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Article

Open Innovation and Determinants of Technology-Driven Sustainable Value Creation in Incubated Start-Ups

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Abstract: Business incubators ensure networking and facilitate Open Innovation (OI) collaborations both inside the incubator among entrepreneurs and outside with external stakeholders. Recently, the sustainability and the promotion of environment-friendly businesses has become an important focus for the business incubators. Sustainability-oriented business incubation is a relatively new and emerging topic both for scholars and BI practitioners. This paper aims to explore the theoretical groundings for the business incubation perspectives in facilitating sustainable value creation through OI approaches and to test research instruments exploring determinants of the technology-driven sustainable value creation in incubated start-ups in Latvia. Through the pilot survey, this study will also increase the awareness on the importance of the OI and the creation of sustainable value, and provides the preliminary results to be considered by scholars and practitioners. Results show that climate change, as a planetary boundary, positively stimulates incubated start-ups to improve their technology-driven sustainable value creation. However, sustainability ambition, if negatively influenced by the incubator location, negatively affects the technology-driven sustainable value creation. These results on the sustainability scale within the business incubation of start-ups contribute to the new theoretical concepts, related to integration of the sustainability issues and OI practices within business incubation.

Keywords: technology-driven sustainable value creation; incubated start-ups; Latvia; sustainable strategy; sustainable ambition; planetary boundaries

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1. Introduction

Open innovation (OI) is the actual framework for exploiting external resources and wider networks so as to accelerate innovation instead of just operating with in-house resources [1]. Scholars believe that OI has increasingly facilitated the development of business incubators (BIs) during the last decade and BIs have gone through several stages of evolution from regional and university incubators to more specialised BIs and other approaches to start-up promotion [2].

This study explores the situation of Latvia, business incubators operated by Latvian Investment and Development Agency (LIDA) and incubated start-ups. LIDA is one of the most important intermediary organisations providing different support incentives to entrepreneurs and start-ups. LIDA has comparatively large experience in the business incubation sector. LIDA was the supervising body for the business incubators funded by European Structural Funds in the period (2007–2013) when regional incubators were operated by private partners attracted through the public procurement. Then, starting from the previous EU planning period (2014–2020), and in this period (since 2021), regional incubators are operated by LIDA. OECD [3] has acknowledged that LIDA is one of the most effective intermediary bodies for the promotion of the open innovation system as it has close links with higher education institutions, research institutions, financing institutions and business representatives.

The OECD assessed the innovation diffusion within Latvia, which is the ability to gather new ideas from external resources outside the company, and using these ideas for the introduction of the innovation [3] that is one type of OI. According to OECD, the start-up ecosystem in Latvia is dynamic with a growing potential of innovation diffusion and development. The national innovation system in Latvia is gradually changing towards an open innovation system, where start-ups play the most important role in promoting and using innovation diffusion [3]. However, there are several obstacles that prevent the innovation diffusion and the adoption of OI practices. The stakeholder collaboration and a trust to cooperate as an important prerequisite of the OI is more common among personally known partners. There is a lack of cooperation between entrepreneurs and the academic community, and the importance of these interrelations has not been acknowledged. Furthermore, OECD highlights the need to strengthen the systemic approach encouraging multi-actor cooperation. Small entrepreneurs and start-ups lack the knowledge and time to engage in the OI activities and attract external knowledge for the development of innovation [3]. Although, the start-up ecosystem is one of the most active and shows dynamic development, in recent years, during the COVID-19 pandemic, the number of start-ups, their survival rate and the growth potential has declined in Latvia, and their recovery will require more than a decade [4]. The incentives for the promotion of the entrepreneurial and innovation ecosystem, innovations, technologies, R&D and a green transition have been identified as promising tools to support this recovery and further development of start-ups [4].

BIs, being an important intermediary actor of the entrepreneurial ecosystem [2], provide support in the creation of new ventures or the scale-up and growth of incubated businesses, namely, tenants [5,6]. Business incubators (BIs) support start-ups in dealing with the uncertainties and overcoming the overwhelming challenges of growth. Business incubators ensure networking and facilitate OI collaborations both inside the incubator among entrepreneurs and outside with external stakeholders. This is a comparatively new research domain within business incubation studies and, as such, it lacks knowledge [6]. Accordingly, the use of the OI approach in business incubators and incubated start-ups is an existing knowledge gap, as there is a lack of detailed studies creating a theoretical basis for the use of the OI approach within business incubators. Although in this respect certain contradictions between the theory and practices are formed, as business incubators have an encouraging environment in which to use the OI approach, moreover, this approach is eventually used without the realization that it is OI and is used without any methodological prescriptions. This determines the first motive and relevance for conducting this research in order to broaden the theoretical understanding of the researched questions, as well as to develop and pilot research instruments for future studies. Recently, sustainability or circular transition and the promotion of environment-friendly businesses has become an important focus for business, and consequently business incubators [7]. Sustainability implies creating a wider positive impact on the environment, society and various stakeholders. From companies and business incubators, it requires significant changes in the current management and business practices. Currently, there is a lack of such experience and approved practices on how to create a wider sustainable impact. The ability to adapt to such changes is a challenge for business support organizations (including business incubators), entrepreneurs and start-ups [7]. Sustainability-oriented business incubation is a relatively new and emerging topic [8]. Recently, more and more companies acknowledge the importance of sustainable value creation, as well as the business opportunities provided by sustainable innovations that require new paradigms in business practices, attitudes, values, cooperation, shared responsibilities with regard to risks, resource allocation and value creation [9].

Sustainable business does not mean charity, but integration of the sustainable value creation within the business model [10]. The European Investment Bank, as well as Latvian commercial banks and investors, are paying more attention as to how companies will be able to perform and report on environmental sustainability, social responsibility and

corporate governance, and this framework more commonly known as the abbreviation ESG and associated with sustainability [11].

Researchers have previously concluded that OI enhances the sustainability, eco-innovations and technological development [9], but acknowledged the need for more detailed investigation of this relationship [12]. This is the essential question in the context of this study, as the adoption of the OI approach in business incubators lacks theoretical and conceptual guidelines, but it is an essential component for creating the sustainable value in the incubated start-ups. This study will motivate the academic discussion about the need for further studies to explore and define new guidelines for a more successful integration of the OI approach in business incubators in order to promote the creation of sustainable value, which is an inevitable transition in the coming years. These challenges are very important and individual solutions are not suitable, so it is important to build global practice and knowledge on how to use OI for creating the sustainable value with a positive social and environmental impact [9]. Business incubators have already proven their ability to act as a driving force for start-up companies and their support ecosystem. There is a fundamental reason to consider that business incubators have a hitherto underappreciated role in promoting sustainable, eco and social innovations directly in the start-up ecosystem, as they have a wide network of partners and tools for motivating the cooperation of various involved parties [13].

This article fills the research gap by defining the main determinants for the creation of technology-driven sustainable value in incubated start-ups, as well as specifying the quadruplex helix cooperation model as the framework allowing integration of sustainability issues and OI practices within the business incubation and start-up ecosystem.

The authors have an ambition to conduct a national study in Latvia on the determinants of technology-driven sustainable value creation in incubated start-ups and the role of OI approaches.

The understanding of responsible and sustainable business and its important role in the business environment of Latvia is increasing. The results of the Sustainability Index are clear proof of this. The recent results of the annual Sustainability Index assessment in Latvia show an increasing interest of various organizations in participating in this assessment. However, the number of participating organisations able to achieve the minimum threshold of the Sustainability Index is slowly increasing and in 2022 the number of such organisations was 78. The organizations that received the Sustainability Index rating are mostly large and medium-sized. The Sustainability Index is not a competition, but any company or organisation may obtain the Sustainability Index ranking measuring how far a given organization is on its way to sustainable business practices [14]. However, small or micro SMEs and start-ups have not passed the Sustainability Index ranking and the total number of organizations listed in this rank is relatively low.

The purpose of this paper is to explore the theoretical groundings for business incubation perspectives in facilitating sustainable value creation through OI approaches and to test research instruments exploring determinants of the technology-driven sustainable value creation in incubated start-ups of Latvia. By this study we also increase the awareness on the importance of the OI approach and the sustainable value creation within the ecosystems of start-ups and business incubation. Moreover, the case studies of Estonia and Finland, as well as the interviews with international experts, have proved the necessity to expand this study to a transnational level.

There are three main tasks:

1. To identify business incubation trends and further perspectives related to OI and the sustainable value creation perspectives;
2. To conduct a pilot study of incubated start-ups and to explore preliminary findings on the determinants of the technology driven sustainable value creation within incubated business start-ups;
3. To validate the theoretical conceptual model and the research instruments.

Latvia is a country motivated to strengthen its sustainability strategy and align it with more developed countries [15]. Moreover, the national innovation ecosystem of Latvia mostly focuses on technological innovations, and that is seen as an important driver for the technology-driven sustainable value creation in start-ups [16]. Previously, the authors emphasized challenges in Latvia for creating sustainable value. There is a low involvement of various stakeholders in the social innovation, which does not encourage the use of OI in sustainable value creation [17]. There is lack of knowledge and studies about social innovation [18]. Entrepreneurs lack the experience and knowledge to develop new circular business models and create a positive environmental impact [19]. The results showed that climate change, as a planetary boundary, positively stimulates incubated start-ups to improve their technology-driven sustainable value creation. However, sustainability ambition, if negatively influenced by incubator location, negatively affects technology-driven sustainable value creation. These preliminary results on the Sustainability scale contribute to the theoretical concepts related to sustainability and business incubation, as well as business incubation practice. These results are in line with the main findings from the literature review.

This article provides national findings on technology-driven sustainable value creation by incubated start-ups. Internationally it proposes the business incubator as an OI partner and a Quadruple Helix actor promoting and ensuring the incubated start-up sustainability as, what is nowadays, emerging global trend.

The article contains five sections. The introduction highlights the topicality and the research gap, as well as providing an insight into the research purpose and main tasks. Section 2 reveals the findings of the literature review and sets-up the theoretical conceptual model for this research. Section 3 describes the research methodological framework. Section 4 provides the description of the data analyses and results acquired, as well as substantiating the findings against the previous discussion of other scholars. In the last section of this article we describe the scientific and practical implications, as well as specifying the limitations of this research and identifying a future research agenda.

2. Literature Review

The literature review was conducted using articles selected from the SCOPUS database. The first search string was as follows: TITLE-ABS-KEY (“Business incubat *” OR “incubated start-up” OR “incubate”) AND (“open innovation”), accordingly 97 articles were selected for the review. The second search string was the following: TITLE-ABS-KEY (“business incubat *” OR “incubated start-up” OR “incubate”) AND ((“sustainab *” OR “shared value” OR “sustainable value”)) AND (“technolog *” OR “technology driven”) and we limited this search to the last 10 years since 2011; accordingly, in total, 375 articles were found and we prioritised the selected articles paying more attention to journals and publications with a higher citation impact. In addition, other relevant literature sources were purposely examined from the references of initially selected articles.

2.1. Business Incubators as Quadruple Helix Actors Promoting Sustainable Value Creation through OI

There are four separate important concepts that have been previously explored by other researchers—the business incubation or business incubators [20], OI [21], Quadruple Helix cooperation [22] and sustainable value creation [23]. In this section, the theoretical positions on the nature and mutual interaction of these concepts are explored.

The literature review reveals the main findings about actual trends in business incubation through the OI approach and the sustainability perspective. These trends are linked with OI due to collaboration and co-creation necessity. The concept of OI offers new strategies and practices for using not only in-house resources in the innovation process, but also to gain knowledge, new ideas and expertise from outside, in order to advance innovation (outside-in), or to share ideas and knowledge with others (inside-out). Both outside-in and inside-out OI activities contribute to advance the value creation and capturing [21,24].

The OI approach envisages the creation of new knowledge and ideas in collaboration with other stakeholders, for instance, government organizations, consultants, research centres and universities, customers, society and non-governmental organizations or other private companies considered as the triple, quadruple and penta helix cooperation [22,25,26].

Incubators are important OI Partners [27,28] for incubated start-ups and form the role of facilitator in empowering cooperation between various actors specified within the Quadruple Helix cooperation model (e.g., public and private sectors, research institutions and society) [29–31].

The scholars' discussion on multi-dimensional cooperation and co-creation is closely related to the concept of an entrepreneurial ecosystem, where incubators have been considered important in promoting new business creation and start-ups [6]. According to the entrepreneurial ecosystem paradigm, various stakeholders are motivated to collaborate or form synergies in order to be more advanced in the competition [6], which complements the general OI approach to share knowledge resources and co-create innovation.

Sustainability-oriented business incubation is a relatively new and emerging topic [8]. Researchers distinguish the impact on the entrepreneurial ecosystem level beyond the boundaries of the business incubators or tenant companies [2]. On the ecosystem level it is important that the business incubator is recognised as a valuable contributor to the sustainable regional growth and the well-being of local people by the promotion of the local entrepreneurship, use of local resources and job creation [32]. Changes in this level have an interdisciplinary nature and can also be influenced by other factors, but incubators may only have a mediating role and may depend on the collaboration with other stakeholders.

Scholars have concluded that collaboration for sustainability is a recently emerging trend and there is insufficient knowledge on these issues, borne out by the comparatively low number of publications within scientific databases [33]. Researchers can agree [33] that the importance of cross-sectoral collaboration will increase in the context of sustainable value creation. The OI approach provides several benefits motivating cross-sectoral collaboration, while the Quadruple helix may help to define the type of actors and their roles. Whereas the stakeholder theory substantiates the theoretical discussion about the cooperation of various actors [34] and the sustainable value co-creation [35], it also paves the way for important interconnectivity with OI.

OI and sustainability have a multi-level nature. The management of business incubators uses these approaches to create a favourable environment for the facilitation and promotion of incubated start-ups. Likewise, OI and the sustainability approaches have been adapted and used at a micro level in each of the incubated start-ups to create and capture value. The Quadruple Helix collaboration model forms the theoretical framework for the cooperation of four types of stakeholder groups in the sustainable value creation [36]. The Quadruplex Helix cooperation model has a common ideology with the concept of collective impact, as described by Kramer and Pfitzer [37]. This concept envisages that social problems caused by complex actions and various stakeholders require collective efforts by different actors mutually engaging in solving these problems, whereas companies must find opportunities for balancing the social impacts and economic benefits [37].

During the last 10 years the community of scholars has been increasingly discussing the promotion of sustainable and circular business model innovations and new ventures [38]. Some researchers have investigated the circular economy or green business incubators that are recently seen as important contributors to the sustainable transition and achievement of sustainable development goals [7].

