

Article

Glancing through Two Decades of Research on the *Human Side* of Sustainable Innovation: The Past, the Present, and Directions for Future Research

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Abstract: The increasingly negative effects of climate change are caused by humans and can be solved only by humans. In the past two decades, researchers have conducted considerable studies devoted to the human side of sustainable innovation. The present work aimed to provide a structured overview of these studies in the frame of the Special Issue: The Human Side of Sustainable Innovations. In contrast to the concepts capturing the human side, the definitions and operationalizations of sustainability and sustainable innovations are considerably ambiguous. We identified six journals that exemplify three factors on the human side of sustainable innovation and elucidate the concept. For their findings to be conclusive, researchers need to engage in significant efforts in investigating the differences in the interpretation and recognition of sustainability, in establishing consensus on the sustainable behavior of actors, and in executing comparable studies and experiments. Moreover, future research needs to establish generally accepted evaluations and measurements of sustainability.

Keywords: sustainable innovation; individual characteristics; human-to-human interaction; intentional intervention



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1. Introduction

Since the Brundtland Report in 1987 [1], global awareness of the sustainability issue has increased exponentially. Decades later, the UN developed and established 17 Sustainable Development Goals (SDGs) that acknowledge the economic, social, and environmental challenges faced by nations [2]. Research suggests that technology and business innovations are drivers of disruptive developments that can propel radical and sustainable changes [3,4]. Start-ups help accelerate innovations and push sustainable innovations, contributing to the 17 SDGs, however heterogeneously [5]. All sustainable innovations arise out of human activities and behaviors. Engaging in sustainable innovations depends on individual circumstances, such as environmental risk exposure [6]. People act as sustainable innovators in roles as lead users and as sources of information in roles such as consumers and users of innovations [7]. As members of new product development (NPD) or research and development (R&D) teams, people innovate while performing their tasks in academic and business institutions and other start-up enterprises on sustainable innovations. As such, whenever and wherever sustainable innovations appear, people are always involved in the game.

Our work attempts to explore the nature of research on the human side of sustainable innovation. The motivation for this endeavor was the release of the Special Issue: The Human Side of Sustainable Innovations in *Sustainability*, edited by the three authors of this paper. To capture a concept as ambiguous as the “human side,” we selected the six most prominent journals in technology, innovation, and entrepreneurship in the past two decades as the baseline. We then conducted an explorative bibliometric analysis on the keyword “sustainable innovation,” differentiated into three time periods (2000–2006,

2007–2013, and 2014–2020). Overall, we examined more than 3,000 journal articles. This explorative analysis aimed at extracting all prominent terms capturing the human side linked to sustainable innovation. Thus, we adopted an intuitive approach. Other words for all the terms that characterize or are prescribed to humans, terms that describe human-to-human interaction and the aggregated variables resulting from them, and all variables that measure interventions for human behavior or human-to-human interaction were considered and extracted.

In summary, this bibliometric analysis generated a rough overview of the number of publications referring to the human side of sustainable innovation, as well as their distribution in the selected journals. In addition, the extracted variables with respect to the terms revealed how the human side is addressed, and its multifaceted nature. In the next step, we summarized the extracted terms in a conceptual model representing the application of the research on the human side to sustainable innovations. The following section discusses the presence of typologies, conceptualizations, and operationalizations of sustainable innovation. Our results revealed a number of partly contradicting and different typologies, conceptualizations, and operationalizations. The last two sections interlink all articles published in the Special Issue to our bibliometric analysis, and also present the conceptualization of the human side and a discussion of sustainable innovations. The concluding section identifies directions for future research.

