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# Responsible innovation in start-ups: entrepreneurial perspectives and formalisation of social responsibility

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**ABSTRACT**

Start-ups are significant incubators of innovation. Notwithstanding, they have largely been ignored in the field of Responsible Innovation (RI). To address this shortcoming, the *social responsibility for start-ups model* (SRSM) for the embedment of RI in the innovation process of early-stage STEM (Science Technology Engineering Mathematics) start-ups has recently been proposed. Nevertheless, the SRSM is a model that still exists at the conceptual level. Therefore, it must be tested to confirm its legitimacy. In this paper, we propose a dedicated research methodology based on *Social Labs* for testing the SRSM through *social experimentation*; we also put this methodology into practice through an empirical case study aiming at operationalising RI in start-ups. A major finding of our study is that the SRSM constitutes an appropriate approach for institutionalising RI in start-ups, and for measuring the degree to which a startup innovates responsibly.

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Social responsibility; innovation; start-ups; social labs; experimentation

## Introduction

Responsible Innovation (RI) is a seminal policy-relevant discourse on science, technology, innovation, and society that emerged over the last decade (Owen et al. 2021). According to Owen et al. (2013), it amalgamates established approaches including anticipatory governance (Barben et al. 2008; Karinen and Guston 2009), constructive and real-time technology assessment (Fisher and Rip 2013; Guston and Sarewitz 2002; Schot and Rip 1997), upstream engagement (Wilsdon, Wynne, and Stilgoe 2005), and midstream modulation (Fisher and Rip 2013). These cognates promote innovation as a complex, future-creating process with the potential of addressing ethical, social, environmental, and political risks (Owen et al. 2021). To minimise these risks and orient towards desirable futures, RI ingrains into the innovation process capacities for *anticipation*, first- and second-order *reflexivity*, *inclusive deliberation* with the public and stakeholders, and

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*responsiveness* in shaping innovation agendas and trajectories (Owen et al. 2013; Stilgoe, Owen, and Macnaghten 2013).[1]

The main bulk of RI literature (see, for example, Blok and Lemmens 2015; Brand and Blok 2019; Lehoux et al. 2020; Long and Blok 2018; Owen et al. 2021; Ryan, Mejlgaard, and Degn 2021; Stahl et al. 2017; van de Poel et al. 2020; and Nazarko 2019) focuses on strategies, guidelines, and objectives for RI in, primarily, research performing and funding organisations and, secondarily, in business organisations. However, with a few exceptions (Long et al. 2020; Thapa and Iakovleva 2023), the RI literature fails to consider *start-ups* and their idiosyncratic characteristics that affect how RI is operationalised in this context.

A similar problem exists with *indicators* for organisational sustainability offered by Environmental, Social, Governance (ESG) data providers[2] to assess the alignment between stakeholder and shareholder value in Socially Responsible Investment. Although these indicators could indeed be used to guide the process of embedding responsibility in organisations and assess the extent to which organisations operate responsibly, they are inherently targeted at large and mature organisations and fail to account for the idiosyncratic characteristics of start-ups.

Evidently, there is a lack of research on RI in start-ups. This is a clear shortcoming, considering that start-ups, and especially STEM (Science Technology Engineering Mathematics) start-ups[3] are significant incubators of innovation. They are characterised by a culture of experimentation, risk-taking, and agility, that fosters innovation; they are also associated with technological advancement and/or disruptive business models. Recently, there have been efforts to overcome this shortcoming and to develop an RI approach that focuses on start-ups. For example, the RRIstart project[4] has proposed a model – *the social responsibility for start-ups model* (SRSM) – for the embedment of RI in the innovation process of early-stage STEM start-ups. The SRSM offers a set of indicators designed to function as a tool for start-ups on how to implement responsible behaviour in their early life-cycle stages and evaluate the current level of responsibility in the start-up innovation process. Nevertheless, the SRSM is still nascent: it is essentially an abstraction that exists at the conceptual level, lacking any form of established practice. It must, therefore, be tested through practical implementation to prove its effectiveness. We argue that such testing entails active *social experimentation* that evaluates the reception of the SRSM by start-ups and investors in *realistic settings* and provides a solid basis for evolving and refining the model.

To this end, this paper proposes a dedicated testing methodology for conducting such experimentation based on *Social Labs* (*SLs*) (Hassan 2015; Timmermans et al. 2020). This methodology is put into practice through an empirical case study aiming at operationalising RI in start-ups. SLs offer a *space* in which start-up entrepreneurs engage with stakeholders to gain insight into social responsibility issues. They foster *experiential learning* (Kolb 1984), a theory underlying any form of (social) experimentation (Lake, Fernando, and Eardley 2016; Timmermans et al. 2020), and embrace *mutual learning* by promoting effective dialogue.

The paper is structured as follows: Section 2 examines the status of industrial RI, and of RI in (STEM) start-ups. Section 3 outlines the SRSM. Section 4 discusses collaborative problem-solving approaches and their role in implementing RI. Section 5 presents our methodological approach to testing the SRSM. Section 6 presents findings of the

application of the SRSM. Section 7 discusses these findings, and Section 8 presents conclusions.

