university. Fittingly, another sustainability office representative used a sporting metaphor to effectively relate this thought by suggesting that the athletic department was “sort of playing the game and they’re on the field. I’m not sure if they’ve really realized what the end goal is”. Such a quandary leaves some sustainability office personnel increasingly frustrated in their attempts to help athletic departments realize the full extent to which sustainability creates value. To this end, one respondent claimed that “it is a nut that we have officially yet to crack and even with athletics being a part of the committee on sustainability they weren’t necessarily actively pushing for sustainable practices in athletics”.

Ultimately, the overriding consensus among sustainability office personnel interviewed in this study was that shared sustainability governance involvement only stands to enhance commitment when used in concert with other change levers. This sentiment was most accurately explained by one respondent who described a scenario whereby the university has “support from the top down and the bottom up, and then you have some champions in the middle that helps to connect that. It’s rare to find that, to find all of those factors together in the same institution, a perfect storm.” Figure 3 is a visual representation of the change levers the respondents disclosed, which either they have successfully deployed or that they feel would be a success given the complexities of engaging athletic departments in the sustainability journey.

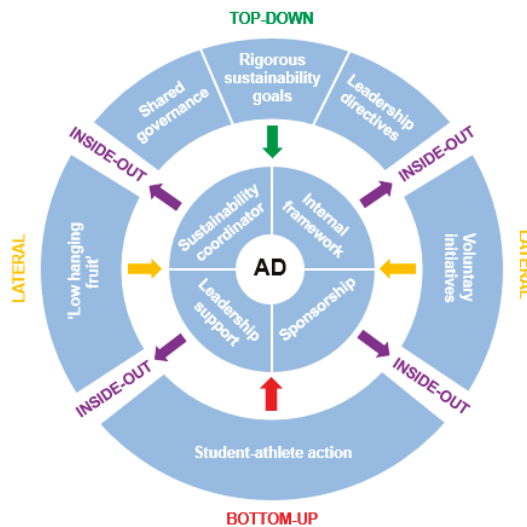


Figure 3. Levers for forcing athletic department attention toward sustainability.

Casper and Pfahl [19] suggest “environmental activities blur lines between distinct management functions making it both a top-down and bottom-up issue at the same time” (p. 24). Figure 3 embodies the notion of the ‘perfect storm’ by organizing the disclosed change levers through not only a top-down and bottom-up approach, but a multidimensional, all-angles approach. Specifically, there are strategic moves that the university could enforce in a top-down manner, or whereby a critical mass could focus attention through bottom-up endeavors. Likewise, there are strategic moves that the university could introduce to incentivize lateral collaboration or involvement in sustainability, as well as measures the athletic department could activate from an inside-out perspective. As such, the identification of these supplemental change levers represent the “nonobvious sources of order that administrators can use to

influence dispersed organizations” [4] (p. 211). Table 1 provides additional context and supporting quotations for each of the proposed change levers.

Table 1. Levers for forcing athletic department attention toward sustainability.

Lever	Direction	Representative Quotation
Rigorous sustainability goals	Top-down	Until all sustainability is just incorporated into every single unit or until our climate commitments have some sort of teeth behind them and saying you must do it.
		I think the opportunity we’ve had is just applying these increasingly rigorous sustainability goals for all facilities to athletics, which sort of brings them along in a way that maybe they haven’t called out for themselves.
Leadership directives	Top-down	My hope would be that the department’s priorities are synced with the university’s priorities, and values, and one of those is sustainability. So it is my hope that would filter down.
‘Low-hanging fruit’	Lateral	I think there’s an interest within waste management and recycling and composting. I say that just because that’s the thing we spend the most time talking about and folks seem to get the most excited about. We do have a lot of low-hanging fruit opportunities there within that realm. So that might be one sort of focal area where I can sort of see a little bit more traction with them.
Voluntary initiatives	Lateral	We are also working on a program that is in-house that allows departments to sign up to make their travel carbon neutral or by helping the university to reduce greenhouse emissions through efficiency projects on campus. We are hoping that by using programs like this it will allow departments and events to advertise the fact that they are doing something that is carbon neutral and get credit for that, that will apply pressure, peer pressure.
Internal framework	Inside-out	I would say the responsibility of the university writ large with sustainability would be to create a culture where somebody on the inside of athletics says, ‘you know what, sustainability is really part of what we do and we need to call it out here.’
		I think having a framework for them can sort of clearly define their expectations, their strategies, to make athletics more sustainable.
Leadership support	Inside-out	I would think it would have to be our Athletics Director wanting sustainability to be part of what they do. And that might happen through conversations with our President. . . . But if it became part of the leadership team and one of their goals was around sustainability, then I could imagine a greater involvement with athletics.
		But I think if they are going to go all in, then it’s going to take that top level leadership to say, ‘look, this is really important’. We want a culture of winning and winning games, but we’re not just winning on the field – we’re winning off the field.
Sustainability coordinator	Inside-out	I think it would take dedicated time from the current staff. We can help support from the outside, but with larger departments on campus there are certain sub-cultures in these departments. And so until those sub-cultures recognize sustainability as part of their daily practices, I think any change that comes from the outside will only be temporary.
Sponsorship	Inside-out	For the athletics department to become more sustainable and really push that, honestly it’s having someone that’s dedicated 24/7 to the operations of our athletics department.
		The other would be sponsorship. Nothing has come to fruition yet, but that is something that if it did happen, that would be a much easier way for athletics, especially the operations, to really make it a priority. That would be a game changer.
Student-athlete action	Bottom-up	Two years ago I had a student working on zero waste. They worked a lot on reducing waste and raising awareness on campus. . . . Our Athletics Director was engaged in that and he helped and advocated for building composting into some of the athletics events and recycling. So that connection, that student-to-director at a smaller scale and not as part of the large group was probably more impactful than coming to the large group.
		I think student interest goes a long, long way. And so if some of the sports teams are interested in this, saying that it is a huge problem for the future of the sport, that would go a long way. I think that goes farther than anything I can say or do as a staff member.
		I think on a college campus the more the student are invested in, involved in something, the better chance of success we have.

5.4. Limitations of the Study

Using AASHE STARS as a means by which to identify cases of athletic department engagement in shared sustainability governance structures presents challenges in reaching the population of interest. First, using AASHE STARS in the context of this study did limit the sample population to universities who chose to complete the reporting process. Second, AASHE STARS, like the majority of assessment-based reporting processes, provides a snapshot in time, and what this study revealed was that shared sustainability governance structures, models, and membership are in a constant state of flux.