2. Explorative Bibliometric Analysis

The first question that appears when intending to conduct a bibliometric analysis on a term as broad as the “human side” of innovation is the selection of sources—in other words, what kind of academic outlets qualify. At first sight, the concept of the “human side” linked to “sustainable innovation” can be presumed to belong to the domain of research on business administration, particularly technology, innovation, and entrepreneurship. The contributions to these fields should exemplify the addressed themes and sub-themes on the interface between “human side” and “sustainable innovation” and indicate the importance of these themes over time. To capture these contributions in particular, we selected journals with sustained relevance over the past few decades and recognized prominence in the fields of technology, innovation, and entrepreneurship (TIE). Given the inherent difficulty in evaluating the quality of journals, and as different rankings and assessments populate the research landscape, we decided to take a mixture of widely accepted cross-sectional and longitudinal measurements. Therefore, we used four sources that have proven useful in the context of rankings, ratings, evaluations, or quality judgments:

1. Meta-ranking of TIE journals (1984–2004) [8,9];
2. Google Scholar ranking in Innovation and Entrepreneurship 2019, https://scholar.google.com/citations?view_op=top_venues&hl=en&vq=bus_entrepreneurshipinnovation (accessed on 1 October 2020);
3. TIE ranking of the German Academic Association for Business Research (VHB) (JOURQUAL 3) 2015, <https://vhbonline.org/vhb4you/vhb-jourqual/vhb-jourqual-3> (accessed on 1 October 2020);
4. H-index > 100; 2020 based on “Publish or Perish,” <https://harzing.com/resources/publish-or-perish/manual/using/query-results/metrics> (accessed on 1 October 2020).

The method identified six academic journals with a very high impact and reach over time, as evaluated and ranked by peers. All of the abovementioned four sources indicated that the six selected academic journals can be differentiated in quality from other journals over time. The order of the journals as they appear below does not represent a ranking. The scores of the journals differed depending on the source used.

5. *Research Policy* (meta-ranking, 1; Google Scholar ranking, 1; h-index, 224; TIE ranking, 1);
6. *Entrepreneurship Theory and Practice* (meta-ranking, 7; Google Scholar ranking, 2; h-index, 140; TIE ranking, 3);
7. *Journal of Business Venturing* (meta-ranking, 3; Google Scholar ranking, 4; h-index, 170; TIE ranking, 2);

8. *Small Business Economics* (meta-ranking, 6; Google Scholar ranking, 3; h-index, 120; TIE ranking, 9);
9. *Journal of Small Business Management* (meta-ranking, 9; Google Scholar ranking, 5; h-index, 103; TIE ranking, 7);
10. *Journal of Product Innovation Management* (meta-ranking, 2; Google Scholar ranking, 6; h-index, 135; TIE ranking, 4).

We searched the issues of these journals for articles investigating/referring to themes relevant to the human side of sustainable innovation. Given that “human side” and “innovation” are rather broad terms, we investigated all journals using the keyword “sustainable innovation” and then extracted all terms for and aggregated variables of “human side” linked to “sustainable innovation.” In other words, all the extracted variables/terms are linked to sustainable innovation and are based on human or social behavioral variables. We listed all variables that appeared the most within the three defined time periods of 2000–2006, 2007–2013, and 2014–2020 in each selected journal. The number of articles referring to the “human side” and “sustainable innovation” per journal linked to each time period is roughly indicated in units of 50 articles, as follows.

2.1. Research Policy

2000–2006 (>250): social network, community, innovation/knowledge diffusion, human capital, learning.

2007–2013 (>300): social networks, learning, organization, leadership, teams/team composition, human capital, innovation/knowledge diffusion, innovative behavior, learning, user/lead user innovation.

2014–2020 (>500): social network, community, innovation/knowledge diffusion, innovative behavior, learning, user/lead user innovation, consumer, teams/team composition, human capital, organization, leadership, gender, education, social influence.

2.2. Entrepreneurship Theory and Practice

2000–2006 (<50): organizational culture, self-efficacy, opportunity recognition, knowledge diffusion, entrepreneurial learning, entrepreneurial behavior, entrepreneurial orientation, trust, entrepreneurial team, gender, social networks, family.