The evolution of corporate social responsibility has led to the necessity of incorporating sustainable value creation within the business models of ventures [10]. Sustainable business is associated with the entrepreneur's motivation to create environmental and social values besides economic value. This means that companies, besides profit-making, are willing to create a positive impact beyond their business by improving the well-being of society or contributing with solutions to environmental or social problems [39].

Researchers have previously defined the triple bottom line to conceptualise the environmental, social, and economic performance [40] or the shared value [37]. Both these concepts insist that environmental and social performance cannot be considered as charity but should be incorporated within the business, allowing it to create monetised value as a profit, either through resources and cost savings, the introduction of new revenue streams, the creation of new products or sharing of resources [40]. According to Kramer and Pfitzer, the creation of shared value must secure the financial revenues in a way that improves the well-being of society [37].

The nature of business is changing from shark-like competition towards cooperation and creation of sustainable or shared values to address social and environmental issues [10,41]. The creation of a positive environmental impact is increasingly promoted as an essential part of business models and a value chain [42], yet positive environmental performance as a value is not precisely conceptualised [43].

The creation of shared value sets new responsibilities to companies, customers and other involved stakeholders, and each of them have different motives, but a common impact to achieve in the long term, for instance, a positive impact on the environment and planetary boundaries [44].

In the sustainable context, the shared value links the economic value—a profit and resource efficiency with the issue of ecological feasibility [45]. This means that sustainable value creation combines an economic value with delivering benefits to external stakeholders and the environment [10].

2.2. Innovations and the Creation of Sustainable Value in Start-Ups

The sustainable business requires various innovations that can provide new or better opportunities to address the needs or problems of society. The concept of sustainable business model (SBM) was developed when different types of businesses, including start-ups, began to integrate sustainability into their business operations [46,47] and within the value chain, meaning the value creation, proposition to customers or stakeholders, delivery and capturing [48].

While ordinary business models focus on the economic value creation and capturing for shareholders, the sustainable value chain differs with the ambition to create social and environmental values beyond the company, bringing benefits to society and the environment [23].

In the wider context, the environmental and sustainable value creation is linked with innovation, all forming key priorities within the Smart Specialization strategies (RIS3) [49]. The sustainable value creation requires system thinking due to the complex systemic changes and innovation involving various actors and therefore the concept of the innovation ecosystem is often exploited [23].

Lüdeke-Freund [39] insists that two motives should be distinguished for the sustainable and environmentally-friendly business performance. The first motive for entrepreneurs has been identified as being the requirement to comply with social and environmental regulations, which may lead to economic benefits or, according to the Porter hypothesis [50], stimulate innovations. The other motive, opposite to the first one mentioned, is associated with the voluntary willingness to create sustainable value as an integral part of the business model, thus creating financial or non-financial benefits for the company [39].

According to first motive (Porter hypothesis), it can be understood that environmental regulations and requirements stimulate the environment-friendly business or sustainable business practices, which results in innovation. Thus, sustainable business practices can be considered as input, but innovation as the outcome. Referring to the second motive according to Lüdeke-Freund [39], in turn, innovation can be considered as input and sustainable business practices as the outcome. However, within the debate of researchers, innovation has a common nature, also called sustainable innovation, which is associated with green, ecological and eco innovations [51]; innovations that provide new solutions to social challenges and respond to the needs of societal changes [23]. In relation to the

innovation and the sustainable value creation researchers opine that this interrelation between innovation and sustainable value creation is more complex and systemic as it must involve the shareholders of a company and various other stakeholders, employees, customers and users, suppliers, people, and the environment [23]. In the last 10 years, with the emergence of the concept of the circular economy, researchers have distinguished circular and sustainable innovations. While circular innovations are explicitly related to ecological, environmental and climate change related innovations [52], sustainable innovations assume both environmental and social issues, balancing economic, social, and environmental values [53].

The innovation for the creation of sustainable value has a multi-dimension nature. In relation to circular innovations, Konietzko et.al. [54] propose three perspectives: product or service innovation; business model innovation; and ecosystem innovation. Furthermore, Evans et.al. [23] have stressed that sustainable innovation has a systemic or a holistic nature. De Jesus et.al. [52] have distinguished various dimensions of the innovation:

1. The narrow—product, service, organisational, process and marketing, mainly associated with the products or processes in a particular company.
2. The holistic—related to the business model and the value chain or the macro systemic level, as similarly proposed by Konezko et.al. [54].
3. The nature of change—the technological innovations, non-technological innovations, incremental innovations; namely having the gradual nature of the change and radical innovations, or creating a completely new value or innovation.

These authors consider the aforementioned division in relation to the circular innovation, but it can also be considered in the wider context of sustainable innovation as having a similar nature from the perspective of sustainable value creation.

In the context of the SBM, Boons and Lüdeke-Freund [55] suggested three streams of innovations that particularly trigger sustainable value creation: technological, organisational and social (see Figure 1). These researchers believe that these streams are interrelated and can be applied within the company, two of them or all three in parallel.

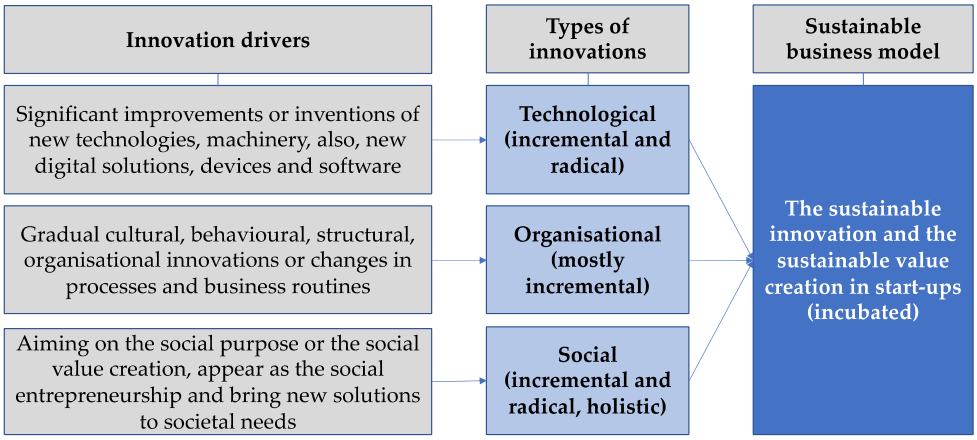

Figure 1. Drivers and types of innovations for the creation of sustainable value in start-ups (source: the authors).

This division of sustainable value creation streams is appropriate for business start-ups considering their abilities and motives for innovation and sustainable value creation. Technological development and innovation are important in the adoption of sustainable business practices and lead companies to sustainable value creation [56]. The classification and types of innovations are different, on the one hand technological changes are distinguished as one type of innovation, yet the technological progress is an important catalyst for other innovations and the sustainable value creation.

The OECD [57] defended the opinion that emerging new technologies will be one of three factors forcing companies to adopt circular business models and to create sustainable

value, especially regarding a positive environmental impact. Government organisations are prioritising support programmes and interventions for the development of green technologies or new technologies that facilitate the development of environment-friendly businesses; furthermore, in regard to start-ups of a cleantech nature, namely ventures that contribute to environmental sustainability [58].

Moreover, the creation of technology-driven sustainable value might require a relatively high investment prior to launching the business and this bears higher risks, especially for start-ups. There are a number of examples of new technologies for sustainable value creation, for energy efficiency, smart solution for monitoring and management of the consumption of energy and other resources, waste recycling, technologies for using renewable resources, electric mobility, smart mobility solutions and others. For instance, technologies for recycling waste tyres require investments in the R&D of new products, production technologies and installing new recycling or production equipment [59]. Furthermore, EU funded Horizon Europe has various projects demonstrating business cases and examples of technology-driven sustainable value creation [60].

Thus, the motivation for further investigation of sustainable value creation, particularly induced by technologically-driven innovations within start-ups, is substantiated by previous studies and the exponentially-growing European and global green transition activities.

Besides emerging new technologies, OECD has declared that new customer needs and sustainable preferences, as well as new risks, will motivate entrepreneurs to an environment-friendly and sustainable way of doing business [57]. New customer needs and business risks can both be related to the necessity of new technologies. This requires the ability, expertise and readiness of start-ups to develop and adopt these technologies. Given the sustainability challenges, start-ups must acknowledge and adapt to social, environmental and climate change challenges, and accordingly perceive the sustainability strategies [61].

Despite the importance of technology-driven sustainable value creation, little is known about its determinants. Some recent studies address factors to be investigated in future studies, such as planetary boundaries, sustainability strategy, and ambition [55,61].

Technology–driven start-ups are important actors of the innovation ecosystem, which enable technological development and innovation through multi-actor collaboration and interaction [62]. Digitalisation and new technologies, open innovation, and strong collaboration networks are important prerequisites for a well-functioning innovation ecosystem [62,63]. Given that, these prerequisites are also important drivers for the successful development of technology-driven start-ups and the creation of sustainable value with a positive impact on the environment [64]. This study contributes to the knowledge and the recently-growing discussions among scholars on circular ecosystem innovation, which is still under-researched with regard to management studies and, more specifically, in relation to the incubation and start-ups [54].

Technology-driven sustainable value creation is considered in relation to the circular economy business principles, especially, recycling, remanufacturing, developing biodegradable materials, solutions for using of renewable energy and others [65].

2.3. Determinants of the Creation of Technology-Driven Sustainable Value in Start-Ups

According to Kuckertz et.al. [61], there are three determinants of technology-driven sustainable value creation: planetary boundaries; sustainability strategy; and sustainability ambition (Figure 2).

In the context of this research, the term planetary boundaries is understood to be the intention of start-ups to respect the global ecological challenges and introduce solutions to these environmental problems within the value chain of a business model and in creating a sustainable value. Previously, researchers identified nine global ecological challenges that characterise planetary boundaries [61,66–68]. Three of these planetary boundaries (i.e., climate change, loss of biodiversity, acidification of the ocean, nitrogen and phosphorus production) are beyond their critical values [61,66]. These ecological challenges are societal problems that the public sector and society are unable to address and pro-

vide new opportunities to business for developing new sustainable business models and innovations [10].

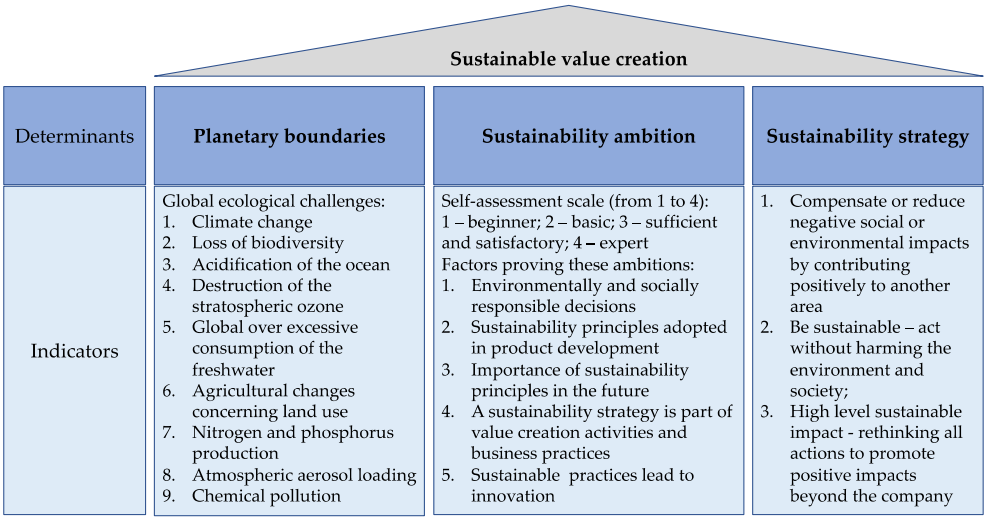

Figure 2. Determinants of sustainable value creation (source: authors).

The next question or determinant for creating sustainable value is start-up consciousness and concerns putting effort into creating sustainable value. In relation to environmental issues, there is the scholars' discussion about the green business mindset, where sustainability thinking, values and concerns play a decisive role [69]. Social and environmental consciousness motivates entrepreneurs and start-ups to consider how to implement sustainable business practices and a suitable strategy for creating sustainable value [56]. Researchers have paid attention to the study of sustainable and green competences, which form both the awareness of sustainability and the future ambition to think about the adaptation of sustainability principles in business [70].

The sustainability ambition, applied both on the individual and company level, has a multi-dimensional nature and can be regarded as the sustainability attitude and a value orientation, the sustainability awareness and knowledge, ability, and willingness to create the sustainable value [71]. The level of sustainability ambition can be different, and researchers propose to determine the measurement scale of the sustainability ambition level from the beginner to advanced or sophisticated level [61,72].

The tension of the sustainability ambition is also considered by specific actions or principles adopted by the company, or the efforts invested leading to the sustainability values. Researchers have paid attention to issues that form the sustainability ambition, for example, the environmental and social responsibility applied in various business processes, e.g., human resources management, sustainable jobs, sustainable performance management, sustainable performance motivation system and other strategic issues in the company [70,71]. Sustainability competences and ambitions are also required for the creation and management of sustainable and resource-efficient production, the organization of supply chains and logistics processes that comply with sustainable principles. The green and pro-environmental behaviour of customers is also relevant as it encourages entrepreneurs to focus on sustainable values and ambitions to create a positive social and environmental impact [73]. Based on the literature review we have listed determining aspects demonstrating the sustainable ambition and efforts in the company (see Figure 3).

The sustainable ambition and values are especially important for entrepreneurs, as in a sustainable business model, economic values and profiting goals must be balanced with social goals—to ensure a positive impact on the environment and society. The sustainability ambition helps to understand and build such an individual and organisational balance between economic and sustainable values. Every organization or a company affects the environment through its activities implicitly or explicitly [74].