In addition, compensations proved a relevant voice to use within the loosely coupled context of athletic departments and wider university sustainability goals and priorities, as most respondents within this study considered this level of coupling to be a sub-optimal state. Yet, perhaps loose coupling in this context is more advantageous than disadvantageous. As one respondent claimed: “The university is so diffuse. There is a lot of autonomy. Ideas are coming from departments. How can we do x, y and z? There is no top-down pressure being applied.” In such a scenario, the coordinating council empowers the representatives to go back to their departments and say this is worthwhile, rather than returning simply to communicate and provide an update on the university’s overall strategy and goals. Furthermore, Haas [83] suggests the best institutional structure for dealing with complex policy environments is, in fact, loose and decentralized, but also dense networks. Haas [83] suggests network density enables the quick relay of information, and that the loosely coupled and decentralized nature of such networks allows the inactivity of one actor not to jeopardize the efforts of the whole. Accordingly, while the voice of compensations provides a sufficiently narrow theoretical guide for this study, under-utilizing other loose coupling voices (e.g., the voice of direct effects or organizational outcomes) presents a limitation in terms of the insights generated.

6. Conclusions

Theoretically, this study provides further evidence of the dialectical nature of loose coupling within the higher education context, and, more specifically, between a more contemporary coupling context than the historical focus on interdependencies between administrators and faculty. The study supports how athletic departments demonstrate at least a basic level of engagement in sustainability that mirrors the wider university (i.e., determinacy). Yet, the varying levels of commitment from athletic departments to shared governance structures demonstrate a simultaneous level of independence between athletics and the university more generally. Athletic departments highlight the challenges universities face in reflecting institutional commitments across all aspects of the campus, which the Rio+20 People’s Sustainability Treaty on Higher Education [85] suggests spans campus management, curriculum, research, and student and community engagement activities. As such, athletic departments are a key internal stakeholder for universities to engage in order to achieve a whole-of-institution approach and commitment to sustainability.

The insight generated through this study points to a number of practical implications for sustainability office personnel. Likewise, such implications are potentially useful for athletic department staff who identify as sustainability leads, and who wish to create greater buy-in internally from colleagues. First, justification should be made for athletic department involvement in shared sustainability governance. For example, does the athletic department boast high visibility as well as being a high-impact campus department? If yes, then athletics likely deserves a seat at the table as a critical cog in the twofold responsibility of universities to sustainability (i.e., as an operation to be changed, and as a change agent). Second (and dependent upon the model of shared governance being deployed), is where exactly the athletics departments are engaged in the system. Athletics, as understood through several of the respondents within this study, has the potential to be the ‘sustainable front porch’ of the university. However, depending on the context, there might be more merit in engaging the athletics department through a thematic subcommittee where tighter coupling exists, and where greater leverage points and synergies can be pitched to optimize levels of engagement.

Third, identifying the most appropriate person to represent the athletics department is crucial, as it is this individual who will serve as a more formal bridge with the university's sustainability goals. Fourth (and connected to the third practical implication), is the extent to which the shared sustainability governance system will focus the attention of the athletic department. In other words, who will represent the athletic department and will this representative be appointed or approached with a request to voluntarily join the coordinating council and/or thematic subcommittee? Such decisions are not solely a matter for athletic departments. However, appointing the Director of Athletics to the coordinating council does not automatically amount to an institutionalized commitment. Rather, sustainability office personnel should match as best they can the personal interest and passion for sustainability of existing athletic department staff with an appropriate means by which to make this engagement routine. Recognizing the relatively high turnover of staff within athletics positions, those charged with heading up shared sustainability governance systems should perhaps focus on succession planning. For example, campuses that address leadership continuity as well as providing training and advice to new officers are more successful at governance [86].

Finally, and most importantly, efforts to engage athletic departments in shared sustainability governance should be supplemented by other change levers. Ultimately, the aspirational condition is to achieve a 'perfect storm' that calls for a combination of top-down, bottom-up, lateral, or inside-out tactics. Yet, while this study suggests that securing an institutionalized commitment is a complex matter, further research is necessary to tease out the importance and effectiveness of multi-dimensional efforts to engage athletics departments in sustainability action. For example, an in-depth case study of a university whose athletics department is immersed in this multi-dimensional approach would elucidate the relative importance of each of the strategic levers. More specifically, a scarcity of research exists that understands the role of student athletes as catalysts for athletics department sustainability action, and further qualitative research could generate a rich understanding of the role of sustainability in the dual identity of student athletes on university campuses in the United States.

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Article

Modelling Organisational Factors Influencing Sustainable Development Implementation Performance in Higher Education Institutions: An Interpretative Structural Modelling (ISM) Approach

Bankole Osita Awuzie ^{1,*} and Amal Abuzeinab ²

¹ Department of Built Environment, Central University of Technology, Bloemfontein 9301, South Africa

² Institute of Architecture, De Montfort University (DMU), Leicester LE1 9BH, UK

* Correspondence: bawuzie@cut.ac.za

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Abstract: Globally, higher education institutions (HEIs) have continued to record varied sustainable development (SD) implementation performances. This variance has been attributed to the presence of certain organisational factors. Whereas previous studies have successfully identified the factors influencing SD implementation performance in HEIs, few studies have attempted to explore the relationship between these factors and the influence of such a relationship on the management of SD implementation in HEIs. This is the objective of this study. Understandably, knowledge of such relationships will facilitate the development of appropriate frameworks for managing SD implementation in HEIs. Relying on a case study of a South African University of Technology (SAUoT), this study elicits data through a focus group discussion session. An interpretative structural modelling (ISM) focus group protocol indicating extant pair-wise relationships between identified organisational factor categories was extensively discussed. The emergent data was recorded, transcribed verbatim and subsequently analysed. The findings suggest that communication was critical to the prevalence of other factors, hence indicating its centrality to the effective management of SD implementation in HEIs. These findings will guide implementing agents in HEIs towards developing appropriate mechanisms for communicating SD implementation strategies.