2007–2013 (>150): entrepreneurial orientation, entrepreneurial learning, human capital, social networks, entrepreneurial team, self-efficacy, entrepreneurial behavior, gender, knowledge diffusion, entrepreneurial education, family.

2014–2020 (>150): gender, innovative behavior, entrepreneurial orientation, entrepreneurial creativity, social networks, entrepreneurial organization, self-efficacy, human capital, family, opportunity recognition, entrepreneurial passion, entrepreneurial team.

2.3. Journal of Business Venturing

2000–2006 (<50): entrepreneurial learning, entrepreneurial orientation, social networks, entrepreneurial leadership, human capital.

2007–2013 (>100): entrepreneurial orientation, social networks, sustainability orientation, entrepreneurial intention, entrepreneurial passion, opportunity recognition, entrepreneurial culture, entrepreneurial education, entrepreneurial teams.

2014–2020 (>100): entrepreneurial orientation, opportunity recognition, collective action, entrepreneurial teams, entrepreneurial vision, innovative behavior, entrepreneurial intentions, conflict, entrepreneurial culture, social identity, socio-cognitive traits.

2.4. Small Business Economics

2000–2006 (<50): human resource management.

2007–2013 (>50): knowledge, entrepreneurial orientation, human capital, social networks, opportunity recognition, family, knowledge diffusion.

2014–2020 (>50): social networks, entrepreneurial creativity, human capital, organization, entrepreneurial behavior, opportunity recognition.

2.5. *Journal of Small Business Management*

2000–2006 (<50): social networks, ethnic entrepreneurs.

2007–2013 (>100): entrepreneurial orientation, organizational climate, culture, knowledge, entrepreneurial personality, family, entrepreneurial motivations, social networks, entrepreneurial behavior, leadership, education.

2014–2020 (>150): organizational culture, entrepreneurial orientation, social networks, leadership, human capital, gender, family, opportunity recognition, self-efficacy, teams, entrepreneurial intentions, education.

2.6. *Journal of Product Innovation Management*

2000–2006 (>100): knowledge diffusion, culture, learning, teams, leadership, education.

2007–2013 (>250): social networks, customer/consumer, lead user, organizational climate, creativity, teams, innovation diffusion, education/training, culture, organization.

2014–2020 (>150): social networks, family, customers, teams, innovative behavior, sustainable orientation, social identity, organizational culture.

The authors carefully reviewed more than 3000 journal articles. Some of the revealed terms indicated overarching dominance throughout the journals, such as “social networks” or “human capital”; others were domain specific to certain journals, such as “self-efficacy.” The periods 2000–2006, 2007–2013, and 2014–2020 did not show actual significant differences in elicited terms/variables. However, variables such as customer/consumer, lead user, family, gender, leadership, and teams seemed to appear more frequently in later periods. Moreover, the total number of articles with the term “sustainable innovation” increased over time, from roughly 600 articles in 2000–2006 to roughly 1200 in 2014–2020. However, in three of the journals, the period 2014–2020 showed decreasing growth or a flattening curve, indicating that research on the human side of innovation is showing signs of saturation. Based on the revealed variables, we constructed a conceptual model and discuss this in the next section.

3. Conceptualizing the Human Side

In the literature on the human side of innovation, three main clusters of variables appear consistently [10,11] (see Figure 1). When considering the human side, the smallest element is the human, followed by human-to-human interaction as dyads, triads, and larger constellations up to societies. All individual or interactive human behavior is affected by norms, values, laws, and institutions, whether managed or manipulated. Individual or social human behavior never takes place in a vacuum.