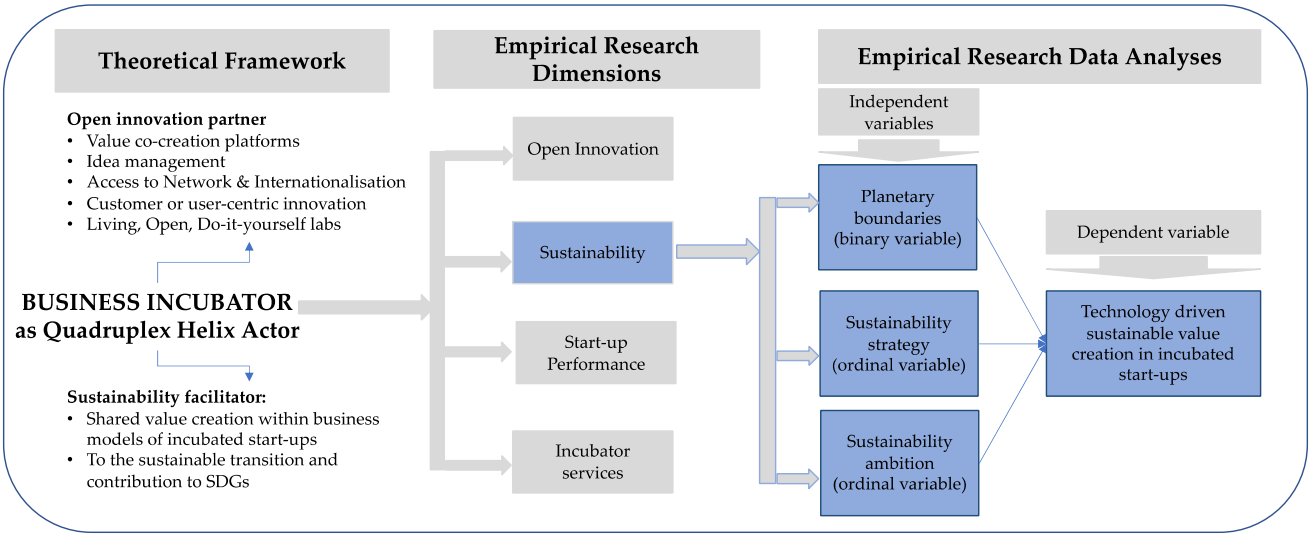

Figure 3. The theoretical conceptual model (source: the authors).

Sustainable value creation does not appear just with ambition, it requires organisation and allocation of reasonable and thoughtful decisions, the ability and a commitment to deal with environmental and social issues as part of the value creation, namely the sustainability strategy intended by the company [46].

Assuming the nature of incubated business start-ups, they are devoted to developing minimum viable products, finding customer segments and appropriate value propositions, testing and validating their business models, considering scale-up possibilities [75]. Accordingly, at the start-up level, the strategies are simple and easy to understand without complicated organizational processes, and this also applies to sustainability strategies. Start-ups are less bureaucratised and formalised with the implementation of strategies and are much more open and dynamic to social and eco innovations, ready to experiment with the most appropriate sustainable business models and revenue streams [76]. Depending on the sustainability ambition and start-ups' motivation to contribute positively to social and environmental issues, start-ups can introduce different activities and approaches in the company. Researchers suggest three sustainability strategies for start-ups [46,61]:

1. Compensate or reduce—while creating harmful and negative social or environmental impacts in one area, contribute positively to the sustainability issues in another area.
2. Be sustainable—do not create negative social or environmental impacts, and purposely organise business activities—production or delivery of services—in a sustainable way.
3. High level sustainable impact—a start-up invests efforts into solving broader environmental or social issues, incorporating this ambition into the business model essence and creating the sustainable value far beyond the company's boundaries.

Previous researchers [61] suggest strategies that have been mentioned with a focus on ecological issues, but it can be regarded to the wider sustainability context, also, assuming societal or social issues. The first strategy, mentioned above, encounters minimisation of negative environmental effects caused by the company. This means that a start-up may have business activities, which negatively affect some social or environmental issues, but it has sustainability concerns to minimise these effects or contribute positively to environment and society in other areas. For instance, if a start-up produces cosmetic products in plastic (polymer) packaging, it provides the customer with a packaging take-back option for recycling purposes.

The second strategy aimed at business activities does not create any harmful impacts on the environment or society. For instance, the start-up may design a product with a biodegradable packaging, apply sustainability criteria in the supply chain when selecting the suppliers, and also provide instructions to customers on proper disposal of the packaging.

The third-most advanced sustainability strategy envisages the creation of more environmental and social benefits than a start-up gains from socio-economic and natural eco-systems. For instance, the start-up decides to solve the problem of a huge number of end-of-life tyres becoming waste. Thus, a start-up develops new technologies for the tyre upcycling and introduces innovative recycled rubber-based products in the market [59].

2.4. The OI Approach and the Sustainability Dimensions within the Business Incubation

The literature review leads to the following trends in the recent development of business incubators and incubated start-ups:

1. OI inbound and outbound practices are beneficial and meaningfully utilised by incubated start-ups, and are mainly performed in the following ways: (a) customer involvement in innovation and co-creation of the value [77,78]; (b) external networking [78–81]; (c) knowledge exploitation and provision [82–84]; (d) idea management [85–87];
2. Globalization and internationalization facilitated by OI strategies, activities, actors and artefacts [88–91];
3. Start-up performance such as competitive ability [92,93] and innovative performance [94,95];
4. Start-up sustainability orientation [96–99], planetary boundaries [61,68], sustainable strategy [61], sustainable ambition [61,72] and sustainable or shared value creation [10,42,61,100,101];
5. Sustainability and sustainable value creation promoted through OI [7,25,102], particularly that recently promoted by the green course of the EU agenda [103] and Sustainable Development Goals globally [104,105].

The sustainability perspective and OI approaches allows the internal boundaries of business incubators to be expanded. Business incubators surrounded by other stakeholders within the innovation and entrepreneurial ecosystem may act as the facilitators or mediators for start-ups in sustainable value creation. The incubators have appropriate structure and capabilities to interact with other stakeholders within the entrepreneurial ecosystem and thus the ability to expand its facilitator roles [20].

Based on these findings there are three research dimensions and related theoretical concepts defined:

1. The OI approach in business incubation such as OI inbound and outbound practices, OI challenges and benefits;
2. Start-up sustainability orientation, mainly the sustainability strategy and an ambition, planetary boundaries, sustainable business models and value creation, particularly a deeper analysis of technology-driven sustainable value creation;
3. Start-up performances, such as competitiveness and innovation, as well as the incubators' services, are complementary as they contribute to the adoption of the OI and sustainability approaches.

Based on these dimensions we have created a theoretical conceptual model (Figure 3) and a structure of the survey to explore and compare the discourse of the scholars with the practices.

3. Methodology

This pilot study is examining the case of Latvia, particularly business incubators operated by the Latvia Investment and Development Agency. Mixed methods were used according to the overall methodological framework (see Figure 4). The research methods applied—the literature review, semi-structured interviews and a pilot survey in Latvia Investment and Development Agency (LIDA) business incubators of the Business Incubation programme funded by EU structural funds.

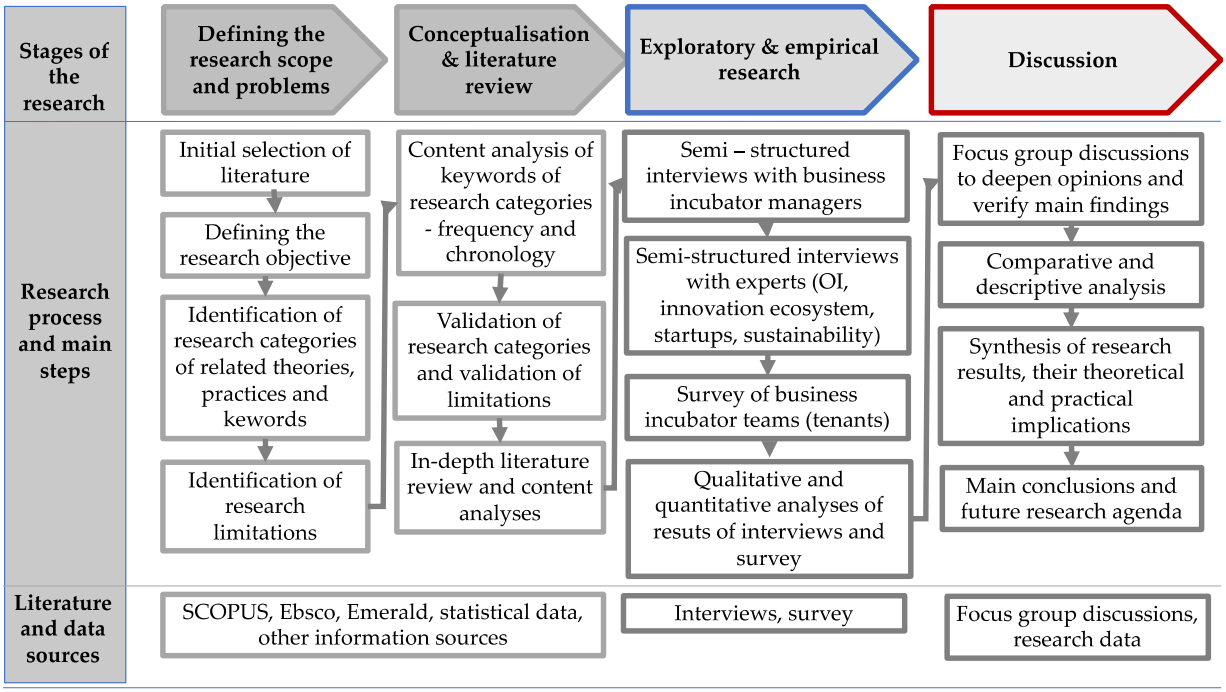

Figure 4. Methodological framework (source: the authors).

The focus of the literature review was on the latest trends in business incubation, particularly the OI approach in business incubation such as OI inbound and outbound practices, OI challenges and benefits; start-up performance such as competitiveness, innovation; start-up sustainability orientation, strategy, ambition, planetary boundaries, business modelling and value creation, particularly the deeper analysis of the technology-driven sustainable value creation [13]. Further details about the search criteria and bibliometric data sets are described within Section 2 of this article.

Semi-structured interviews with national and international business incubation and innovation experts were organised. The interviews were organized in two rounds, first a total of 18 incubator management representatives were interviewed, then 15 interviews were organized with business incubation and innovation experts. The first round of interviews was organised in 2018 and 2019. The second round of interviews were organised during 2020 and 2021. The interviews were conducted by phone, video call or physically meeting the interviewee. These interviews lasted from 40 to 90 min. The transcripts were prepared for each interview, they were coded and anonymously analysed.

During the first round of interviewees, the management representatives of various incubators were approached for interviews. Interview questions were related to the existing challenges, development trends and topicalities in the business incubators, potential improvement of incubation services, and the importance of OI and the sustainability issues. A detailed list of questions is attached in Appendix A (see Table A1). In the second round, when interviewing experts, the questions were more focused on the OI ecosystem and the incubator's role in it, including the aspect of creating sustainable value. Since 2016 there have been 12 business incubators operated by LIDA and funded by public financing (EU and government funding). Eleven of them are regional incubators located throughout development centres of Latvia and some of them have branch units (in total 9) in less populated areas. These incubators do not specialize in specific industries and serve start-ups in a wide range of industries. The Creative Industries Business Incubator operates in Riga, and accordingly it provides support only to start-ups of creative industries. This limitation on creative industries was set considering Riga, as the capital, is the most important economic development driver of the whole of Latvia. These incubators provide incubation support services to already established start-up companies and teams or individual authors of

business ideas developing their business model [106]. The number of incubated start-ups is dynamic and changing; during the pilot survey there were approximately 200 incubated start-ups within all incubators of LIDA. These incubated start-ups were invited to participate in the pilot on-line survey.

An online pilot survey of incubated start-ups (tenants of business incubators) was conducted to collect the preliminary data and reveal conclusions on the statistical significance of the determinants of sustainable value creation.

The pilot survey was based on the four dimensions (namely, OI, sustainability, BI services, performance of incubated start-ups), and was piloted on the incubated start-ups of business incubators operated by LIDA. The pilot survey has three parts labelled with codes A, B and C. Each part contains closed-type questions with pre-defined answers. Some of the questions have evaluation rubrics or rating scales. The structure of questions of the survey is presented in Appendix A. The first part of the questionnaire is related to the respondent profile and the start-up performance (see Table A2). The second part of the survey indicates the type and frequency of business incubation services used by the respondent (see Table A3). The third part of the survey assesses the intention of start-ups to respect global ecological challenges (the planetary boundaries), sustainability attitudes and sustainability strategies (see Table A4).

Survey scales and questions were developed based on the literature review and findings of interviews. The questionnaire was discussed in the focus group discussion in order to improve the understanding and clarity of key concepts, definitions and questions included in the survey.

The survey validation was performed in January–February 2022 in cooperation with the Business Incubation Department of the Investment and Development Agency of Latvia (LIDA). The survey validation was carried out by Department core experts (2) and business incubator management (4), as well as tenant teams (10); after this validation, the survey questions were reformulated in a more explicit way to let tenants understand the meaning of these questions. The survey was prepared in English and Latvian, but after consultations with LIDA the survey was launched in Latvian to limit its length in order to receive tenant replies. Respondents were introduced with the main concepts and definitions included in the survey.

The pilot survey was launched online in the digital survey platform (https://new.webropolsurveys.com), where the data collection started in February 2022. The survey digital link was distributed to managers of twelve LIDA incubators in order to send individual emails to all incubator tenants with the introduction of the survey. The first round of survey data collection (February–March 2022) was affected by the start of the war in Ukraine on 24 February 2022. Tenants explained to business incubator managers that they were not willing to fill in such a long survey at this time. The second attempt to reach potential respondents was carried out at the end of March–May 2022. In April 2022, a postdoctoral researcher conducted specially-designed online training seminars for tenants and the incubator management, and during this training, the survey was promoted to potential respondents. After these seminars the tenants' replies were received. For the pilot survey, 48 valid fulfilled questionnaires of respondents were collected, which represents approximately 24% of all tenants. These completed questionnaires were processed through the frequency and reliability analyses, and thus the internal consistency of questions and measurement scales was tested.

We performed best practice analysis from the business incubators of two European countries—Finland and Estonia. Finland is one of the more developed countries of Europe and shows leadership positions in various measures of innovation performance. Moreover, Finland was one of the first European countries that accepted the principles of green and sustainable development, and has already shown for a longer period a great perception and consciousness of sustainable values among society and entrepreneurs. The experience and knowledge accumulated in Finland may reveal recommendations and findings that can be relevant to other developed European countries and globally to improve national or

regional entrepreneurial and start-up support ecosystems towards new OI approaches and sustainability practices.