Keywords: higher education institutions; implementation; organisational factors; sustainable development; interpretative structural modelling (ISM)

1. Introduction

Based on their time-honoured role in shaping and enabling the attainment of society's aspirations, higher education institutions (HEIs) are fast assuming leadership positions in championing societal transformation towards sustainability. Consequently, a meteoric rise in the attention being accorded to sustainable development [1] in the aftermath of 'Our Common Future' report of the Brundtland Commission by HEIs has been observed [2]. However, Zutshi and Creed [3] trace the earliest instance of the HEI-sustainability/sustainable development (SD) nexus to the United Nations Conference on the Human Environment in 1972, otherwise known as the Stockholm Declaration. They point out that this nexus was focused on environmental sustainability. However, the Talloires declaration marked a defining moment for SD implementation in HEIs given its global acceptance by university leadership [3]. Since then, HEIs have shown concern about the incorporation of SD into their core activities [4,5]. However, such interest has been traced to the traditional roles of HEIs as change agents [6,7] among increasing expectations from society for them to share knowledge created therein with relevant stakeholders [3]. Such transfer of knowledge will contribute to the expected transformation of

entities situated beyond HEI boundaries, if communicated to appropriate quarters [8]. To buttress the contributions of HEIs to society, Ngo and Trinh [9] have argued for the centrality of HEIs not just in the modernisation of society, but also for the development and provision of cultural centres which have formed the bedrock for the physical development of cities. This much has been attested by the plethora of SD advocacies, declarations, and partnerships to which a multiplicity of HEIs have signed on to since the post-Talioires era [2,10].

Significant improvements in SD uptake among HEIs across the globe have been reported [11,12]. However, varied SD implementation performances have also been observed [13,14]. Whereas some HEIs have reported successful SD implementation, others have posted underwhelming performances. In some other instances, SD implementation has remained largely underreported [3,4]. This appears to be the case for South African HEIs. As such, a comprehensive assessment of the South African HEI SD implementation performance has become difficult [15]. Undoubtedly, such an assessment will not only contribute to improving understanding of the efforts being made by HEIs, but also lead to the identification of factors influencing the SD implementation performance. Further to this, there is an imminent need for the extant relationships between these factors and the influence of such relationships on the implementation performance to be gauged. Enabling such understanding will facilitate the development of an optimal SD implementation framework within HEIs as managers and implementation agents alike can focus on the aspects that will facilitate optimal implementation and, perhaps, have a significant impact on the implementation performance.

This study was informed by this gap, especially within the South African HEI context. Relevant literature highlights the significant contributions made by organisational factors to the variance experienced in SD performance implementation within HEIs [16,17]. Accordingly, any attempt at addressing SD implementation performance within HEIs will require a thorough understanding of the organisational factors, the extant inter-relationships and the influence thereof, on SD implementation. This is central to the scope of this study.

To achieve its main aim, this study will be structured accordingly. First, a review of the literature on the role of HEIs as SD champions in contemporary society and the nature of organisational factors influencing SD implementation in HEIs will be presented. In the second section, a description of the case study research design employed in the study will be provided. Furthermore, an exposé on the study context, a South African University of Technology (SAUoT), will be given. Additionally, in this section, the modalities behind the use of interpretative structural modelling (ISM) as an analytic tool will be presented. This will be followed by an account of the development of the ISM model in the fourth section, as well as a detailed presentation of the findings as they concern the development of the ISM-based model. A discussion of the findings will be provided in the fifth section of the paper. Finally, the study concludes in the sixth section.

2. Theoretical Perspective

2.1. HEIs and Sustainable Development

The twin concepts of sustainability and SD continue to dominate the global societal development discourse. Developmental patterns are consistently being aligned with the sustainable development goals (SDGs) and the inherent milestones promoted by the United Nations (UN) and adopted by signatory countries of the UN SDG charter. Due to the lack of a widely accepted definition and multiplicity of views concerning their actual connotation, notwithstanding [18], sustainability and SD have remained recurring constants in the scheme of things. This study aligns itself with the position outlined by Boström [19], wherein sustainability was described as a state of utopia, whereas SD consisted of the steps required to arrive at that state. Therefore, within the boundaries of HEIs, the desire to achieve a sustainable university status can be related to sustainability and a utopian state, whilst the strategy and processes being implemented have to conform to SD ethos. Accordingly, within society and the domain of societal sustainability aspirations, HEIs are expected to contribute through

their internal processes, with the product of such processes and engagement with society shaping SD strides towards the implementation of sustainability [20–26].

An examination of existing literature traces the evolution of the SD theme in HEIs through the various declarations and partnerships that commenced with the Stockholm Declaration of 1972 [2,3,5]. Lozano et al., [2] have demonstrated a long-standing commitment of HEIs to leading the drive for SD. This commitment is supposedly premised on the traditional role of HEIs as new knowledge creators [27]. The significance of HEIs to the SD challenge is reinforced by the fact that 14 out of 18 declarations pertaining to education are targeted at HEIs. HEIs are associated with the advancement of knowledge frontiers, hence society's expectation for them to provide leadership for SD [28]. They are expected to ensure that the next generation of professionals are equipped with the necessary skills to oversee the implementation of SD across various societal and organisational facets [12,29–35]. According to Stephens, Hernandez [29], HEIs are expected to show leadership by example, serving as models of sustainable practice for the society to emulate. Furthermore, Lozano et al., [2] have mentioned a surge in the number of HEI signatories. Several scholars have highlighted the efforts being made across the global HEI community in championing SD implementation within and beyond their institutions. For instance, Hugé, Block [36], in an assessment of SD implementation in HEIs, observed the slow integration of sustainability into academic research. They proposed actions for achieving this objective, having noted the criticality of such incorporation for societal sustainability aspirations. In another study, Ngo and Trinh [9] investigated the manner through which HEIs provide the intellectual requirements of their environs using the university-city complex model. The point of departure in this study was the notion that HEIs were responsible for the creation of knowledge that can be subsequently applied to city development in a manner corresponding with society's SD aspirations. Another contribution of HEIs to the production of sustainability knowledge for society's benefit was highlighted by Trencher, Nagao [24]. According to them, society stands to benefit from the co-creation of sustainability knowledge with HEIs. However, HEIs have to be adequately prepared to carry such responsibility. Sedlacek [37] has articulated the place of universities in engendering sustainable development within societal boundaries. According to Sedlacek, HEIs contribute to SD at an individual and societal level through research, the education of individuals and the supposed influence on governance. It is expected that, as sustainability champions, HEIs can influence the mindset of individuals and policymakers towards SD [38]. Furthermore, the contributions of HEIs towards energy efficiency and conservation through the design and subsequent development of sustainable campus improvement programmes are outlined in Faghihi, Hessami [39]. Concerning the incorporation of a sustainability ethos into the curriculum, scholars across different studies have shown how HEIs are transforming their curriculum across various disciplines towards being pro-SD in nature, through an assessment of the extant curriculum and subsequent modifications [40–47].