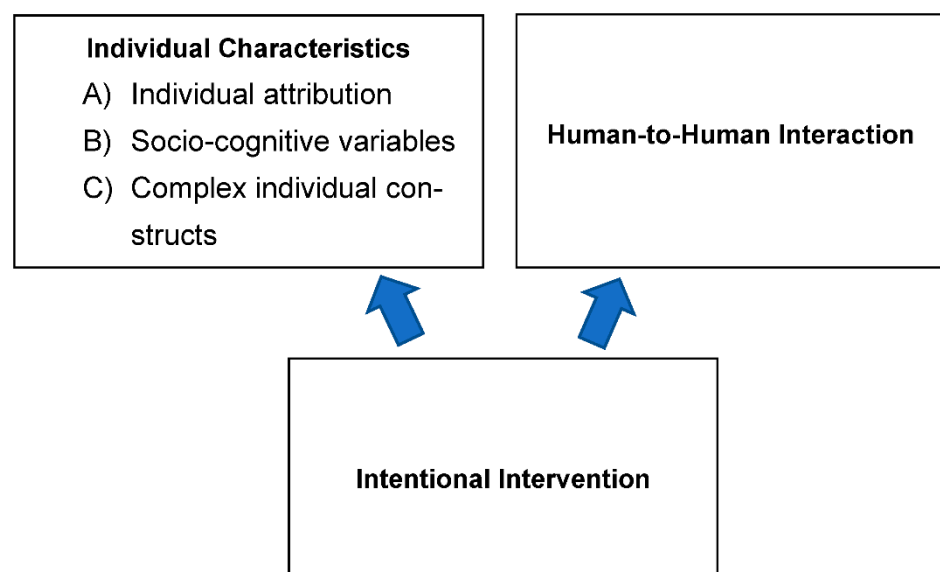


Figure 1. Conceptualization of the human side.

The first cluster covers “human” or individual characteristics, which have four dimensions. The first dimension covers variables that represent individual attributes, such as gender or, later in time, customers or lead users [12]. The second dimension relates to individual characteristics that cover a more complex issue, such as human capital or identity. Davenport provided a comprehensive summary of all aspects of human capital to be considered in the context of human management [13]. The third dimension encompasses variables that focus on the psycho-cognitive status of individuals, such as opportunity recognition, entrepreneurial orientation, self-efficacy, entrepreneurial intentions, and entrepreneurial passion. Most of these terms and variables first appeared in research on entrepreneurship in the 1970s and 1980s. The most prominent journals in this realm were established during this time: *Entrepreneurship Theory and Practice* in the 1970s, and *Journal of Business Venturing* in the 1980s. Most of the terms were conceptualized in the context of innovations in these journals for the first time. The fourth dimension assesses all behavioral constructs, such as learning, innovative, or entrepreneurial behavior, e.g., [14].

The second main cluster on the human side is the entire breadth of variables related to human-to-human interaction. In sociology, there is a strong link between these aggregated variables and the development of, for example, human capital [15]. The most central variable in this category is social networks, from which many other variables can be derived, such as culture, knowledge, teams, family, communities, conflict, social influence, collective action, and innovation/knowledge diffusion. Social networks began to be of academic interest linked to innovation in the 1960s and 1970s, when realms such as diffusion of innovation, R&D teams, and gatekeeping began to be investigated, e.g., [16,17]. Since then, an increasing number of publications has examined social networks as a major source of innovative endeavors.

The third cluster represents all the variables that describe intentional interventions for clusters one and two. This cluster encompasses variables such as education, organization, management, and leadership. Innovation-related activities have a long history of intentional interventions, from systematic design methods to agile management, design thinking, and lean entrepreneurship, e.g., [18–21].

We cannot claim this conceptualization to be completely comprehensive. However, all of the terms and variables extracted via bibliometric analysis can be sorted into the conceptual model, and as such, it might serve as a skeleton of the human side in research. In reality, no innovation will appear without touching all three dimensions. As humans are “in the game,” they inevitably interact and follow norms or guidelines. The “human side” inherently refers to sustainable innovations; the next section provides a more detailed view of sustainable innovations.