Estonia is one of the post-soviet and eastern European countries recently showing great results in facilitating the creation of globally recognized start-ups and "unicorns". This country has shown remarkably rapid development progress, especially in the last ten years following the deep economic recession. Various successful initiatives have been developed in this country to stimulate the creation and scale-up of new ventures and this has been recognized with national pride, which has in turn also increased the interest of foreign investors. The example of Estonia can be useful for any eastern European country wishing to increase innovation and start-up performance.

Due to the specific nature of this study, it should also be emphasized that Latvia borders the two countries Estonia (having an inland border) and Finland (having a sea border). It is essential to understand what good practices can be learned from these neighbouring countries, assuming that these countries have a relatively common cultural and historical background, and other factors that would encourage the adoption of these good practices within Latvia.

This research was an integral part of the larger research carried out within the postdoctoral project (January 2020–June 2022) focusing on the business incubation through open innovation approach [107].

The methodological framework was designed in a way to ensure the internal validity, the construct validity, the external validity and the reliability of this research (see Table 1) [108,109].

Table 1. The internal validity, the construct validity, the external validity and the reliability of this research (source: the authors).

Internal validity	The research framework was designed based on the literature review exploring key concepts, describing previously identified relationships between variables and constructing the theoretical conceptual model. The main highlights from previous research were compared and analysed in the context of the business incubators of LIDA and incubated start-ups. Though the theory triangulation we conceptualised main gaps and issues of this research, specified key theoretical concepts and interpreted them in relation to the results.
Construct validity	This research framework followed the data triangulation principles. There were clear and precise guidelines developed for the semi-structured interviews. The interview questions were defined based on the literature review. Authors of this study performed original interviews by phone, Zoom or in written form and prepared transcripts for all interviews. Transcripts were reviewed by the consultative group of other academics (see Acknowledgments of this Article). The survey questions were defined based on the literature review and interviews. Survey questions were tested and validated before launching the pilot survey. The results and their interpretation were discussed within focus group discussions.
External validity	The pilot survey was conducted in business incubators of LIDA, which represent publicly-funded business incubators and the largest population of incubated start-ups in Latvia since 2011. This provides a clear justification for selection of LIDA's incubators for the pilot study in Latvia. The respondents of the pilot survey were incubated start-ups receiving incubation services (located in incubators) during the pilot study. The number of valid answers obtained in the pilot survey is not statistically significant (n = 48), but it covers the convenient part (24%) of all incubated tenants. In order to generalize the data, validate results and conclusions obtained in the pilot survey, semi-structured interviews and focus group discussions were conducted. In total 33 semi-structured interviews were conducted interviewing 18 incubator managers and 15 experts. A variety of experts invited to interviews ensured different perspectives and opinions about the research questions.

Table 1. *Cont.*

Reliability	The pilot study was conducted assuming the transparency and replication in all steps and research methods. All interview guidelines have been developed and discussed with other scholars and are available for other future studies. Survey questions are tested with experts and discussed in focus group discussions, also, presented in Appendix A of this Article. Throughout the study the anonymity of informants, their answers, opinions, and other personal data were ensured. The methodological framework of the research included the study of foreign cases (from Finland and Estonia), which validates the replication of both—research instruments and results of this research.

4. Results and Discussion

4.1. Preliminary Results of the Pilot Survey of Incubated Start-Ups

At the pilot study the data of collected responses were processed. The frequency analyses were carried out to evaluate the respondents practice or existing experience in introducing technological, organizational, or social innovations that lead to the sustainable value creation.

In the pilot survey, the respondents were given the choice to indicate whether and what type of innovation they had introduced—technological, organizational, or social (see Figure 1). For each type of innovation, respondents could indicate "yes" or "no", which also means that one respondent with could choose several types of innovation ("yes" answers) as previously implemented. The pilot survey results show that half of incubated start-ups have been dealing with the technological innovations leading to the sustainable value creation. Less than a half (43.70%) experienced organisational innovations leading to the sustainable value creation (see Table 2). The lowest number of respondents (27.10%) acknowledged socially-driven innovations.

Table 2. Orientation or drivers of the sustainable value creation of respondents, percentage of respondents' answers (n = 48) (source: authors' calculation).

Orientation of the Sustainable Value Creation	YES	NO
Technology-driven value creation	50%	50%
Organizationally-driven value creation	43.70%	56.30%
Socially-driven value creation	27.10%	72.90%

This division of answers needs to be reassessed and reconsidered after conducting the national survey and obtaining larger sample of responses. Furthermore, after the focus group discussion it was concluded that the division of the orientation or drivers of the sustainable value creation should be reconsidered in the national study. Experts acknowledged the technology-driven sustainable value creation, as most clear and represented among incubated start-ups. The focus group discussion suggested the need to revisit the socially-driven value creation as it is overlapping with both other types and generally is misleading in the context of the sustainable value creation as the sustainable value encounters positive environmental and social impacts.

Experts of the focus group discussion suggested the possibility to expand this study from business incubators to other accelerator support programmes, like, clusters. This would reflect more significant statistical results, especially regarding the organisationally-driven sustainable value creation. It was concluded that start-ups are more oriented towards launching their business, validating the business model, and testing the minimum viable product, and less towards considering potential organisational improvements leading to the sustainable value creation. Organisational improvements and innovations are more topical to scale-up and growth companies, and existing businesses that are gradually adopting sustainable business practices.

Interviews have proved the opinion that business incubators attract technological start-ups and therefore their larger representation is reasonable. However, experts admitted that previously eco-innovations and other innovations addressing the environmental sustainability were less relevant. Their relevance has significantly increased in the last two years, along with more active promotion of the European Green Deal strategy and the potential focus of the EU support. At the same time, the COVID pandemic marked a rapid development of social innovations and, accordingly, an interest in the socially-driven sustainable value creation in start-ups. This was facilitated by various ideation activities facilitated within and outside incubators, such as hackathons, innovation labs and others that use OI approaches. The COVID pandemic acted as a trigger, initiating a series of social problems in society, and start-ups offered solutions integrating them into the profitable business models, thus, successfully demonstrating the principles of the shared value creation.

In the focus group discussion, it was recognized that the war in Ukraine caused not only a reluctant attitude of potential respondents to fill out the questionnaire, but in general caused a significant reassessment of attitudes and behaviour in the business environment. In the war situation, the business community and start-ups reassessed their social responsibility. Values such as resilience, social justice and safety gained an increasingly important role. In such a situation start-ups were also looking for solutions on how to provide support and help, considering it more as a social mission, and not expecting economic gains in return, but rather personal and global safety.

There were two control variables used within this preliminary study. One variable was related to the development stage of start-ups: an idea; the minimum viable product developed; an active business or sales development (see Table 3). This variable may provide the conclusions regarding the relationship between the start-up performance and the sustainable value creation.

Table 3. The stage of development of respondents—incubated start-ups, percentage of respondents (n = 48) (source: authors' calculation).

	No	%
Just an idea	2	4.2%
Minimum viable product	26	54.1%
Active action or sales	20	41.7%

The preliminary results show that most incubated start-ups have developed and are testing the minimum viable product. This means they have managed to find the most appropriate technologies for developing the product and now are targeting first customer segments. In this stage, there should be a strong ambition to create sustainable value, but the appropriate sustainability strategy is still being found through experimentation [101].

The other control variable was related to the location of the start-up during the incubation (see Table 4) and respondents indicated one of three answers—on-site at the incubator's premises; virtual incubation; and combined both virtual and physical incubation. The answers to this question were affected by the restrictions of the COVID pandemic with remote work. However, the literature review also reveals that the importance of premises in business incubation is decreasing, while the importance of remote or virtual incubation services is increasing [13].

There are three independent variables used that have been adapted from Kuckertz et al. [61]. The sources, an interpretation and the measure of each variable were adjusted according to the latest studies of other scholars and assuming the specific nature of start-ups. Three main variables have been used in this preliminary study: sustainability strategy; sustainability ambition; and planetary boundaries. The table of the descriptive statistics is attached in Appendix A (see Table A5).

Table 4. The location of respondents at the time of incubation, percentage of respondents (n = 48) (source: authors' calculation).

	No	%
On-site at the incubator's premises	0	0%
Virtual incubation	9	18.7%
Combined—virtual and face-to-face	39	81.3%

Planetary boundaries mean the intention of start-ups to respect the global ecological challenges and introduce solutions to these environmental problems within the value chain of a business model that aims to create a sustainable value. The planetary boundaries are the first set of independent variables used within the statistical data analyses. In the survey, respondents were asked to indicate their experience to make a positive impact to a predefined list of environmental issues. Respondents indicated "yes" in response to those global ecological challenges they were addressing within their business model and with "no" to the ones that were not important in the value chain. Therefore, this variable has been set as the binary variable, just with two values "yes" and "no".

Table 5 demonstrates the descriptive statistics regarding the planetary boundaries. There are no substantially high factors of the planetary boundaries. Climate change is one of most significant factors indicated by 45.8% of respondents. The rest of the factors are comparatively low and varies approximately in between 2 to 10%. Thus, climate change has been used further to test the relationship between climate change and the sustainable value creation. Previously researchers have discovered that just 37% of ecological start-ups address such global challenges composed as the planetary boundaries [62]. Although this is just a pilot survey, these preliminary results may indicate an increase in intention of start-ups to address global environmental challenges. Their focus may slowly shift from local and internal environmental issues to global, covering a wider area and impacting a larger part of society. In a previous study, researchers focused narrowly on ecological start-ups [61]. However, the concept and an interpretation of an ecological start-up can be misleading and should be revisited, as currently there is an increasing discussion and perception by society, practitioners, and researchers about the need to develop sustainable and green business models as part of any company. The preliminary results of our study may support the argument that more companies that are not natively ecological, and even those that could be deemed as beginners in regard to sustainability ambition, consider climate change as the leading future issue of their sustainable business models.

The sustainability ambition is the variable with the measurement scale where respondents provided their self-assessment about their intention to address the sustainability issues or the value orientation to incorporate the environmental and social value creation within their business model. The measurement scale shows the level of the sustainability ambition in a scale from one to four, where one is the lowest or beginner level and four is the highest or an expert level. As such, 79.9% of respondents indicate the beginner (lowest) level for their start-up in the sustainability ambition, 12.5% consider the basic level, 6.2%—sufficient and, only, 2.1%—an expert level. As this self-assessment depends on the subjective opinion of the respondents about themselves, there was an additional control-question introduced within the survey providing a predefined list of factors and respondents could rank the importance of these factors. Respondents ranked the importance of each factor within a scale from one to five (where one—not important and five—very important). Previous researchers [61] have limited this ambition mostly to ecological issues and the creation of a positive impact on the environment. Yet, social issues and a positive impact on society are also important in the context of the sustainable value creation and this perspective was expanded in this survey compared to previous studies.

Table 5. Indicate whether your company has specific actions in place to address the following environmental issues (n = 48) (source: authors' calculation).

	YES, %	Average	Median
Climate change	45.8%	1.5	2.0
Biodiversity loss	10.4%	1.9	2.0
Ocean (water) acidification	4.2%	2.0	2.0
Exhaustion of atmospheric ozone	4.2%	2.0	2.0
Global freshwater consumption	2.1%	2.0	2.0
Agricultural land use change	10.4%	1.9	2.0
Nitrogen and phosphorus production	4.2%	2.0	2.0
Atmospheric pollution load	8.3%	1.9	2.0
Chemical pollution	6.2%	1.9	2.0

As described before, there are three types of sustainability strategies, and respondents indicated which sustainability strategy applies in the company (compensate or reduce; be sustainable; high level sustainable impact). Table 6 indicates the descriptive statistics on the answers of respondents regarding this variable. The preliminary results show that most of the respondents assume neutral strategy and considerably less consider pro-active strategies towards the creation of a positive social or environmental impact. These results lead to some contradictions with the planetary boundary factors, where a larger part has indicated the consciousness towards climate change. These inconsistencies may indicate that start-ups are motivated and considering the sustainable value creation but lack practical tools, approaches, and strategies for the sustainable value creation. This indicates further room for the support necessary from such intermediating bodies as business incubators.

Table 6. Which sustainability strategy does your company use? (n = 48) (source: authors' calculation).

	n	Average, %
Compensating for harmful actions in one area by doing good in another	13	27.1%
Be sustainable without harming the environment or society	24	50.0%
Be sustainable by rethinking all actions to promote positive environmental or social impacts far beyond the company	11	22.9%

In regard to this question, an additional control question was introduced in the survey providing a list of sustainability principles and requiring assessment to what extent (from zero—never to three—often) these principles are adapted in the start-up company.

As regards the dependent variable—the sustainable value creation—respondents were asked to indicate to what extent does their company implement the principles of the sustainable value creation as a part of their business model (one—not implemented and five—fully implemented).

The logistic regression analyses is the next stage in the statistical data analyses. The logistic regression analyses results show that technology-driven sustainable value creation is significantly influenced by the planetary boundary related to climate change (B = 1.16, $p \leq 0.10$) and sustainability ambition (B = −1.72, $p \leq 0.10$) (see Table 7). The sustainability ambition variable is negative, but the planetary boundary (climate change) is positive. The sustainability strategy variable is close to zero, which means no significant influence on the sustainable value creation.

Table 7. Summary of results on the determinants of technology-driven sustainable value creation (source: authors' calculation).

Variables	B	E.S	Wald	ddl	Sig.	Exp(B)
Control Variable The stage of development of your business when starting an incubation or receiving business support	0.927	0.700	1.754	1	0.185	2.526
Control Variable Please indicate your location at the time of incubation	0.208	1.017	0.042	1	0.838	1.231
Sustainability strategy	−0.020	0.493	0.002	1	0.968	0.980
Sustainability ambition	−1.728	0.922	3.513	1	0.061	0.178
Planetary Boundary (climate change)	1.164	0.698	2.781	1	0.095	3.202
Constant	−2.391	3.689	0.420	1	0.517	0.091

Preliminary results demonstrate that the most significant factor of the planetary boundaries is climate change, and that positively stimulates the technology-driven sustainable value creation. The further necessity to address the green transition issues has been recently identified as an important tool for further development of start-ups and post COVID-19 recovery of the whole entrepreneurial ecosystem [4].

Indeed, the climate change invites start-ups to engage in various technical experiments that serve, for example, to test new standards in a specific sector [110]. Furthermore, a significant level of sustainable technology-driven value creation is needed to deploy technologies needed to achieve climate change mitigation goals. For example, several start-ups in energy efficiency, waste management, and organic agriculture have already been recognized for their potential to contribute to climate change mitigation and adaptation, while addressing other environmental and social issues [111].