From the above, it can be deduced that HEIs have indeed taken the lead to support society's sustainability aspirations at different levels and through numerous means available to them. Despite this, 28 years after the first declaration directly targeted at HEIs, there has been a lack of reports detailing successful SD implementation across various HEIs, particularly among signatories of these declarations [2]. This under-reporting, a severe incidence across the developing world, has been attributed to an underwhelming implementation performance as HEIs which have made a success of SD implementation have often drawn attention to their achievements [48]. In addition, the seeming failure of HEIs to provide leadership has been blamed as the reason for the poor societal uptake of the agenda in these countries. Nevertheless, certain attributes of HEIs have been blamed for this. Salient amongst these attributes is the HEIs' renowned resistance to change and innovation [6,49] and the discipline-centric nature of these institutions, which leads to knowledge compartmentalisation. Compartmentalisation is considered hostile to the creation of relevant knowledge for resolving SD-related challenges, hence the recent agitation surrounding the adoption of inter-and transdisciplinary research approaches [23,50]. The inability of HEIs to deliver on the expectations of society on

sustainability and SD has been attributed to a plethora of factors [16,22,51]. These factors are covered in more detail in the next section.

2.2. Organisational Factors and SD Implementation

Richardson and Lynes [51] have attempted to categorise the factors influencing SD implementation in HEIs into two broad categories, namely organisational and financial factors. This study will focus on organisational factors because they arguably outweigh other factors. Table 1 chronicles various factors according to their categories, as sourced from a review of relevant literature. From Table 1, it can be deduced that the organisational factors outweigh the financial factors and, accordingly, significantly influence implementation. As such, managing the influence of this category of factors will yield positive changes on the SD implementation curve. These factors are highlighted in Table 1. For clarity, the organisational factors are classified as Collaboration, Leadership, Communication, Knowledge, Behavioural, and Physical factors.

Table 1. Factors Influencing sustainable development (SD) Implementation in higher education.

Category	Factors	Authors
Organisational	Collaboration (Stakeholder Collaboration/Staff Commitment/Student Partnerships/Collaborative Decision-making/Presence of Silos)	Lozano-Garcia, Huisinigh [14], Ralph and Stubbs [14], Stafford [17], Sharp [52], Shriberg [27], Sharp [17], Cortese [6], McMillin and Dyball [13]
	Leadership (Strategic Vision/Support from Top Level Management /Visionary Leadership) Incentive Structure/Connectors to Society/Coordination Units and Projects/Sustainability Champions/Organizational Structure/Societal Pressure)	Ferrer-Balas, Adachi [53], Velazquez, Munguia [16], Luo and Yang [49], Sharp [52], Velazquez, Munguia [4]
	Communication (Communication of the Sustainability concept)	Luo and Yang [49], Sharp [52], Djordjevic and Cotton [54], Franz-Balsen and Heinrichs [55]
	Knowledge (Degree of Innovativeness/Understanding/Awareness/Experience/Skills)	Ferrer-Balas, Lozano [49], Velazquez, Munguia [52], Luo and Yang [42], Ralph and Stubbs [11]
	Behavioural (Appreciation of the Value of Outreach Activities within Academia/Level of Freedom exercised by Faculty Members/Desire to Change)	Ferrer-Balas, Adachi [53], Ferrer-Balas, Lozano [56], Luo and Yang [49], Ralph and Stubbs [12], Shriberg [27]
	Physical (Organizational Size)	Stafford [17] Ferrer-Balas, Adachi [53]
Financial	Finance (Financial Constraints/Consideration of Life-Cycle Savings During Budget Modelling/Source of Funding)	Luo and Yang [49], Stafford [17], Velazquez, Munguia [4], Ralph and Stubbs [12], Ferrer-Balas, Lozano [56], Ferrer-Balas, Adachi [53]

Source: Awuzie and Emuze [48].

Having identified the factors capable of influencing the SD implementation performance in HEIs, it becomes pertinent to explore the interrelationships existing between these factors. Also imperative is the need to establish the influence of such interrelationships on the SD implementation performance within HEIs. It is to be expected that this understanding will engender the successful development of

an appropriate mechanism for managing SD implementation effectively in the HEIs for the benefit of the wider society. This is what subsequent parts of this paper will concern themselves with, albeit via a case study of the context of a South African University of Technology (SAUoT) and the institution's sustainable university (SU) aspirations.

3. Materials and Methods

The objective of this study is to explore the interrelationship existing between organisational factors influencing the SD implementation performance within an HEI context, relying on an SAUoT exemplar. Accordingly, the choice of the case study research design came naturally to the authors due to the design's reputation for enabling an understanding of a phenomenon within its context. In this case, the choice of method facilitated not just the identification of the organisational factors affecting SD implementation within SAUoT from the perspective of relevant parties, but also enabled the determination of the relationships between these factors and the influence thereof, on implementation performance within the case study. Additionally, the case study design makes the use of a multiplicity of data collection and analysis techniques necessary during the data elicitation and analysis stages of the research project [57,58].

In this study, data was collected using a focus group discussion. Focus group discussions have been described as an appropriate medium for eliciting the opinions of a small group of stakeholders concerning any phenomenon, with a facilitator steering, discussions accordingly [59,60]. According to Hugé, Block [36], this data elicitation technique is specifically designed to elicit information concerning people's preferences, opinions, and values as it pertains to a given topic. However, Kitzinger [60] was quick to add that the success of the focus group was largely dependent on the facilitation skills of the facilitator, as well as the selection of the focus group panel. According to Kitzinger, the wrong facilitation will yield responses that are irrelevant to the scope of the study. A lack of consideration of the power dynamics existing between the discussants during recruitment, as well as the absence of a strategy for dealing with this, if it exists, was capable of undermining whatever benefits were expected. This is necessarily so as these discussions are often held in a permissive, convivial environment, allowing for free and unhindered interaction between discussants.

Discussants of the focus group were purposively selected based on their roles in SD implementation at SAUoT. Care was taken to cover all facets of engagement with SD implementation. However, students were not enlisted at this point, representing a probable limitation of the study; this was intentional as the authors opined that a smaller sample of implementing agents was appropriate for the study. The lead author acted as the facilitator and was assisted by the second author at different intervals. Table 2 provides a description of the focus group discussants' demographics.