4. Sustainable Innovation: Typologies

As Cagarman et al. [22] discussed and indicated through a small study in Germany, the term “sustainability” might be perceived very differently in various parts and economies around the globe. In countries such as Germany and France, where social security and support developed as a governmental activity, the term “sustainable” might intuitively be much more closely connected to ecologically/environmentally driven commercial enterprises, whereas in countries in which social security and support emerged owing to privately organized endeavors, such as the US or UK, the perception of “sustainability” shifts much closer toward social entrepreneurship and innovation [22].

We considered the possible legal structures of “sustainable” enterprises and resulting innovations, and our findings were similar to those of Weber and Kratzer [23], who analyzed data from the Schwab Foundation on social entrepreneurship, spanning the whole range from charities to profit-driven companies, as displayed in Figure 2. The issue that emerged when examining social, ecological/environmental, or sustainable enterprises was the extent to which profit or shareholder value could be maximized. Regarding economy-dominating international corporations, economic goals seemed to take priority over other goals. However, at the same time, all corporations tended to present themselves

as having sustainable product and market strategies, as well as placing high importance on corporate social responsibilities.

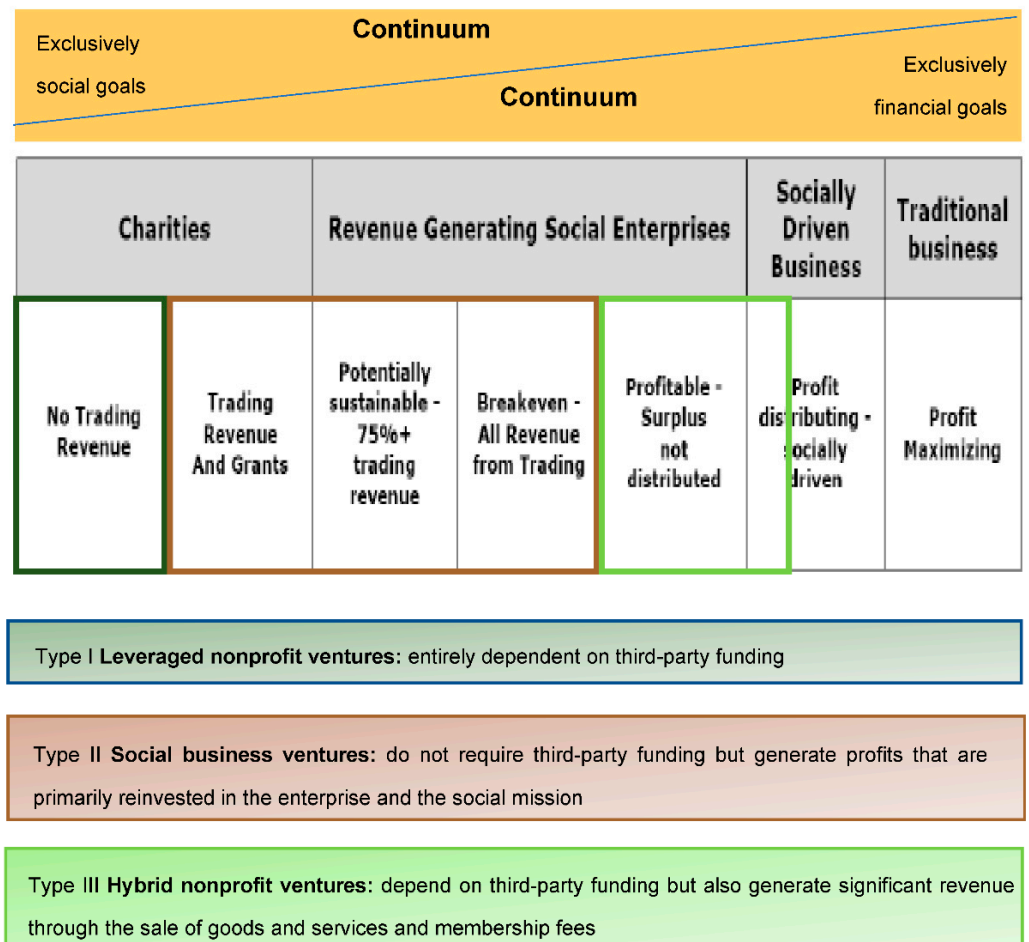


Figure 2. Typologizing the legal structure of social enterprises. Adapted with permission from [23]. Source: Schwab Foundation for Social Entrepreneurship, 2012 (<https://www.schwabfound.org/> (accessed on 1 October 2020)).