These results are also confirmed by the opinions of experts and the findings of the focus group discussion, that the current risk of energy restrictions caused by the war in Ukraine will further trigger technologically-driven innovations leading to energy efficiency and, thus, to a positive impact on the environment.

The correlation matrix between main variables is presented in Appendix A (see Table A6). The sustainability ambition shows statistically significant correlations. Interestingly, sustainability ambition has a negative impact on technology-driven sustainable value creation, in contrast to the previous literature showing a positive effect of this variable [61]. This result could be explained from different angles. As shown in the correlation matrix (see Appendix A), sustainability ambition is positively associated with the incubation stage and negatively associated with the location of the business incubators where tenants are held. The more mature the start-ups are in their stage of evolution, the more sustainability ambition they possess. The day-to-day business management concerns of start-ups may be more related to the creation, testing and scale-up of their business model, and less to specific goals and ambitions to address sustainability challenges. This may indicate that start-ups have not yet reached the maturity to perceive the sustainable value creation as a shared value within the business model. This also echoes the descriptive statistics indicated above, where start-ups prefer the neutral sustainability strategy and rather than taking proactive actions to create a wider positive impact.

Sustainability ambition is the first step in realizing technology-driven sustainable value creation. If the start-up is aware of sustainable values, it accordingly searches for the most appropriate ways to implement these values in the business model and the value creation. As the literature analysis reveals, the implementation of sustainability principles are often directly related to technological innovations [61]. Therefore, it is

possible that business incubators can facilitate the sustainable value creation by showing positive examples, practices and approaches, how to integrate the sustainable value creation in the production or service provision process. It will promote the start-up's understanding that sustainable value creation is part of the business model and the overall technological process. These preliminary results indicate that start-ups design their value creation process as in the traditional business model oriented to create an economic value [61]. In this respect the role of a business incubator is to provide knowledge to start-ups on the creation of new business models, assuming the creation of social and environmental impact. In addition, in order to create such an impact and create sustainable value, cooperation and an OI approach are needed, as foreseen by multi-stakeholder collaboration and the value creation assuming the needs of various stakeholders. However, the location of start-ups within incubators (physical or virtual) is negatively related to sustainability ambition, meaning that when tenants are retained in incubators where they do not have sufficient support, it negatively influences their sustainability ambition, which ultimately negatively influences technology-based sustainable value creation. These results require further investigation and reconsideration in the national study. The results may indicate that internal sustainability concerns create sustainability ambitions within start-ups. It is a matter of inner consciousness and personal values, where factors such as the sustainability awareness and education play a more significant role than the physical environment and support of business incubators.

Assuming a close relationship between the OI approaches and the sustainable value creation, this indicates the need for business incubators to think about the development of services in the pre-incubation stage that strengthens the awareness and ambitions of the sustainability during definition and development of the business idea. This sustainable ambition is dependent on business support received by the start-up, which is different depending on the location of the incubator [111].

Start-ups are developing their own responses to sustainable change, in the form of localised schemes tailored to the local context [112]. High sustainability ambition increases the likelihood that technology-driven innovations will lead to the sustainable value creation. However, it must be recognized that for the development of such innovations it is essential to strengthen the technological capacity of start-ups [61]. In this sense, it is essential to use OI approaches to create a system or a framework for attracting external resources for the development of technological innovations from universities and research centres, as well as for testing these technologies, for example, in the so-called sandboxes, which are currently successfully used by fintech start-ups in Latvia. The preliminary results prove the existing challenges in using OI approaches in start-ups and business incubators, particularly in facilitating the technological competences and innovation dynamic capabilities, as well as the networking and collaboration abilities. This is an important future role for the business incubators to facilitate not just innovation and technological capabilities but contributing to the sustainable value creation in incubated start-ups.

The existing data set allowed a logistic regression model analysis to be conducted. Preliminary results of the descriptive statistics and correlation matrix are presented in Appendix A (Tables A5–A8). In relation to the research instruments applied, these results prove the consistency of the questions, measurement scale and can be further used in the national survey. The logistic regression analyses conducted can be expanded when collecting the statistically significant number of valid responses in the national survey. Furthermore, the results of the national study should be validated and supported by several robustness tests, such as, ROC curve, tolerance and other [113].

4.2. Opportunities of Business Incubation through OI and Sustainability Perspectives

Regarding the division of the scales of sustainable value creation—technologically-driven, organisationally-driven and socially-driven, as proposed by the previous research [55,61], our research instruments and a piloting survey prove that these scales need to be revisited. While at the beginning it was considered that start-ups had limited ambition and ability

to introduce the holistic innovations [52], the systemic and ecosystem innovations [54], incubated start-ups facilitated by incubators may have a higher ambition and ability to also introduce radical and systemic innovations, both on a micro business level as well as on a macro regional, country or global level.

These findings are in line with the opinion of other scholars on the increasing role of business incubators within the facilitation of the sustainable transition and engaging start-ups to the sustainable value creation, and this creates the need to review the functions of the business incubator and the types of support for the tenants [114].

Likewise, the specialisation of business incubators could be important in the future, highlighting the role of the business incubator as a sustainability facilitator in the business start-up and sustainable innovation ecosystems. Other researchers have also expressed an opinion about the necessity of the sustainability specialisation of business incubators [115].

This specialisation of the incubators requires better acknowledgment and further classification of the incubated start-ups, depending on the sustainability ambition and the strategy. There is a need to distinguish two types of business start-ups. One group of incubated start-ups are "native sustainable value creators" that implement the sustainability principles and assume the sustainable value creation as the part of their business model since their establishment. The second group of incubated start-ups may include late adopters of the sustainability principles. These start-ups begin their business according to the principles of the linear economy, but gradually change their business model and integrate sustainable value creation (see Figure 5). This is consistent with the opinion of some scholars about the division of companies depending on their values and needs to create a positive contribution to the environment [116].

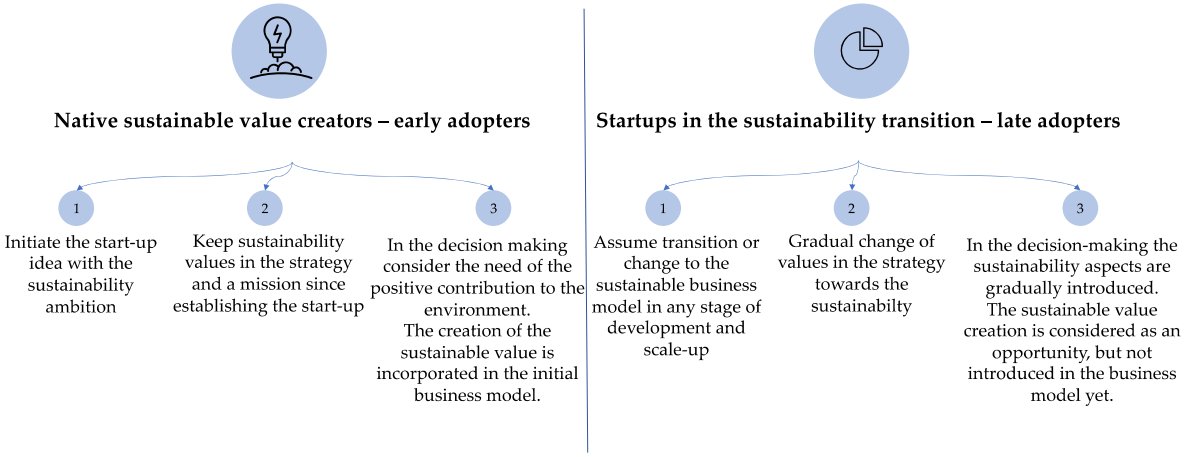

Figure 5. Types of incubated start-ups, depending on sustainability ambition and strategy (source: the authors).

Involving different parties is essential in creating sustainable value to have a positive impact on the social and environmental dimensions [117].

Porter has previously conceptually defined the basic idea of the value chain in terms of creating a value proposition for the customer. Accordingly, the value chain mainly includes raw material producers, suppliers, producers, service providers involved in value creation and delivery to the customer [117,118]. In turn, the sustainable or shared value creation, due to its multidimensional nature, requires cooperation between various stakeholders, which not only represent the interests of the business-to-business or business-to-customer, but may include relationship and collaboration outside the value chain, for instance, between public authorities, non-governmental organizations and communities, education and research institutions, financial institutions, and support providers [26].

In the context of creating a sustainable value, researchers highlight the need for collaboration within the ecosystem [119–121]. The conceptual idea of an ecosystem resonates with the OI [122].

There is an identified need to combine the OI and a sustainable value creation concept, explaining how the innovation ecosystem and sustainable value creation ecosystems are linked. Researchers [123] have confirmed this issue, highlighting that such an integrated view of two ecosystems would give practitioners and policy makers a much broader understanding of how to design a model for cooperation, the facilitation and management of the collaboration within the ecosystem, as well as developing multi-stakeholder engagement strategies to address the sustainability issues.

The ecosystem is characterized by the involvement of different parties, complex and diverse interrelationships [120,123]; it is necessary to promote dynamic and active cooperation [123], openness to cooperation and willingness to cooperate [123] and self-directed management and organisation [123].

To meet these conditions, researchers are proposing a Quadruplex Helix innovation collaboration model that defines the types of stakeholders involved—business, education and research institutions, the state and society [25,31], also, named as helices [124], and their interactions in the innovation and sustainable development process within the ecosystem [30].

Scholars state that a Quadruplex Helix cooperation model is constructed from a combination of the National Innovation ecosystem and a Triple Helix (as a predecessor of a Quadruplex Helix), putting larger accents on the value of the social capital due to the involvement of society or people as a fourth element within the Quadruplex Helix [30].

Relations between different stakeholders or helices are not regular and linear but appear to be more eventual and asymmetric [124]. Moreover, each helix has different expectations or enablers [31] that drive and motivate them to participate in the Quadruplex Helix cooperation [124]. The Quadruplex Helix collaboration model (see Figure 6) is the framework for moving towards shared sustainability values, which means that involved stakeholders create value and benefits for themselves and for other society members or other helices [29].

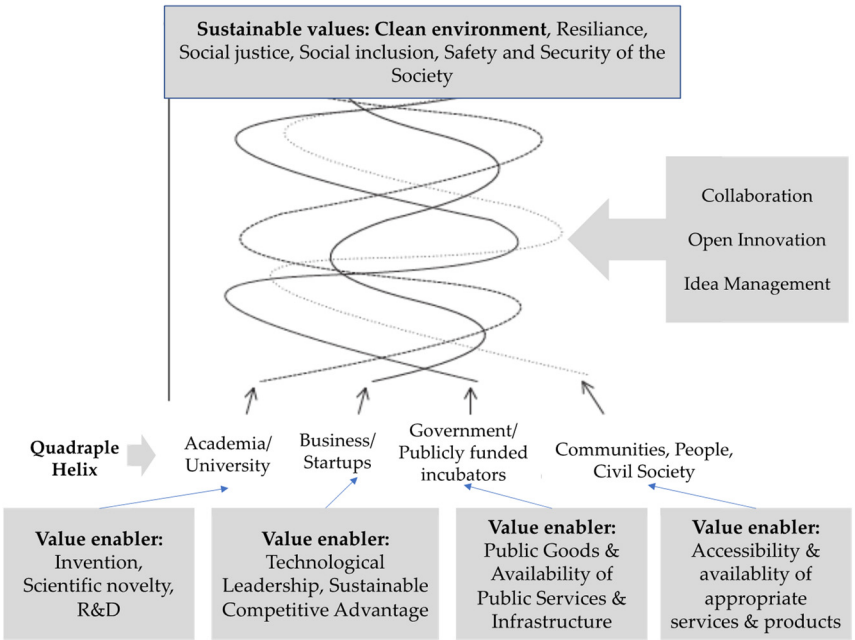

Figure 6. Conceptual model of sustainable value creation (source: the authors).

Previous studies have focused on the analyses of the collaboration within the entrepreneurial ecosystem and define precise types of actors within the Quadruplex Helix collaboration model [6,125]. We propose that within this Quadruplex Helix cooperation model the business incubators can act as the hybrid intermediary organisation that integrates and engages the collaboration of different stakeholders, in order to supervise and

facilitate the sustainable value co-creation of incubated new ventures [29,126]. We also propose that the OI approach and sustainable value creation are closely related to each other as three important factors apply—collaboration, knowledge/resource-sharing to innovate (also understood as the OI), and idea management. The Quadruplex Helix provides the OI direction for all involved stakeholders to create sustainable values, although each involved stakeholders may have their own specific needs regarding sustainable value creation. The Quadruplex Helix collaboration framework provides a common ecosystem and the critical mass for achieving sustainability aims and implementing the sustainability strategies.

5. Conclusions and Suggestions

5.1. Theoretical and Practical Implications

The research has implications for theory and practice. The results contribute to the sustainability literature and come with an explanation of the determinants of the creation of technology-driven sustainable value by start-ups, as suggested by Kuckertz et al. [61]. Moreover, the empirical contribution was present by an investigation into incubators in Latvia, a catching-up country that needs to intensify its sustainability processes and align with the strategies of developed countries [15]. These findings also contribute to recently-growing practices and the relatively new research area about the circular, green or sustainability oriented–business incubators [8].

These results could help policymakers, incubator managers, and tenants understand the importance of developing the determinants of sustainable technology-based value creation, particularly the ambition for sustainability that may evolve with the incubation phase, but also the importance of business support that differs from place to place and, if not appropriate, can negatively influence technology-driven sustainable value creation.

Incubator managers should draw attention to the incubation services and activities that engage technology-driven start-ups in the creation of sustainable value and promote their sustainable ambition. Technology-driven start-ups have to acknowledge new opportunities of value capturing and scaling by the application of sustainability strategies and sustainable principles in their business management.

The research results show a higher interest in the climate change factor of the planetary boundaries, which shows that start-ups have thought about positive environmental impact. However, in daily business practice, the start-up prefers a neutral sustainability strategy, mainly avoiding the creation of a negative social and environmental impact. Incubated start-ups largely consider themselves in the position of beginners regarding the implementation of the sustainability ambition in the company. This may highlight a preference for a traditional business model approach applied by start-ups, focusing mainly on the economic value (profit) creation, rather than on the creation of sustainable value, where economic, social and environmental values are balanced.

This research proposes the pedagogical implications. Key findings and the research methodology applied is suitable to be presented, applied, and further explored in higher education institutions for the study courses on the innovation, entrepreneurship and research methods in the business, as well as in the executive management educational process.