Table 2. Focus Group Discussants' Profile.

No	ID	Job Sector
1	L	Lecturer
2	FS1	Facilities
3	RF	Research Fellow
4	PS	Procurement Staff
5	L2	Lecturer
6	FS2	Facilities

In total, six discussants participated in the focus group besides the authors. The session lasted for approximately two and half hours. With the permission of the discussants, the session was recorded and subsequently transcribed. The discussions at this point centred on the interpretative structural modelling (ISM) protocol indicating a pairwise relationship between the identified organisational factors; see Table 3. As indicative of the protocol utilised, an ISM methodology was deployed when

analysing the data emanating from the transcripts. This culminated in the development of an ISM-based model showing the relationships between the identified factors.

Table 3. A Description of Organisational Factors.

	Organisational Factors	Description
1	Collaboration	Stakeholder collaboration to attain a common purpose such as SD implementation
2	Leadership	Willingness from upper management to buy-in and drive SD implementation and willingness to lead the HEI towards the attainment of an SU status
3	Communication	The ability of HEIs to effectively communicate its SD agenda to all stakeholders
4	Knowledge	The ability of an organisation to create and share knowledge
5	Behavioural	Human behaviour, reforming the individual, change in attitude
6	Physical	The size of an organisation

Adapted from Awuzie and Emuze [48].

3.1. Study Context: SAUoT

In 2010/2011, SAUoT commenced a transformational journey towards becoming a sustainable university of technology (SUoT). This transformation was built around the following context-specific features: its place as a South African public institution and its nature as a university of technology (UoT). The former makes it imperative for SAUoT to adopt and support the national commitments and development aspirations of the government and citizenry of the South African nation, especially as it concerns making contributions in science, technology transfer, and education. The latter is concerned with the UoT's institutional context.

SAUoT's resolve in achieving an SUoT status is discernible, particularly given its development of a sustainability implementation framework. Furthermore, the HEI has inaugurated a Sustainable Development Working Group with a mandate to monitor and co-ordinate the various SD projects. These gestures signal its move from strategy adoption and articulation to actual implementation.

Obviously, it is one of the few HEIs within South Africa that has developed such an implementation framework. It is the intention of this study to identify the motivating factors (drivers) behind the HEI's resolve to embark upon SD implementation. It is believed that an identification of these drivers will promote the development of a social ontology among various stakeholders of the implementation exercise and thus enable a positive attitudinal change amongst them and provide a framework for other HEIs embarking on this path.

3.2. Interpretive Structural Modelling (ISM)

ISM is a qualitative and interpretive method used to generate solutions for complex problems. ISM is a valuable management tool because it identifies the relevant importance of each variable with reference to the problem under consideration [61,62].

ISM is used to identify and structure a relationship between variables that define a problem. The main objectives of ISM are as follows:

1. To identify and rank the relationship between variables;
2. To discuss the managerial implications of the outcome to aid decision makers.

The various steps involved in the ISM method are extracted from [63–65] and are as follows:

Step 1. Identification of variables relevant to the problem. This can be done through secondary data or primary data, such as that collected through interviews, surveys or focus groups;

Step 2. Establishing a contextual relationship type, such as influence or drive, depending on the problem;

Step 3. Development of a structural self-interaction matrix (SSIM) by a pair-wise comparison. This step will be carried out by experts on the problem context. The participants must decide upon the pairwise relationship between the variables. The existence of a relation between any two variables (i and j) and the associated direction of the relation is questioned. Four symbols are used to denote the direction of the relationship between the variables i and j:

V—for the relation from i to j, but not in both directions $i \longrightarrow j$;

A—for the relation from j to i, but not in both directions $j \longrightarrow i$;

X—for both direction relations from i to j and j to i, as well as $i \longleftrightarrow j$;

O—if the relation between the variables does not appear to be valid $i \begin{array}{c} \longleftarrow \\ \longleftarrow \\ \longrightarrow \\ \longrightarrow \end{array} j$;

Step 4. A reachability matrix (RM) is developed from the SSIM and the matrix is checked for transitivity. The transitivity of the contextual relation is a basic assumption made in ISM. It states that if a variable X is related to Y and Y is related to Z, then X is necessarily related to Z. The reachability matrix is a binary matrix since the entries V, A, X, and O of the SSIM are converted into 1 and 0 as follows: V, X = 1 & A, O = 0;

Step 5. Classification of variables based on their driving and dependence power using MICMAC (matriced' impacts croises-multiplication applique' and classment) analysis;

Step 6. The reachability matrix obtained in step 4 is partitioned into different levels;

Step 7. Based on the relationships given above in the reachability matrix, a directed graph is drawn, and the transitive links are removed;

Step 8. The ISM model developed in step 7 is reviewed to check for conceptual inconsistency and necessary modifications are made.

4. ISM Model Development

In this section, a rendition of the steps taken towards model development based on the ISM methodology is provided.

4.1. Identification of Organisational Factors Affecting Sustainable Development in a South African University

The factors have been identified in previous research by combining the literature and a qualitative single case study research design in the same study context [48]. The final organizational factors resulted from a series of semi-structured interview sessions held with purposively selected interviewees. The identified factors are presented in Table 3 below with a brief description.

4.2. Developing SSIM for Organisational Factors

Existing pair-wise relationships were identified via a focus group with six stakeholders from SAUoT, as detailed previously. A contextual relationship of “influence” was chosen for the ISM focus group protocol, as reported in Table 4.

Table 4. Interpretative structural modelling (ISM) Focus Group Protocol.