Weber and Kratzer [23] drew a line within the group of hybrid non-profit ventures and excluded profit-maximizing traditional businesses from their analysis. However, one central question remained unanswered: What balance between social, ecological/environmental, and economic goals characterizes sustainable innovations? In addition, do we classify innovations as being sustainable when causing slightly less unsustainable externalities, as in the chemical or energy sector, or do innovations only reach the threshold of being sustainable when they significantly improve environmental or social issues? Many questions require answers before research can advance toward a unique understanding of sustainable innovations.

Other lines of approaching the term “sustainable innovation” in the literature tended to be content-driven conceptualizations and operationalizations. In this realm, the focus on terms such as “green” or “eco-innovation” were most often synonymously applied to sustainable innovation, and very prominently so. A summary of existing concepts can be found in De Pra Carvalho et al. [24]. In the 1990s, the conceptualizations concentrated on the reduction and diminishment of negative environmental externalities [25]. Later, social innovations were also considered in this regard [26]. More current works have conceptualized environmental performance. One example for investigating environmental performance might be a study of 245 Chinese enterprises by Dong et al. [27]. A factor analysis elicited four types of sustainable innovations, from which only two may be independently applied

by enterprises: first, measures that attempt to increase environmental performance (reducing material, energy, water, emissions, and replacing non-renewable energy, materials), and second, measures to increase competitiveness (pollution control, image, patents, and R&D investments). The other two factors, environmental regulation and regulatory execution, depend upon the authority of governments. However, the aforementioned study [27], like most other studies in this field, focused on economic performance as the outcome variable. Other studies have defined and investigated outcome variables that are more specific to sustainable innovation in terms of social and/or ecological/environmental innovation.

One attempt to capture sustainable performance beyond purely economic measures can be found in Weber and Kratzer's work [23], which operationalized social impact (aggregated from the variables of direct beneficiaries, result tangibility, and extent of effect) and social replicability (aggregated from the variables of adaptability and potential expansion) next to financial outcomes. Other research has used patent data and descriptions to measure sustainable innovations beyond economic value creation [28], or adopted a technometric approach to measure the net social utility of innovations [29]. Other studies have also modified the method of lean entrepreneurship [21] to develop an approach for measuring sustainable return on investment (SROI) [30]. An overview and summary of possible measurements and operationalization of sustainable innovations can be found in the study of Gunarathne [31].

Another line of research has defined and characterized the innovator. We identified a number of such classifications. Green innovators and entrepreneurs have been described, for example, as "visionary champions," "ethical mavericks," "innovative opportunists" [32], and "green change agents" [33], or as "alternative actors," "ecopreneurs," and "bioneers" [34]. A good example is the field of biofuels, which was very prominent a few years ago and one of the main topics in the cleantech investment hype within the venture capital space. Young companies such as Amyris, Codexis, LSN 9, and Gevo, which were all founded between 2002 and 2005 by "visionary innovators," had driven the discourse on this topic in cooperation with large oil companies [3]. Lubberink et al. [35] conducted an empirical study of social innovation and presented a typology that distinguishes between "rushing social innovators," "wayfinding social innovators," and "rigid visionary social innovators." All these classifications showed similarities and overlaps, as well as some distinct features.