5.2. Limitations and a Further Research Agenda

This research does not cover the practical and legal aspects of the collaboration forms in the OI process and sustainable value creation. The complexity of the collaboration between business and the public sector also involves research institutions and society as customers or users require new specifications for legal cooperation forms, resource sharing and division of responsibilities. This is an important aspect for future research.

This empirical research was performed in Latvia, exploring tenants of the business incubator operated by LIDA, which is funded by the government and European Structural Funds. The results of this study can be adapted for university business incubators and for privately-funded ones, in the research methodology assuming the specific requisites of the private funding source and ownership requirements of such business incubators.

This research does not explore in detail the strategies implemented by the incubators, but findings of this study suggest to the management of incubators further necessity to revise and renew incubator's strategies welcoming the introduction of the OI and the sustainability approaches.

This study is initially limited by the fact that data collection is still ongoing, and a limited amount of data was collected. The limitations of this study arise from the limited number of respondents participating in the survey. The goal is to continue the collection, strengthen analyses, and present further results regarding this ongoing investigation. Despite these limitations, these preliminary results not only show the importance of technology-driven sustainable value creation for start-ups, but also its determinants. In spite of our huge efforts to stimulate incubated start-ups to complete the questionnaire, it was difficult to reach them, and the circumstances with the war in Ukraine and COVID limitations discouraged them. In a more stable situation there would be a more favourable potential to reach larger number of respondents leading to higher statistical significance. In the further operation and management of business incubators of Latvia, LIDA can consider expansion of the reporting data provided regularly by incubated start-ups and incubation managers. This will put legal bindings for incubated start-ups to report data. Then LIDA, together with scholars, may analyse the interdependencies and the statistical relationship on the performance of incubated start-ups in regard to the OI and sustainability issues. This approach can also be applied in other countries having a network of incubators supported by public or EU funding.

Our research is limited to measuring the existing situation. In this respect, the regular and sequencing data collection in the longer period would be essential to observe possible changes in the strategies, ambitious and sustainable value creation practices by start-ups during their incubation and within the post-incubation period.

In order to generalize the results of this study to start-ups in business incubators of other countries, it is necessary to conduct additional research in the respective country. This article proposes and verifies the methodological framework that can further be adapted accordingly for conducting such studies and surveys in other countries to analyse key factors of the technology-driven sustainable value creation in start-ups within and outside of business incubators. Furthermore, other factors can be considered as influencing or moderating to the causal relationships, such as the type of incubation services used by tenants, the scale-up and internationalisation ambition, the general attitude and openness to sharing of resources and knowledge, and industry, etc.

Despite its limitations, this article provides a valuable contribution to conceptualising and creating new knowledge regarding the Quadruplex Helix cooperation model, the OI approach, and the sustainability issues in the context of business incubators. This research proves that these dimensions are important priorities to be adopted in the strategies and daily management practices by incubator managers and incubated start-ups.

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Institutional Review Board Statement: This is a non-interventional study with the survey, interviews and focus group discussions conducted. When invited to participate, all participants (informants) were informed that the anonymity is assured. There were written statement about the purpose of a study and interviews/the survey/focus group discussions, also, the confirmation that there will be the anonymity assured regarding all answers, opinions and other personal data provided by informants (interviewees and respondents of a survey). The results obtained will be analysed in a summarised and descriptive form without specifying the informants and their opinions. All

interviewees prior the interview provided the consent for the participation within this interview. This protocol and research instruments have been approved by the Scientific Ethics Committee of the project "Open Innovation" (funding/grant No. No1.1.1.2/VIAA/3/19/426).

Informed Consent Statement: Not applicable.

Data Availability Statement: Data availability upon request: postdoctoral researcher Iveta Cirule, biorganik3@gmail.com.

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Appendix A

Table A1. Questions of the interviews of the incubation managers.

Code	Questions	Types of Responses
IQ1	Represented institution	Open
IQ2	Incubator type	Closed: Public, University, Private, Other
IQ3	What are the current trends and actualities in business incubators?	Open
IQ4	What do you see as future possibilities for improving the work of the incubator?	Open
IQ5	What different/new services would you like to introduce and what would you like to change in the operation of business incubators?	Open
IQ6	How do you think it would be possible to manage the incubator more conveniently/accessible?	Open
	How are state, university and industry/private business incubators different?	Open
IQ7	Do the incubated companies sufficiently use the networking services provided by the incubators?	Open
IQ8	How important is the creation of sustainable values for incubated companies?	Open
IQ9	How important is the role of the incubator in the creation of sustainable values in the incubated companies?	Open
IQ10	How important is physical presence in the incubator when receiving incubation service offering?	Open
IQ11	What most incubated companies expect from business incubators?	Open
IQ12	What difficulties do you think the incubated companies face when they leave the incubator?	Open
IQ13	What are the performance indicators of the incubation program and how are they measured in your incubator?	Open
IQ14	What is your understanding of open innovation approach, how you can use it in the work of the incubator?	Open

Table A2. The respondents' profile and the start-up performance (survey).

Code	Questions	Type of Responses
A-SQ1	Number of founders of a start-up company/start-up idea team?	(1) Less than 5; (2) 5–9; (3) 10–24; (4) 25–49; (5) 50–99; (6) 100–249; (7) 250–499; (8) 500+
A-SQ2	How long you have spent in the incubator (used incubator's services)?	(1) Up to 1 year; (2) 1–2 years; (3) 2–3 years; (4) 3–4 years; (5) 5 and more years
A-SQ3	The stage of development of your business?	(1) Idea; (2) Minimum viable product developed; (3) Active action/business or sales development
A-SQ4	Location during the incubation?	(1) On-site at the incubator's premises; (2) Virtual incubation; (3) Combined—virtual and face-to-face
A-SQ5	By commercializing your innovation, you (YES/NO)?	(1) Sell patent licenses or know-how; (2) Use cooperation and sales agreements; (3) Collaborate to create new joint ventures or research companies; (4) provide research and development services to organizations and government agencies; (5) you perform external networking and cooperation with external participants (suppliers, customers, research institutions, competitors); (6) make your unused innovations available to others for free (for free), (7) actively participate in innovation projects of other parties; (8) use the knowledge and initiatives of your employees who are not directly involved in research and development

Table A3. The use of the incubator's services (survey).

Code	Questions	Responses
B-SQ1	To what extent have you used the incubator's sharing services and facilities (0–3, Scales: 0—Never, 1—sometimes, 3—often)?	(1) Secretariat; (2) Car parking; (3) Meeting rooms; (4) Shared office facilities (printer, etc.); (5) Co-creation room; (6) Private office; (7) Registered legal address; (8) Mailbox option
B-SQ2	To what extent have you used the incubator's advisory services and consultations (0–3, Scales: 0—Never, 1—sometimes, 3—often)?	(1) Accounting advice; (2) Financial advice; (3) Marketing consultation; (4) Engineering consultation; (5) Fundraising; (6) Strategic and other business development consultations; (7) Coaching; (8) Mentoring; (9) Group training; (10) Seminars; (11) Legal advice; (12) Consultation on intellectual property rights (patent, etc.)
B-SQ3	To what extent have you used access to capital provided by the incubator (0–3, Scales: 0—Never, 1—sometimes, 3—often)?	(1) Network of business angels; (2) Venture capital; (3) Seed capital; (4) Private financing (loans from individuals); (5) EU and other public funds' support; (6) International accelerators; (7) Other
B-SQ4	To what extent have you used specific services of LIDA (0–3, Scales: 0—Never, 1—sometimes, 3—often) ?	Closed with rating of scales from 0 to 3 (0—Never, 1—sometimes, 3—often): (1) Initial evaluation of a business idea; (2) 3-days business school; (3) "PINK" school to improve business ideas; (4) Experience stories and visits of experienced entrepreneurs; (5) Member of young entrepreneurs' community in LV

Table A4. The intention to create a positive impact to the planetary boundaries, the sustainability ambition, and the sustainability strategies (survey).

Code	Questions	Responses
C-SQ1	Please indicate (yes/no) whether your business is in line with any of the following types of sustainable value creation	(1) Technology-driven sustainable value creation; (2) Socially driven value creation; (3) Organizational value creation
C-SQ2	Indicate (yes/no) whether your company has specific actions in place to address following environmental issues	(1) Climate change; (2) Biodiversity loss; (3) Ocean (water) acidification; (4) Exhaustion of atmospheric ozone; (5) Global freshwater consumption; (6) Agricultural land use change; (7) Nitrogen and phosphorus production; (8) Atmospheric pollution load; (9) Chemical pollution
C-SQ3	Sustainability ambition In your opinion, the degree of sustainability in your company	(1) Beginners; (2) Basic; (3) Sufficient and satisfactory; (4) Expert
C-SQ4	Rate the importance of following factors (1–5, scales: 1—not important and 5—very important)	(1) Environmentally responsible decisions (2) Socially responsible decisions; (3) Compliance to the sustainability principles in development of new products; (4) Importance of sustainability principles in the future; (5) A sustainability strategy is part of daily business practices and value creation activities; (6) Sustainable practices lead to innovation
C-SQ5	Which sustainability strategy does your company use?	(1) Compensating for harmful actions in one area by doing good in another; (2) Be sustainable without harming the environment or society; (3) Be sustainable by rethinking all actions to promote positive environmental or social impacts far beyond the company;
C-SQ6	To what extent (0–3) the following principles are adapted in your company (Scale: 0—Never, 1—sometimes, 3—often)?	(1) Sustainability policies; (2) Activities to reduce CO2 emissions; (3) During product design and development assess the environmental and social impact; (4) Inclusion of sustainability costs in the product development budget; (5) Selection of suppliers and partners based on sustainability criteria; (6) Introduction of environmentally-friendly production; (7) Use of eco-design practices; (8) Application of eco-innovation
C-SQ7	To what extent (1–5) does your company implement the principles of a sustainable business model (scale: 1—not implemented and 5—fully implemented)?	(1) less material and energy consumption through more efficient processes; (2) reuse or recycling of resources; (3) replacement of non-renewable resources with renewable and artificial processes that mimic or use processes in nature; (4) offering a solution to the customer without owning a product such as car sharing; (5) protecting the environment by encouraging certain customer behaviour; (6) providing information and incentives/bonuses that encourage less consumption; (7) use of organizational resources and opportunities to generate benefits for society or the environment; (8) providing value to previously unattainable stakeholders or involving them in the value creation process; (9) sustainable solutions and wider use of technology; (10) adoption of a shared business model; (11) Adoption of a "return and resale" product strategy; (12) promote longer use of the product; (13) offer a product as a service.

Table A5. Table of the Descriptive Statistics.

		Control Variable: Location at the Time of Incubation	Control Variable: The Stage of Development of Business when Starting or Receiving an Incubation Support	Sustainability Strategy	Sustainability Ambition	Technology-Driven Sustainable Value Creation	Planetary Boundary Climate Change
n	valide	48	48	48	48	48	48
	manquant	6	6	6	6	6	6
Average		1.00	2.38	1.96	1.31	1.50	1.54
Median		1.00	2.00	2.00	1.00	1.50	2.00
Standard deviation		0.000	0.570	0.713	0.689	0.505	0.504
Variance		0.000	0.324	0.509	0.475	0.255	0.254
Minimum		1	1	1	1	1	1
Maximum		1	3	3	4	2	2

Table A6. Table of the Correlation Matrix.

		Control Variable (the Stage of Development of Business when Starting or Receiving an Incubation Support	Control Variable (Location at the Time of Incubation)	Sustainability Strategy	Sustainability Ambition	Technology-Driven Sustainable Value Creation
Control variable the stage of development of your business when starting an incubation or receiving business support	coefficient	1.000	0.176	0.034	0.296 *	0.176
	sig. (bilateral)	.	0.232	0.818	0.041	0.233
	"*n*"	48	48	48	48	48
Control variable location at the time of incubation/business support	coefficient	0.176	1.000	−0.254	−0.294 *	−0.121
	sig. (bilateral)	0.232	.	0.082	0.043	0.415
	"*n*"	48	48	48	48	48
Sustainability strategy	coefficient	0.034	−0.254	1.000	0.234	−0.113
	sig. (bilateral)	0.818	0.082	.	0.109	0.443
	"*n*"	48	48	48	48	48
Sustainability ambition	coefficient	0.296 *	−0.294 *	0.234	1.000	−0.160
	sig. (bilateral)	0.041	0.043	0.109	.	0.278
	"*n*"	48	48	48	48	48
Technology-oriented value creation	coefficient	0.176	−0.121	−0.113	−0.160	1.000
	sig. (bilateral)	0.233	0.415	0.443	0.278	.
	"*n*"	48	48	48	48	48

*: Higher significance of the statistical correlation.

Table A7. Table of Models summary.

Not	Log of Likelihood −2	Cox's R-Square and Snell	R-Two of Nagelkerke
1	53.405 [a]	0.239	0.319

[a] Estimation stopped at iteration number 5 as the number of changes in parameter estimates is less than 0.001.

Table A8. Test of Hosmer and Lemeshow.