	Pairwise Relationship	Type of Relationship	Response
1	Collaboration-Leadership	Do collaboration factors influence leadership factors?	Yes
2	Collaboration-Communication	Do collaboration factors influence Communication factors?	No
3	Collaboration-Knowledge	Do collaboration factors influence Knowledge factors?	Yes
4	Collaboration-Behavioural	Do collaboration factors influence Behavioural factors?	Yes
5	Collaboration-Physical	Do collaboration factors influence physical factors?	Yes
6	Leadership-Collaboration	Do leadership factors influence collaboration factors?	Yes
7	Leadership-Communication	Do leadership factors influence Communication factors?	Yes
8	Leadership-knowledge	Do leadership factors influence knowledge factors?	Yes
9	Leadership-Behavioural	Do leadership factors influence Behavioural factors?	Yes
10	Leadership-Physical	Do leadership factors influence Physical factors?	Yes
11	Communication-Collaboration	Do Communication factors influence Collaboration factors?	Yes
12	Communication-Leadership	Do Communication factors influence Leadership factors?	Yes
13	Communication-knowledge	Do Communication factors influence knowledge factors?	Yes
14	Communication-Behavioural	Do Communication factors influence Behavioural factors?	Yes
15	Communication-Physical	Do Communication factors influence Physical factors?	Yes
16	Knowledge-Collaboration	Do Knowledge factors influence Collaboration factors?	Yes
17	Knowledge-Leadership	Do Knowledge factors influence Leadership factors?	Yes
18	Knowledge-Communication	Do Knowledge factors influence Communication factors?	Yes
19	Knowledge-Behavioural	Do Knowledge factors influence Behavioural factors?	Yes
20	Knowledge-Physical	Do Knowledge factors influence Physical factors?	Yes
21	Behavioural-Collaboration	Do Behavioural factors influence Collaboration factors?	Yes
22	Behavioural-Leadership	Do Behavioural factors influence Leadership factors?	Yes
23	Behavioural-Communication	Do Behavioural factors influence Communication factors?	Yes
24	Behavioural-knowledge	Do Behavioural factors influence knowledge factors?	Yes
25	Behavioural-Physical	Do Behavioural factors influence Physical factors?	Yes
26	Physical-Collaboration	Do Physical factors influence Collaboration factors?	Yes
27	Physical-Leadership	Do Physical factors influence Leadership factors?	Yes
28	Physical-Communication	Do Physical factors influence Communication factors?	Yes
29	Physical-Knowledge	Do Physical factors influence Knowledge factors?	Yes
30	Physical-Behavioural	Do Physical factors influence Behavioural factors?	Yes

Table 4 presents pair-wise relationships and the response of each relationship by the stakeholders. This step will inform the next steps in the development of the SSIM matrix as explained below.

Four symbols were used to denote the direction of the relationship between any two organisational factors (i and j):

1. V: factor i will influence factor j, but not in both directions;
2. A: factor j will influence factor I, but not in both directions;
3. X: factor i and j will influence each other; and
4. O: factor i and j are unrelated.

Table 5 presents the SSIM with different symbols relevant to each pair-wise relationship.

Table 5. Structural self-interaction matrix (SSIM).

No.	Organisational Factors	1	2	3	4	5	6
1	Collaboration		X	A	X	X	X
2	Leadership			X	X	X	X
3	Communication				X	X	X
4	Knowledge					X	X
5	Behavioural						X
6	Physical						

Table 5 builds on Table 4's responses and uses the logic above to construct the SSIM matrix.

From the matrix above, it was clear that all the organisational factors were related, and therefore, we did not use the symbol (O), indicating the absence of a relationship. The contextual relationship between organisational factors was obtained from the participants as detailed in Table 4.

4.3. Developing RM from SSIM

The RM was obtained by converting the SSIM into a binary matrix by substituting V, A, X, and O with 1 and 0 as per the case. The rules for the substitution of 1s and 0s are the following:

1. If the (i, j) entry in the SSIM is V, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0;
2. If the (i, j) entry in the SSIM is A, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1;
3. If the (i, j) entry in the SSIM is X, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry also becomes 1;
4. If the (i, j) entry in the SSIM is O, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

Following these rules, the RM for the organisational factors is shown in Table 6.

Table 6. RM matrix.

No.	Organisational Factors	1	2	3	4	5	6
1	Collaboration	1	1	0	1	1	1
2	Leadership	1	1	1	1	1	1
3	Communication	1	1	1	1	1	1
4	Knowledge	1	1	1	1	1	1
5	Behavioural	1	1	1	1	1	1
6	Physical	1	1	1	1	1	1

Table 6 uses the rule of binary entries to replace symbols V, A, X, and O with 1 and 0. Therefore, Table 6 converts Table 5 into a binary matrix.

Table 7 presents the final RM. As there is no transitivity, the RM matrix and final RM will be the same. Table 6 has been represented to show the calculation of driving and dependence power as an important step of the ISM method. Hence, it has been re-named as Table 7 because it includes this calculation. The driving power of an organisational factor is the total number of factors, including itself, that it may influence. The dependence power is the total number of factors that may help in alleviating it. Based on the driving and dependence power, the organisational factor can be classified into four clusters: autonomous, dependent, linkage, and independent/driver barriers. This classification and its implications are explained in more detail in the next section.

Table 7. Final RM.

No.	Organisational Factors	1	2	3	4	5	6	Driver Power
1	Collaboration	1	1	0	1	1	1	5
2	Leadership	1	1	1	1	1	1	6
3	Communication	1	1	1	1	1	1	6
4	Knowledge	1	1	1	1	1	1	6
5	Behavioural	1	1	1	1	1	1	6
6	Physical	1	1	1	1	1	1	6
	Dependence	6	6	5	6	6	6	35/35

4.4. Classification of Organisational Factors: MICMAC Analysis

Based on the driver power and dependence power generated in Table 6, the organisational factors were classified into four clusters, as shown in Figure 1 below.

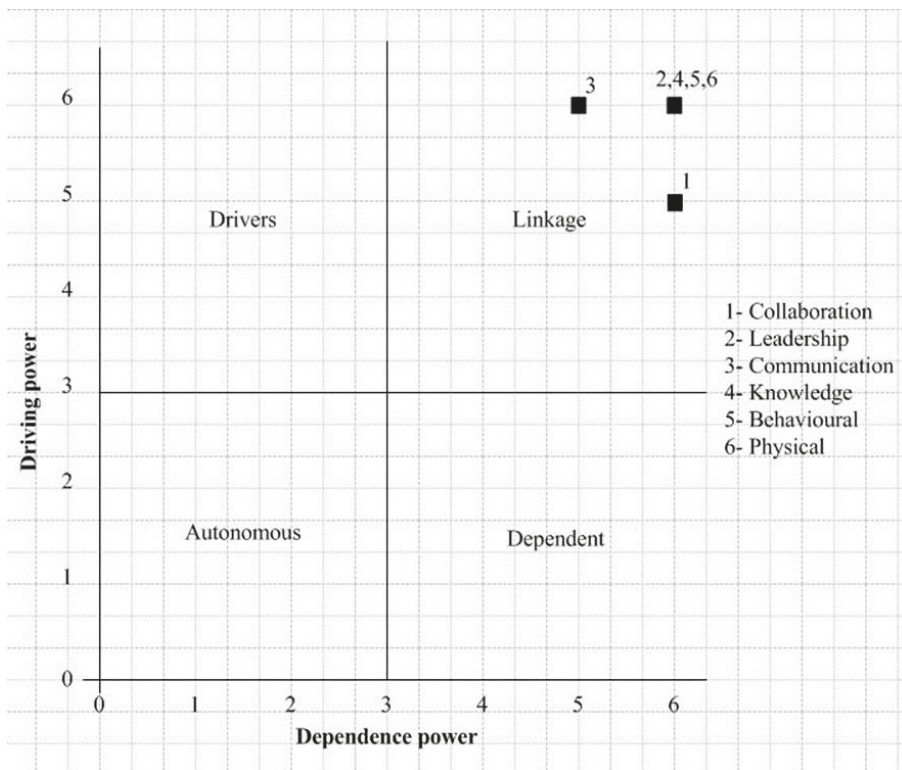


Figure 1. Driving power and dependence diagram.