Certainly, sustainable innovation can be described by many more classifications, conceptual approaches, definitions, measurements, and operationalizations. However, all research into sustainable innovation faces the problem of ambiguity in multiple respects. Due to a lack of consensus on definitions, conceptualizations, and operationalizations, the research suffers from an inconsistency of results that cannot be compared. The discussions show the triple bottom line as a sustainable balance of economic, ecological, and social goals and general agreement among scientists appears to splinter into globally different perceptions of sustainable innovation; different approaches in balancing social, ecological/environmental, and economic aspects; several classifications and definitions of what "sustainable innovations" and "sustainable innovators" are; and finally, countless measures and operationalizations for capturing social and ecological/environmental value creation. When glancing through the literature of the past few decades, we found a change in the accentuation of certain aspects, from reductions to more radical changes in processes, products, and life cycles. However, the mind-boggling diversity of terms, conceptualizations, measurements, and operationalizations has remained.

5. Synthesis of Current Special Issue Contributions

Now that we have presented the different and complex aspects of our study to the Special Issue: The Human Side of Sustainable Innovations, we will reflect on the single contributions to the context of our discussion. The articles considered in our study cover a wide range of themes, from individual behavior and perception in teams and collective decision-making, to co-working, interventions from start-up accelerators, and

rural development programs. Thus, all three blocks in Figure 1 were equally covered. None of the articles apply economic value creation as a central dependent variable.

With reference to Figure 1, beginning from individual characteristics, two articles address this point. Fernqvist and Lundqvist [36] examined the behavior of insiders who initiate decisions toward energy transition. The qualitative study focused on insiders—business owners, directors, managers, and researchers—to identify their motivations, personal beliefs, and actions or behaviors toward (sustainable) transitional effects. Möller and Herm [37] defined user innovators as consumers who contemplate starting a company and bringing innovation to the market. User innovators are classified as green entrepreneurs when they profess environmentalism. This operationalization might be close to the definitions of lead users or, in this case, green lead users [38]. In comparing green entrepreneurs with other consumers, the authors highlighted that green user entrepreneurs' perceptions of business performance are superior to those of non-green user entrepreneurs.

Two publications address human-to-human interactions in their analysis. Lopes Reyes et al. [39] confirmed the role of collective decision-making in making sustainable decisions actionable. The authors proposed establishing a much stronger human-centered approach in decision-making by adding and integrating extrinsic or external factors explicitly in collective decision-making. This study was based on a comprehensive literature analysis. Cagarman and von Arnim [40] examined start-up teams and their tendency to engage in cooperation and co-working. They indicated that ecological-oriented entrepreneurs tend to utilize all three forms of university–industry collaboration, product and prototype development, and support from professor–student collaborations. On the contrary, social-driven start-ups are not likely to adopt any kind of collaboration with universities. Ventures with economic SDGs are prone to employing product and prototype development along with support from professors.

The third type of article on interventions related to human characteristics and/or human-to-human interaction investigate the role of start-up incubators and participation in framing rural development programs. Casilino and Menteleone [41] presented a case study in the Italian region of Friuli Venezia Giulia. Their results implied that higher participation of all groups and stakeholders enhanced the number and impact of sustainable innovations in European development programs. Butz and Mrozewski [42] investigated the role of start-up accelerators by looking at the differences between the nature of commercial and impact accelerators, which follow the traditional approach and focus on economic prosperity, and those between incubators that focus on sustainable entrepreneurship and innovation. Their empirical study confirmed remarkable differences.

In summary, the six articles covered the entire range of topics that fall under “the human side of sustainable innovation.” The first article pertains to the frameworks of political programs to propel sustainable innovations. The second examines the improvement of decision-making toward sustainable transition by adding human-centered meaning. The third investigates individual behavior in initiating energy transitions. The fourth classifies user innovators and shows their different perceptions on green entrepreneurs. The fifth investigates the nature of accelerators concentrating on sustainable innovations compared to traditional and commercial accelerators. The sixth article shows that co-working propels the prioritization of social and environmental SDGs in start-up teams. This diversity can be found in the attention to the individual, human-to-human interaction, and intervention levels; the choice of dependent variables in capturing sustainable innovation; and the applied balance of the social, ecological, environmental, and economic aspects of sustainability. The articles look at sustainable innovations in different ways. Some use it as a very general and largely undefined term; others emphasize roles, such as green entrepreneurs. Yet other articles apply the SDGs as dependent variables. Although the selection of articles in our work was far from being random or comprehensive, the resulting diversity mirrored the current ambiguity of research in this field.