Not	Chi-Square	dof	Sig.
1	5.099	8	0.747

References

1. Chesbrough, H.W.; Vanhaverbeke, W. Open Innovation and Public Policy in the EU with Implications for SMEs. In *Researching Open Innovation in SMEs*; World Scientific Publishing Company: London, UK, 2018; pp. 455–492. [CrossRef]
2. Hausberg, J.P.; Korreck, S. Business Incubators and Accelerators: A Co-Citation Analysis-Based, Systematic Literature Review. *J. Technol. Transf.* **2020**, *45*, 151–176. [CrossRef]
3. Weingarden, A.; Raes, S. *Innovation Diffusion in Latvia. A Regional Approach*; OECD Publishing: Paris, France, 2022.
4. Benedetti, F.C.; Sedláček, P.; Sterk, V. *EU Start-Up Calculator: Impact of COVID-19 on Aggregate Employment: Scenario Analysis for Denmark, Estonia, Finland, France, Latvia, Lithuania, Portugal and Sweden*; Publication Office of the European Union: Luxembourg, 2020. [CrossRef]
5. Vanderstraeten, J.; van Witteloostuijn, A.; Matthyssens, P. Organizational Sponsorship and Service Co-Development: A Contingency View on Service Co-Development Directiveness of Business Incubators. *Technovation* **2020**, *98*, 102154. [CrossRef]
6. Theodoraki, C.; Messeghem, K.; Audretsch, D.B. The Effectiveness of Incubators' Co-Opetition Strategy in the Entrepreneurial Ecosystem: Empirical Evidence From France. *IEEE Trans. Eng. Manag.* **2022**, *69*, 1781–1794. [CrossRef]
7. Hull, C.E.; Millette, S.; Williams, E. Challenges and Opportunities in Building Circular-Economy Incubators: Stakeholder Perspectives in Trinidad and Tobago. *J. Clean. Prod.* **2021**, *296*, 126412. [CrossRef]
8. Fichter, K.; Hurrelmann, K. Sustainability-Oriented Business Incubation: Framing and Supporting Sustainable Entrepreneurship. In *Handbook of Research on Business and Technology Incubation and Acceleration*; Edward Elgar Publishing: Cheltenham, UK, 2021; pp. 478–495. [CrossRef]
9. Costa, J.; Matias, J.C.O. Open Innovation 4.0 as an Enhancer of Sustainable Innovation Ecosystems. *Sustainability* **2020**, *12*, 8112. [CrossRef]
10. Porter, M.E. The Changing Role of Business in Society. 2021. Available online: https://www.hbs.edu/ris/Publication%20Files/20210716%20Business%20in%20Society%20Paper%20For%20Website_84139c25-9147-4137-9ae9-28e27e1710a1.pdf (accessed on 19 June 2022).
11. Intrum.lv. Ilgtspēja Kā Biznesa Veiksmes Formula. Available online: https://www.intrum.lv/biznesa-risinajumi/zinas/raksti/ilgtspeja-ka-biznesa-veiksmes-formula/ (accessed on 19 August 2022).
12. Sabando-Vera, D.; Yonfa-Medranda, M.; Montalván-Burbano, N.; Albors-Garrigos, J.; Parrales-Guerrero, K. Worldwide Research on Open Innovation in SMEs. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 20. [CrossRef]
13. Cirule, I.; Uvarova, I.; Caune, G. European Trends in Business Incubation Through Open Innovation Approach. *Eur. Integr. Stud.* **2022**, *16*, 111–124. [CrossRef]
14. InCSR. Ilgtspējas Indekss 2022. Korporatīvās Ilgtspējas un Atbildības Indekss. Available online: https://www.incsr.eu/novertejumi/ilgtspejas-indekss/ilgtspejas-indekss-2022/ (accessed on 19 August 2022).
15. Sempere-Ripoll, F.; Estelles-Miguel, S.; Rojas-Alvarado, R.; Hervas-Oliver, J.L. Does Technological Innovation Drive Corporate Sustainability? Empirical Evidence for the European Financial Industry in Catching-up and Central and Eastern Europe Countries. *Sustainability* **2020**, *12*, 2261. [CrossRef]
16. Cirule, I.; Adela, S.; Grama, M.; Ludviga, I.; Kreituss, I. Open Innovation Strategies and Business Incubation Service Impact on the Success of Incubation. In Proceedings of the 2017 International Conference "Economic Science for Rural Development", Jelgava, Latvia, 27–28 April 2017; Volume 44, pp. 36–43.
17. Oganisjana, K.; Surikova, S.; Kozlovskis, K.; Svirina, A. Financial, Organisational and Informative Involvement of the Society in Social Innovation Processes in Latvia. *Entrep. Sustain. Issues* **2018**, *6*, 456–471. [CrossRef]
18. Dobele, L.; Grinberga-Zalite, G.; Kelle, L. Sustainable Economic Development: Scenarios For Promotion Of Social Innovation In Latvia. *J. Secur. Sustain. Issues* **2015**, *5*, 149–158. [CrossRef]
19. Uvarova, I.; Atstaja, D.; Korpa, V. Challenges of the Introduction of Circular Business Models Within Rural SMEs OF EU. *Int. J. Econ. Sci.* **2020**, *IX*, 128–149. [CrossRef]
20. Baraldi, E.; Ingemansson Havenvid, M. Identifying New Dimensions of Business Incubation: A Multi-Level Analysis of Karolinska Institute's Incubation System. *Technovation* **2016**, *50–51*, 53–68. [CrossRef]
21. Chesbrough, H.; Lettl, C.; Ritter, T. Value Creation and Value Capture in Open Innovation. *J. Prod. Innov. Manag.* **2018**, *35*, 930–938. [CrossRef]
22. Carayannis, E.G.; Campbell, D.F.J.; Grigoroudis, E. Helix Trilogy: The Triple, Quadruple, and Quintuple Innovation Helices from a Theory, Policy, and Practice Set of Perspectives. *J. Knowl. Econ.* **2022**, *13*, 2272–2301. [CrossRef]
23. Evans, S.; Fernando, L.; Yang, M. *Sustainable Value Creation—From Concept Towards Implementation. Sustainable Manufacturing*; Springer: Berlin/Heidelberg, Germany, 2017; pp. 203–220. [CrossRef]
24. Chesbrough, H. The Logic of Open Innovation. *Calif. Manag. Rev.* **2003**, *45*, 33–58. [CrossRef]
25. Carayannis, E.G.; Campbell, D.F.J. Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate to Each Other? A Proposed Framework for a Trans-Disciplinary Analysis of Sustainable Development and Social Ecology. *Int. J. Soc. Ecol. Sustain. Dev.* **2010**, *1*, 41–69. [CrossRef]
26. Uvarova, I.; Platonova, I.; Rascevska, Z.; Volkova, T.; Atstaja, D. The Value Co-Creation in Circular Business Models: QuadruplexHelix Perspective. In Proceedings of the 6th International Conference on New Business Models: New Business Models in a Decadeof Action: Sustainable, Evidence-Based, Impactful, Online, 9–11 June 2021; Hoveskog, M., Halila, F., Eds.; Halmstad University: Halmstad, Sweden, 2021; pp. 382–389.

27. Grama-Vigouroux, S.; Royer, I. Impact Des Parties Prenantes et de l'innovation Collaborative Sur La Création de Valeur Des Start-Ups Incubées: Le Cas Des Incubateurs d'affaires Roumains. *Innovations* **2020**, *62*, 129–160. [CrossRef]
28. Carayannis, E.G.; Grigoroudis, E.; Wurth, B. OR for Entrepreneurial Ecosystems: A Problem-Oriented Review and Agenda. *Eur. J. Oper. Res.* **2022**, *300*, 791–808. [CrossRef]
29. Hasche, N.; Höglund, L.; Linton, G. Quadruple Helix as a Network of Relationships: Creating Value within a Swedish Regional Innovation System. *J. Small Bus. Entrep.* **2020**, *32*, 523–544. [CrossRef]
30. Barcellos-Paula, L.; de la Vega, I.; Gil-Lafuente, A.M. The Quintuple Helix of Innovation Model and the Sdgs: Latin-American Countries' Case and Its Forgotten Effects. *Mathematics* **2021**, *9*, 416. [CrossRef]
31. Carayannis, E.G.; Campbell, D.F. Developed democracies versus emerging autocracies: Arts, democracy, and innovation in Quadruple Helix innovation systems. *J. Innov. Entrep.* **2014**, *3*, 1–23. [CrossRef]
32. European Business and Innovation Centre Network. Solutions. High Quality Business Support. EUBIC: Brussels, Belgium. Available online: https://ebn.eu/solutions/ (accessed on 15 June 2022).
33. Pedersen, E.R.G.; Lüdeke-Freund, F.; Henriques, I.; Seitanidi, M.M. Toward Collaborative Cross-Sector Business Models for Sustainability. *Bus. Soc.* **2021**, *60*, 1039–1058. [CrossRef]
34. Kujala, J.; Lehtimäki, H.; Freeman, R.E. *A Stakeholder Approach to Value Creation and Leadership. Leading Change in a Complex World: Transdisciplinary Perspectives*; Tampere University Press: Tampere, Finland, 2019.
35. Freudenreich, B.; Lüdeke-Freund, F.; Schaltegger, S. A Stakeholder Theory Perspective on Business Models: Value Creation for Sustainability. *J. Bus. Ethics* **2020**, *166*, 3–18. [CrossRef]
36. Carayannis, E.G.; Goletsis, Y.; Grigoroudis, E. Composite Innovation Metrics: MCDA and the Quadruple Innovation Helix Framework. *Technol. Soc. Change* **2018**, *131*, 4–17. [CrossRef]
37. Kramer, M.R.; Pfitzer, M.W. The Ecosystem of Shared Value. *Harv. Bus. Rev.* **2016**, *94*, 80–89.
38. Geissdoerfer, M.; Savaget, P.; Bocken, N.M.P.; Hultink, E.J. The Circular Economy—A New Sustainability Paradigm? *J. Clean. Prod.* **2017**, *143*, 757–768. [CrossRef]
39. Lüdeke-Freund, F. Sustainable Entrepreneurship, Innovation, and Business Models: Integrative Framework and Propositions for Future Research. *Bus. Strategy Environ.* **2020**, *29*, 665–681. [CrossRef]
40. Gimenez, C.; Sierra, V.; Rodon, J. Sustainable Operations: Their Impact on the Triple Bottom Line. *Int. J. Prod. Econ.* **2012**, *140*, 149–159. [CrossRef]
41. Porter, M.E.; Kramer, M.R. *Creating Shared Value. How to Reinvent Capitalism-and Unleash a Wave of Innovation and Growth*; Harvard Business Review: Brighton, MA, USA, 2011.
42. Geissdoerfer, M.; Morioka, S.N.; de Carvalho, M.M.; Evans, S. Business Models and Supply Chains for the Circular Economy. *J. Clean. Prod.* **2018**, *190*, 712–721. [CrossRef]
43. Korhonen, J.; Honkasalo, A.; Seppälä, J. Circular Economy: The Concept and Its Limitations. *Ecol. Econ.* **2018**, *143*, 37–46. [CrossRef]
44. Stål, H.I.; Jansson, J. Sustainable Consumption and Value Propositions: Exploring Product–Service System Practices Among Swedish Fashion Firms. *Sustain. Dev.* **2017**, *25*, 546–558. [CrossRef]
45. Bocken, N.; Ritala, P. Six Ways to Build Circular Business Models. *J. Bus. Strategy* **2021**, *43*, 184–192. [CrossRef]
46. Stubbs, W.; Cocklin, C. Conceptualizing a "Sustainability Business Model". *Organ. Environ.* **2008**, *21*, 103–127. [CrossRef]
47. Schaltegger, S.; Lüdeke-Freund, F.; Hansen, E.G. Business Cases for Sustainability: The Role of Business Model Innovation for Corporate Sustainability. *Int. J. Innov. Sustain. Dev.* **2012**, *6*, 95–119. [CrossRef]
48. Schaltegger, S.; Hansen, E.G.; Lüdeke-Freund, F. Business Models for Sustainability. *Organ. Environ.* **2016**, *29*, 3–10. [CrossRef]
49. Lopes, J.M.; Gomes, S.; Oliveira, J.; Oliveira, M. The Role of Open Innovation, and the Performance of European Union Regions. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 120. [CrossRef]
50. Porter, M.E.; van der Linde, C. Green and Competitive: Ending the Stalemate Harvard Business Review. *Harv. Bus. Rev.* **1995**, *95507*, 120–134.
51. Díaz-García, C.; González-Moreno, Á.; Sáez-Martínez, F.J. Eco-Innovation: Insights from a Literature Review. *Innovation* **2015**, *17*, 6–23. [CrossRef]
52. De Jesus, A.; Lammi, M.; Domenech, T.; Vanhuyse, F.; Mendonça, S. Eco-Innovation Diversity in a Circular Economy: Towards Circular Innovation Studies. *Sustainability* **2021**, *13*, 10974. [CrossRef]
53. Cillo, V.; Petruzzelli, A.M.; Ardito, L.; del Giudice, M. Understanding Sustainable Innovation: A Systematic Literature Review. *Corp. Soc. Responsib. Environ. Manag.* **2019**, *26*, 1012–1025. [CrossRef]
54. Konietzko, J.; Bocken, N.; Hultink, E.J. Circular Ecosystem Innovation: An Initial Set of Principles. *J. Clean. Prod.* **2020**, *253*, 119942. [CrossRef]
55. Boons, F.; Lüdeke-Freund, F. Business Models for Sustainable Innovation: State-of-the-Art and Steps towards a Research Agenda. *J. Clean. Prod.* **2013**, *45*, 9–19. [CrossRef]
56. Bakry, D.S.; Daim, T.; Dabic, M.; Yesilada, B. An Evaluation of the Effectiveness of Innovation Ecosystems in Facilitating the Adoption of Sustainable Entrepreneurship. *J. Small Bus. Manag.* **2022**, 1–27. [CrossRef]
57. *Business Models for the Circular Economy Opportunities and Challenges from a Policy Perspective RE-CIRCLE Resource Efficiency & Circular Economy Project*; OECD: Paris, France, 2018.