The major findings of this classification (Figure 1) were as follows:

1. The diagram indicated that there is no factor that comes under an autonomous cluster. Autonomous factors generally appear as weak drivers, as well as being weakly dependent, and are relatively disconnected from the system. These factors do not have much influence on the other factors of the system;
2. No dependent factors. The dependent factors mean other factors need to be addressed and removed before their removal;

3. All factors were within the linkage cluster. Linkage barriers have a strong driving power, as well as strong dependence. These factors are unstable because any action on them will influence others and have a feedback effect on themselves;
4. No factors within the driver cluster. Driver factors will have strong driving power, but weak dependence power. Driver factors need to be addressed first and they can influence all other factors.

4.5. Partitioning the RM into Different Levels

From the final RM, the reachability and antecedent set for each factor were derived and the intersection of these sets was then identified, as presented in Table 8. The factor for which the reachability and the intersection sets were the same in the first iteration was assigned as the top-level element in the ISM hierarchy. Similarly, levels were identified for other factors by duplication of this process. Once the level was identified for a factor, it was discarded from the list of remaining factors. Table 8 presents the first iteration, which showed that five factors out of six were found in the first level. Therefore, the remaining factor was in the second level. These two levels helped in developing the ISM model in the final step.

Table 8. Iteration 1.

Organisational Factors	Reachability Set	Antecedent Set Intersect	Intersection Set	Level
1	1, 2, 4, 5, 6	1, 2, 3, 4, 5, 6	1, 2, 4, 5, 6	1st
2	2, 1, 3, 4, 5, 6	2, 1, 3, 4, 5, 6	2, 1, 3, 4, 5, 6	1st
3	3, 1, 2, 4, 5, 6	3, 2, 4, 5, 6	3, 2, 4, 5, 6	
4	4, 1, 2, 3, 5, 6	4, 1, 2, 3, 5, 6	4, 1, 2, 3, 5, 6	1st
5	5, 1, 2, 3, 4, 6	5, 1, 2, 3, 4, 6	5, 1, 2, 3, 4, 6	1st
6	6, 1, 2, 3, 4, 5	6, 1, 2, 3, 4, 5	6, 1, 2, 3, 4, 5	1st

4.6. Developing the ISM Model for Organisational Factors

From Table 6, all factors but communications were found at level one. Therefore, they will be positioned at the top-level of the ISM hierarchy. The final ISM model for organisational factors is shown in Figure 2 below. The arrow direction indicates the relationship between the different factors. For example, the relationship between collaboration and leadership factors was a two-way relationship. Therefore, an arrow pointing in both directions was used to denote this relationship. Conversely, the relationship between communication and collaboration factors only occurred in one direction, in which the former could influence the latter. Therefore, an arrow pointing from the communication to collaboration factor was used.

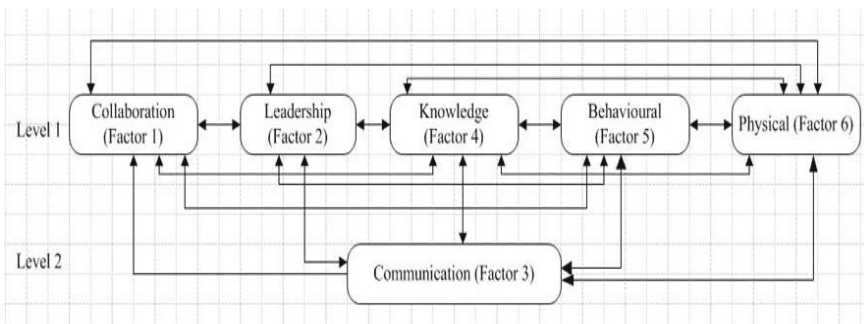


Figure 2. Interpretative structural modelling (ISM)-based model for organisational factors influencing the sustainable development (SD) implementation performance.

It was found from Figure 2 that communication (factor 3) was a significant organisational factor affecting SD implementation as it came in the base level of the ISM model. However, the ISM model only two levels to indicate the close relationship between these factors.

5. Discussion

From the ISM-based model shown in Figure 2, a close relationship between the various organisational factors which have been previously identified as influencing the SD implementation performance at the SAUoT was observed. The positioning of these factors on two levels, levels 1 and 2, highlights this closeness. The model serves as an example of operational management of HEIs to complement teaching and research for SD to contribute to a whole-institute approach to SD [13].

The salience of communication as a critical factor capable of influencing other organisational factors has been reinforced. This notion corresponds to findings from similar studies, which have sought to investigate the SD implementation both within HEIs and in other organisations [3,21,66,67]. For instance, Zutshi and Creed [3] cite instances where HEIs have been admonished to ensure that the communication of their sustainability themes remains at the forefront of their institutional communication strategies. Furthermore, they allude to happenings in the United Kingdom, United States, and Australian HEI context, where such suggestions are also being observed. Still focusing on the utility of communication protocols, Zutshi and Creed [3] maintain that an evaluation of the effectiveness of communication protocols can only be based on the actions taken by recipients of such information as it is reflective of their interpretation of the information passed on through such protocols. By implication, poor communication protocols will lead to wrong interpretations by the stakeholders, an act which can undermine other factors identified in Figure 1. In their contribution, Adomssent, Godemann [8] reiterate the importance of communication and participation in securing the optimal implementation of SD in universities. According to them, communication is usually deployed towards achieving consensus from stakeholders within the HEI context and beyond concerning the developmental pattern that has to be adopted to achieve sustainability, as well as the integral processes thereof. Franz-Balsen and Heinrichs [48], whilst observing the lack of studies looking into sustainability communication management within HEIs at the time, reiterated the significance of all types of communication in engendering effective SD implementation. They maintained that the “vision of a sustainable university is ideally generated in a mutual communication process and is continuously elaborated, there stimulating structural changes as well as individual and collective development” (431). This emphasises the influence of effective communication structures on the breaking down of extant silos which often trigger resistance to change and participation apathy among stakeholders, which are factors recognised as severe impediments to smooth SD implementation in HEIs [16,48].