6. Directions for Future Research

We identified some general points of common agreement among researchers in the area of sustainability. The world is facing an increasing challenge in tackling sustainability issues with social, ecological, environmental, and economic aspects, which can be balanced and modeled along a triple bottom line. All these issues are expressed in the 17 UN SDGs and can be broken down into sub-goals. However, these widely common agreements exist at a very high level of abstraction, below which the lines of discourse are fragmented.

The definitions of the triple bottom line and SDGs are far from clear, and no precise conceptualizations or operationalizations are available. Future research may address this issue of ambiguity in two ways. First, the experimental settings could inform the interpretation and recognition of the SDGs in different countries and economies. Second, researchers could attempt to operationalize SDGs with measurable indicators. Considerable effort will thus be needed to establish generally accepted metrics. In addition, the major problem is that the SDGs are formulated with internal inconsistencies and contradictions. For example, SDG #8, which talks about economic growth, may contradict the idea of sustainability, which precludes infinite growth on a finite planet. In addition, the cyclic nature of economic development and growth in general is contrary to the goal of sustainability, which is aimed at the preservation or maintenance of a certain state or function. These contradictions embedded in the SDGs hamper their application in general [43]. Future research needs to investigate these inconsistencies and contradictions.

Meanwhile, the discourse is muddled by countless attempts of “greenwashing” and “greenscamming” business actions. The increasing number of “green” and “eco” labels or greenscamming organizations, such as “The Sahara Club,” “The Alliance for Environment and Resources,” “The Global Climate Coalition,” or the “American Council on Science and Health,” exemplify this [44].

Therefore, future research needs not only a clear view of sustainability but also a common agreement on the accepted share of sustainable and unsustainable behavior of role players, such as enterprises or governments. At present, it often appears that 90% of unsustainable actions are masked by 10% of sustainable behaviors that are prominently made public. Figure 2 shows one attempt to focus on this issue. However, merely looking at the legal setup of enterprises might not be concrete enough. Future research should investigate the share and magnitude of sustainable actions and behaviors instead of looking only at their existence.

A third direction of future research, particularly in the fields of technology, innovation, and entrepreneurship, should concentrate on executing comparable studies and experiments that allow for repeated research. With regard to research, unlike business administration research, not every new study requires entirely new research questions, conceptualizations, and operationalizations. This requirement of novelty prevents any progress in research. Research results and new research attempts have to be aligned, and repeated studies within other settings or mere extensions of prior research should be given attention.

The last two suggestions for future research relate to the diversity and conduct of research. Given that sustainability and sustainable innovation touch all facets of human life, maintaining the diversity in the themes and topics of research, similar to this Special Issue, are required and appreciated. However, research should slowly tread the path of executing longitudinal studies that capture causal effects better and account for all phenomena around sustainability as a multi-level phenomenon.

The relevance of the human side of sustainable innovation in practice is shown by examples such as biofuels and bioplastics. Visionary innovators, acting as entrepreneurs who founded young companies, have enabled sustainable innovation. Sustainable venture capital has also played a key role [45]. Performance parameters and measurement are, in practice, increasingly important, amid the general trend toward sustainable investments outside the area of risk capital [46]. Nevertheless, the definition of widely accepted sustainability performance criteria remains underdeveloped compared with the sophisticated

traditional performance measurement frameworks. Future research and development should concentrate on methods that synthesize adaptable and generic sustainability evaluations as well as analytical and conceptual models [47]. In addition, measuring and forecasting actual impact should be at the core of any measurement and evaluation of sustainable performance.

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