58. Aagaard, A.; Saari, U.A.; Mäkinen, S.J. Mapping the Types of Business Experimentation in Creating Sustainable Value: A Case Study of Cleantech Start-Ups. *J. Clean. Prod.* **2021**, *279*, 123182. [CrossRef]
59. Uvarova, I.; Atstaja, D.; Korpa, V.; Avena, L.; Erdmanis, M. End-of-Life Tyre Recycling: Going beyond to New Circular Business Models in Latvia. In *Engineering for Rural Development*; LLU: Jelgava, Latvia, 2020; Volume 19. [CrossRef]
60. Maastricht Sustainability Institute (MSI). Case Studies of Circular Business Models. Available online: https://www.circularx.eu/en/cases (accessed on 22 July 2022).
61. Kuckertz, A.; Berger, E.S.C.; Gaudig, A. Responding to the Greatest Challenges? Value Creation in Ecological Startups. *J. Clean. Prod.* **2019**, *230*, 1138–1147. [CrossRef]
62. Bandera, C.; Thomas, E. The Role of Innovation Ecosystems and Social Capital in Startup Survival. *IEEE Trans. Eng. Manag.* **2019**, *66*, 542–551. [CrossRef]
63. Oh, D.S.; Phillips, F.; Park, S.; Lee, E. Innovation Ecosystems: A Critical Examination. *Technovation* **2016**, *54*, 1–6. [CrossRef]
64. Osorno-Hinojosa, R.; Koria, M.; Ramírez-Vázquez, D.D.C. Open Innovation with Value Co-Creation from University–Industry Collaboration. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 32. [CrossRef]
65. Veleva, V.; Bodkin, G. Emerging Drivers and Business Models for Equipment Reuse and Remanufacturing in the US: Lessons from the Biotech Industry. *J. Environ. Plan. Manag.* **2018**, *61*, 1631–1653. [CrossRef]
66. Steffen, W.; Persson, Å.; Deutsch, L.; Zalasiewicz, J.; Williams, M.; Richardson, K.; Crumley, C.; Crutzen, P.; Folke, C.; Gordon, L.; et al. The Anthropocene: From Global Change to Planetary Stewardship. *Ambio* **2011**, *40*, 739–761. [CrossRef]
67. Whiteman, G.; Walker, B.; Perego, P. Planetary Boundaries: Ecological Foundations for Corporate Sustainability. *J. Manag. Stud.* **2013**, *50*, 307–336. [CrossRef]
68. Steffen, W.; Richardson, K.; Rockström, J.; Cornell, S.E.; Fetzer, I.; Bennett, E.M.; Biggs, R.; Carpenter, S.R.; de Vries, W.; de Wit, C.A.; et al. Planetary Boundaries: Guiding Human Development on a Changing Planet. *Science* **2015**, *347*, 1259855. [CrossRef]
69. Uvarova, I.; Mavlutova, I.; Atstaja, D. Development of the Green Entrepreneurial Mindset through Modern Entrepreneurship Education. *IOP Conf.Ser. Earth Environ.Sci.* **2021**, *628*, 012034. [CrossRef]
70. Cabral, C.; Lochan Dhar, R. Green Competencies: Construct Development and Measurement Validation. *J. Clean. Prod.* **2019**, *235*, 887–900. [CrossRef]
71. Hermes, J.; Rimanoczy, I. Deep Learning for a Sustainability Mindset. *Int. J. Manag. Educ.* **2018**, *16*, 460–467. [CrossRef]
72. Baumgartner, R.J.; Ebner, D. Corporate Sustainability Strategies: Sustainability Profiles and Maturity Levels. *Sustain. Dev.* **2010**, *18*, 76–89. [CrossRef]
73. Barber, N.; Taylor, C.; Strick, S. Wine Consumers' Environmental Knowledge and Attitudes: Influence on Willingness to Purchase. *Int. J. Wine Res.* **2009**, *1*, 59–72. [CrossRef]
74. Etzion, D. Research on Organizations and the Natural Environment, 1992-Present: A Review. *J. Manage.* **2007**, *33*, 637–664. [CrossRef]
75. De Faria, V.F.; Santos, V.P.; Zaidan, F.H. The Business Model Innovation and Lean Startup Process Supporting Startup Sustainability. *Procedia Comput. Sci.* **2021**, *181*, 93–101. [CrossRef]
76. Bocken, N.M.P. Sustainable Venture Capital—Catalyst for Sustainable Start-up Success? *J. Clean. Prod.* **2015**, *108*, 647–658. [CrossRef]
77. Burcharth, A.L.d.A.; Knudsen, M.P.; Søndergaard, H.A. Neither Invented nor Shared Here: The Impact and Management of Attitudes for the Adoption of Open Innovation Practices. *Technovation* **2014**, *34*, 149–161. [CrossRef]
78. Elia, G.; Margherita, A.; Passiante, G. Digital Entrepreneurship Ecosystem: How Digital Technologies and Collective Intelligence Are Reshaping the Entrepreneurial Process. *Technol. Soc. Change* **2020**, *150*, 119791. [CrossRef]
79. Grama-Vigouroux, S.; Saidi, S.; Berthinier-Poncet, A.; Vanhaverbeke, W.; Madanamoothoo, A. From Closed to Open: A Comparative Stakeholder Approach for Developing Open Innovation Activities in SMEs. *J. Bus. Res.* **2020**, *119*, 230–244. [CrossRef]
80. Montelisciani, G.; Gabelloni, D.; Tazzini, G.; Fantoni, G. Skills and Wills: The Keys to Identify the Right Team in Collaborative Innovation Platforms. *Technol. Anal. Strat. Manag.* **2014**, *26*, 687–702. [CrossRef]
81. Holzmann, T.; Sailer, K.; Galbraith, B.; Katzy, B.R. Matchmaking for Open Innovation – Theoretical Perspectives Based on Interaction, Rather than Transaction. *Technol. Anal. Strat. Manag.* **2014**, *26*, 595–599. [CrossRef]
82. Van de Vrande, V.; de Jong, J.P.J.; Vanhaverbeke, W.; de Rochemont, M. Open Innovation in SMEs: Trends, Motives and Management Challenges. *Technovation* **2009**, *29*, 423–437. [CrossRef]
83. Lee, S.; Park, G.; Yoon, B.; Park, J. Open Innovation in SMEs—An Intermediated Network Model. *Res. Policy* **2010**, *39*, 290–300. [CrossRef]
84. Wynarczyk, P.; Piperopoulos, P.; McAdam, M. Open Innovation in Small and Medium-Sized Enterprises: An Overview. *Int. Small Bus. J. Res. Entrep.* **2013**, *31*, 240–255. [CrossRef]
85. Mikelsone, E.; Segers, J.-P.; Spilbergs, A. Governance of Web-Based Idea Management System Rewards: From the Perspective of Open Innovation. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 97. [CrossRef]
86. Mikelsone, E.; Spilbergs, A.; Volkova, T.; Liela, E. Idea Management Systems in Developing Innovation Capacity. *Int. J. Innov. Technol. Manag.* **2022**, *19*, 2240001. [CrossRef]
87. Gerlach, S.; Brem, A. Idea Management Revisited: A Review of the Literature and Guide for Implementation. *Int. J. Innov. Stud.* **2017**, *1*, 144–161. [CrossRef]

88. Tsai, F.S.; Hsieh, L.H.Y.; Fang, S.C.; Lin, J.L. The Co-Evolution of Business Incubation and National Innovation Systems in Taiwan. *Technol. Soc. Change* **2009**, *76*, 629–643. [CrossRef]
89. Zykiene, I.; Laučienė, R.; Daugėlienė, R.; Leskauskienė, A. Strengthening Lithuanian—Latvian Cross—Border Cooperation in the Context of International Trade. *Eur. Integr. Stud.* **2021**, *1*, 138–159. [CrossRef]
90. Franco, M.; Haase, H.; Rodini, A. The Role of Incubators in the Internationalization Process of Incubated SMEs: A Perspective of International Cooperation. *Glob. Bus. Rev.* **2020**, 097215092091938. [CrossRef]
91. Gao, Q.; Cui, L.; Lew, Y.K.; Li, Z.; Khan, Z. Business Incubators as International Knowledge Intermediaries: Exploring Their Role in the Internationalization of Start-Ups from an Emerging Market. *J. Int. Manag.* **2021**, *27*, 100861. [CrossRef]
92. Hansen, T.M.; Chesbrough, W.H.; Nohria, N.; Sull, N.D. Networked Incubators. *Harv. Bus. Rev.* **2000**, *78*, 74–84.
93. Kambil, A.; Eselius, E.D.; Monteiro, K.A. Fast Venturing: The Quick Way To Start Web Businesses. *Sloan. Manag. Rev.* **2000**, *41*, 55.
94. Ferreras-Méndez, J.L.; Fernández-Mesa, A.; Alegre, J. Export Performance in SMEs: The Importance of External Knowledge Search Strategies and Absorptive Capacity. *Manag. Int. Rev.* **2019**, *59*, 413–437. [CrossRef]
95. Spender, J.-C.; Corvello, V.; Grimaldi, M.; Rippa, P. Startups and Open Innovation: A Review of the Literature. *Eur. J. Innov. Manag.* **2017**, *20*, 4–30. [CrossRef]
96. Saeed, M.A.; Kersten, W. Drivers of Sustainable Supply Chain Management: Identification and Classification. *Sustainability* **2019**, *11*, 1137. [CrossRef]
97. De Jesus, A.; Mendonça, S. Lost in Transition? Drivers and Barriers in the Eco-Innovation Road to the Circular Economy. *Ecol. Econ.* **2018**, *145*, 75–89. [CrossRef]
98. Du, S.; Yalcinkaya, G.; Bstieler, L. Sustainability, Social Media Driven Open Innovation, and New Product Development Performance*. *J. Prod. Innov. Manag.* **2016**, *33*, 55–71. [CrossRef]
99. Tiba, S.; van Rijnsoever, F.J.; Hekkert, M.P. Sustainability Startups and Where to Find Them: Investigating the Share of Sustainability Startups across Entrepreneurial Ecosystems and the Causal Drivers of Differences. *J. Clean. Prod.* **2021**, *306*, 127054. [CrossRef]
100. Geissdoerfer, M.; Pieroni, M.P.P.; Pigosso, D.C.A.; Soufani, K. Circular Business Models: A Review. *J. Clean. Prod.* **2020**, *277*, 123741. [CrossRef]
101. Bocken, N.M.P.; Rana, P.; Short, S.W. Value Mapping for Sustainable Business Thinking. *J. Ind. Prod. Eng.* **2015**, *32*, 67–81. [CrossRef]
102. Barile, S.; Grimaldi, M.; Loia, F.; Sirianni, C.A. Technology, Value Co-Creation and Innovation in Service Ecosystems: Toward Sustainable Co-Innovation. *Sustainability* **2020**, *12*, 2759. [CrossRef]
103. European Commission. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*; The European Green Deal: Brussels, Belgium, 2019.
104. United Nations. *The Sustainable Development Goals Report 2021*; United Nations Publications: New York, NY, USA, 2021.
105. Halkos, G.; Gkampoura, E.-C. Where Do We Stand on the 17 Sustainable Development Goals? An Overview on Progress. *Econ. Anal. Policy* **2021**, *70*, 94–122. [CrossRef]
106. Latvijas Investīciju un Attīstības Aģentūra. Par Biznesa Inkubatoriem. Available online: https://www.liaa.gov.lv/lv/biznesa-inkubatori/par-projektu. (accessed on 25 June 2022).
107. Cirule, I. Business Incubation Guidelines and Open Innovation. In Proceedings of the 2022 International Conference "Economic Science for Rural Development", Jelgava, Latvia, 11–13 May 2022; pp. 435–446. [CrossRef]
108. DeCampos, H.A.; Fawcett, S.E.; Melnyk, S.A. Collaboration Expectation Gaps, Transparency and Integrated NPD Performance: A Multi-Case Study. *J. Purch. Supply Manag.* **2022**, 100789. [CrossRef]
109. Gibbert, M.; Ruigrok, W.; Wicki, B. What Passes as a Rigorous Case Study? *Strateg. Manag. J.* **2008**, *29*, 1465–1474. [CrossRef]
110. Hildén, M.; Jordan, A.; Huitema, D. Special Issue on Experimentation for Climate Change Solutions Editorial: The Search for Climate Change and Sustainability Solutions—The Promise and the Pitfalls of Experimentation. *J. Clean. Prod.* **2017**, *169*, 1–7. [CrossRef]
111. Gaurav, J.K.; Rathi, V.; Burnwal, K.; Chaturvedi, A. Green Startups in India: Challenges and Opportunities. *J. Gov. Spec. Issue Environ.* **2019**, *18*, 235–244.
112. Rabadjieva, M.; Terstriep, J. Ambition Meets Reality: Mission-Oriented Innovation Policy as a Driver for Participative Governance. *Sustainability* **2021**, *13*, 231. [CrossRef]
113. Zizi, Y.; Jamali-Alaoui, A.; el Goumi, B.; Oudgou, M.; el Moudden, A. An Optimal Model of Financial Distress Prediction: A Comparative Study between Neural Networks and Logistic Regression. *Risks* **2021**, *9*, 200. [CrossRef]
114. Lin-Lian, C.; De-Pablos-Heredero, C.; Montes-Botella, J.L. Value Creation of Business Incubator Functions: Economic and Social Sustainability in the Covid-19 Scenario. *Sustainability* **2021**, *13*, 6888. [CrossRef]
115. Klofsten, M.; Lundmark, E.; Wennberg, K.; Bank, N. Incubator Specialization and Size: Divergent Paths towards Operational Scale. *Technol. Soc. Change* **2020**, *151*, 119821. [CrossRef]
116. Rovanto, I.K.; Bask, A. Systemic Circular Business Model Application at the Company, Supply Chain and Society Levels—A View into Circular Economy Native and Adopter Companies. *Bus. Strategy Environ.* **2021**, *30*, 1153–1173. [CrossRef]
117. Rutitis, D.; Smoca, A.; Uvarova, I.; Brizga, J.; Atstaja, D.; Mavlutova, I. Sustainable Value Chain of Industrial Biocomposite Consumption: Influence of COVID-19 and Consumer Behavior. *Energies* **2022**, *15*, 466. [CrossRef]
118. Porter, E.M. *The Competitive Advantage: Creating and Sustaining Superior Performance*; Free Press: New York, NY, USA, 1985.

119. Konietzko, J.; Bocken, N.; Hultink, E.J. A Tool to Analyze, Ideate and Develop Circular Innovation Ecosystems. *Sustainability* **2020**, *12*, 417. [CrossRef]
120. Aarikka-Stenroos, L.; Ritala, P. Network Management in the Era of Ecosystems: Systematic Review and Management Framework. *Ind. Mark. Manag.* **2017**, *67*, 23–36. [CrossRef]
121. Nylund, P.A.; Brem, A.; Agarwal, N. Innovation Ecosystems for Meeting Sustainable Development Goals: The Evolving Roles of Multinational Enterprises. *J. Clean. Prod.* **2021**, *281*, 125329. [CrossRef]
122. Grosse, M.; Pohlisch, J.; Korbel, J.J. Triggers of Collaborative Innovation in Online User Communities. *J. Open Innov. Technol. Mark. Complex.* **2018**, *4*, 59. [CrossRef]
123. Yin, D.; Ming, X.; Zhang, X. Sustainable and Smart Product Innovation Ecosystem: An Integrative Status Review and Future Perspectives. *J. Clean. Prod.* **2020**, *274*, 123005. [CrossRef]
124. Leydesdorff, L. The Triple Helix, Quadruple Helix, . . . , and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy? *J. Knowl. Econ.* **2012**, *3*, 25–35. [CrossRef]
125. Cunningham, J.A.; Menter, M.; O'Kane, C. Value Creation in the Quadruple Helix: A Micro Level Conceptual Model of Principal Investigators as Value Creators. *RD Manag.* **2018**, *48*, 136–147. [CrossRef]
126. Champenois, C.; Etzkowitz, H. From Boundary Line to Boundary Space: The Creation of Hybrid Organizations as a Triple Helix Micro-Foundation. *Technovation* **2018**, *76*, 28–39. [CrossRef]