At SAUoT, previous studies have indicated that the communication of SD implementation plans and processes has proceeded in a top-down manner, with instructions and aspirations being handed down to implementing agents [68]. Additionally, a subsequent study discovered an absence of a common understanding of what sustainability and SD entailed from an SAUoT perspective, as well as what the stakeholders stood to benefit from the transition towards an SU status [69]. Without a common ontology in sight, optimal SD implementation will remain an abandoned idea. No doubt, the setting up of effective communication protocols within SAUoT will lead to an improvement of this situation, as it has been noted that the implementation of SD in the institution has been fraught with participation apathy in most spheres. It has been a case of ‘their sustainability not ours’, i.e., a lack of ownership in most instances. This working group launched the ‘Sustainable Development Working Group’ (SDWG), which evolved as a means of breaking down extant discipline-oriented mentality which had led to the growth of knowledge silos within CUT and enabled the effective communication of SAUoT’s SD ideals to relevant implementation agents. The group had an adequate representation from all stakeholder groups in SAUoT and was steered by the office of the Deputy Vice-Chancellor, Research, Innovation and Engagement. However, the continued apathy towards participation in SD implementation implies a seemingly lackluster performance of this working

group as the silos have continued to persist. The group's mode of operation is being associated with another form of top-down implementation communication structure. The group is supposed to guide implementing agents within the institution in such a manner as to achieve conformity with the contents of a pre-determined sustainability development implementation framework. Therefore, this mode of operation is considered a contradiction for optimal communication.

The inadequacies of such top-down communication protocols are perceived as authoritarian and incapable of stirring individual and collective interest in SD implementation [61]. In her study into SD implementation across 30 HEIs, Sharp [11] advocated for the adoption of person-to-person communication and dialogue, as well as improved listening skills on the part of the agents. Studies like Disterheft, Caeiro [70] have highlighted the need for the adoption of participatory approaches in driving SD implementation. However, such implementation approaches can only yield positive outcomes with the support of effective communication. Djordjevic and Cotton [54] have identified barriers which serve to undermine the communication process of sustainability and SD in HEIs and these barriers do not largely differ from what is obtained within the study context. These barriers range from the complexity and non-contextual orientation of the message being communicated and a lack of the same understanding between the sender and recipient concerning the contents of the message, to information overload, thus leading to noisy channels for information sharing, top-down communication, and overt-reliance on electronic communication, often at the expense of face-to-face communication etc. Therefore, it is possible to state that effective communication structures are imperative for successful levels of SD implementation to be achieved in HEIs, like the SAUoT being understudied. According to Zutshi and Creed [3], the Talloires declaration was particularly emphatic concerning the relevance of communication in driving SD adoption and implementation. To reinforce this position, they observed that the aspects pertaining to communication constituted 60% of the recommended actions stated in that declaration. However, according to them, a meagre 0.2% of the signatories of that declaration have effectively communicated SD through their institutional websites. Speaking from a conventional organisational perspective, Siano, Conte [71] have described sustainability communication as a necessary platform for showcasing an organisation's sustainability commitment, whilst also facilitating communication of the reasons behind their sustainability ideals, thus allowing for an appreciation of the alignment between the organisational projects and corporate image. This is the situation in the HEI organisational context as HEIs need to showcase their sustainable development ideals through effective communication protocols as this will bring about an increased commitment from a diverse range of stakeholders.

Notwithstanding the significance of communication to SD implementation, it is evident from Figure 1 that factors such as leadership, behaviour, knowledge, and physical factors are all influenced by communication in a bi-directional manner. This much affirmed by Mohamad, Kadir [72] in their study on the importance of the heartware in engendering SD implementation in HEIs. Heartware in this instance was exercised through the presence of shared values concerning sustainability among stakeholders, which in turn, inspire voluntary action and adaptive governance for the resolution of any conflicts hindering implementation [72]. The organisational factors were identified as impacting the heartware aspect, in addition to the software and hardware aspects. Therefore, it is necessary that these factors be considered in tandem with the communication structures within the HEI.

6. Research Implications

The ISM-based model developed will assist the management of the SAUoT to re-focus their implementation efforts accordingly. Ideally, such efforts will take into consideration the re-design of the sustainability communication strategy of the HEI. The model provides a step-by-step guide to start solving the problem. The SAUoT can embark on a wider consultation to identify effective means of communication. The university should identify common and specific modes of communication, taking into consideration the current communication culture and preference. ISM-based model is focused on

the operational management of SAUoT to complement its existing teaching and research strategies for SD.

Decision makers will need to appreciate the close relationship between these factors, and they will need to invest significant resources to tackle these factors. The findings from this study will enable SAUoT to prioritise and allocate resources for implementing SD more effectively.

7. Conclusions

The implementation of SD findings from this study highlights the extant relationship between the various organisational factors influencing the SD implementation performance in an HEI. An ISM methodology has been used to show these relationships based on the views of implementing agents within the context of SAUoT. Based on evidence from the emergent ISM-based model, it was observed that the factors shared close relationships and influenced each other to a large extent, except for the collaboration–communication pairwise relationship, where the relationship was observed as being uni-directional instead of bi-directional, as is the case in other pairwise relationships evaluated. However, the critical nature of sustainability communication was deduced. Accordingly, the absence of the effective communication of SD will serve to undermine all the other efforts of the distinct implementing agents, as reiterated in similar studies. The case is no different to the case investigated herein.

The study relied on a single case study: the SAUoT. As such, the conclusions arrived at are reflective of this case. Although this can be regarded as a limitation of this study, it must be noted that the scope of this study was to understand the relationships between identified factors influencing the SD implementation performance in the SAUoT context. Additionally, it sought to highlight the utility of the ISM in establishing this relationship. Although both objectives have been achieved, it should be stated that the conclusions reached herein are to be subjected to further generalisation in subsequent studies. Such studies will seek to compare HEIs in different geographic and economic contexts.

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