## Overview of responsibility in technological innovation

Technological innovation extends beyond solving technical problems; it is a social process in which science and society mutually influence one another, reshaping the world we live in (Evers and Ewert 2015). RI is thus a means to transition to a positive future by collectively managing technological innovation in the present (Owen et al. 2013). A model that has been particularly successful in capturing the essence of RI is the one proposed by Owen et al. (2013). This model revolves around four principles or 'process requirements' depicted in Table 1. These principles were initially developed in an academic context, and their adoption has largely been *substantive* motivated by the belief that RI is indeed a pathway to a better future.

However, circa 2015, a growing focus on *industrial RI* emerged (Blok and Lemmens 2015; Garst et al. 2017; Martinuzzi et al. 2018; Stahl et al. 2019; van de Poel et al. 2020). This focus has been primarily *instrumental*, motivated by the fact that the adoption of RI practices can benefit innovation-oriented firms by facilitating early (upstream) stakeholder engagement in the innovation process, thereby enabling better risk anticipation downstream and enhancing the firm's offerings, reputation and marketability (Long et al. 2020). Studies have also emphasised the potential of RI to increase a firm's competitive advantage (Blok, Hoffmans, and Wubben 2015) and demonstrated its alignment with Corporate Social Responsibility (CSR) initiatives (Long and Blok 2018) and open innovation strategies (Long, Looijen, and Blok 2018). Additionally, research has illustrated how RI can be incorporated into R&D decision-making processes and corporate strategy (Blok, Hoffmans, and Wubben 2015; van de Poel et al. 2020). Similarly, Lubberink et al. (2017) demonstrated how the processual requirements of Table 1 can be implemented in a business context (see Table 2).

Turning to (STEM) start-ups, their context is significantly different from that of larger corporations: their small size and early stage of development confer several idiosyncratic traits (see Table 3) that effectively invalidate the use of existing approaches to the institutionalisation of industrial RI (see, for example, Blok and Lemmens 2015; Brand and Blok 2019; Lehoux et al. 2020; Nazarko 2019; Owen et al. 2021; Ryan, Mejlgaard, and Degn 2021; Stahl et al. 2017; van de Poel et al. 2020). This is a significant drawback

**Table 1.** RI processual requirements (Owen et al. 2013).

| Processual requirement | Description |
|---|---|
| Anticipation | Asking questions about the future, taking into consideration what is not known, what is likely, what is plausible, and what is possible. |
| Reflexivity | Thinking and being critical about the innovation process and being aware that there is typically no valid universal viewpoint. |
| Inclusion | Engaging various stakeholders to participate from the start in science and innovation such that societal values are absorbed in the process of bringing new technologies to the market. |
| Responsiveness | Modifying ways of thinking, research trajectories, and behaviours in response to stakeholder or public demand. |

**Table 2.** Business-context conceptualisation of RI processual requirements (Lubberink et al. 2019).

| Processual requirement | Description |
|---|---|
| Anticipation | (1) Determining desired impacts and outcomes of innovation<br>(2) Preventing or mitigating negative impacts<br>(3) Development of roadmaps for impact |
| Reflexivity | (1) Actions and responsibilities<br>(2) Values and motivations<br>(3) Knowledge and perceived realities |
| Inclusion | (1) Involvement of stakeholders at different stages (who and when)<br>(2) Values and motivations<br>(3) Knowledge and perceived realities |
| Responsiveness | (1) Making sure that one can respond to changes in the environment<br>(2) Actual response to changing environments<br>(3) Addressing grant challenges<br>(4) Mutual responsiveness |

**Table 3.** Idiosyncratic characteristics of start-ups.

| | |
|---|---|
| Fluidity of roles | Start-up entrepreneurs are also managers, staff, administration, and finance. The entrepreneurs wear many hats in their roles, and the start-up is very fluid with roles, titles, and functions, of individuals (Henriques and Öberg 2016; Long et al. 2020). |
| Specialisation and size | Start-ups are usually quite specialised in their products, and target audience, and are small in comparison to more mature businesses, which means fewer resources and opportunities to focus on everything the entrepreneurs would like to (Henriques and Öberg 2016; Long et al. 2020; Maccarrone and Contri 2021; Retolaza, Ruiz-Roqueni, and San-Jose 2009). |
| Dependence of external environment | Start-ups often have less control over many of the (social, economic, and political) aspects that may help or hinder their product's design, which often creates a degree of uncertainty about the product's potential success or failure (Henriques and Öberg 2016; Long et al. 2020; Retolaza, Ruiz-Roqueni, and San-Jose 2009). |
| No current stakeholders | Because of their early stage of development, start-ups often lack stakeholders; instead they (mostly) depend upon anticipated or future stakeholders (Retolaza, Ruiz-Roqueni, and San-Jose 2009; Voinea et al. 2019). |
| Technological innovation | There is a high degree of innovation in STEM start-ups, and they require highly-skilled employees to pioneer the success of their products (Henriques and Öberg 2016; Long et al. 2020; Retolaza, Ruiz-Roqueni, and San-Jose 2009). |

given that STEM start-ups are significant carriers of technological innovation (Long and Blok 2021; Lubberink et al. 2019). Many start-ups are already implementing RI *de facto* (Lubberink et al. 2019; Randles, Tancoigne, and Joly 2022). This often comes as a response to pressure to demonstrate social responsibility to investors (Houterman, Blok, and Omta 2014) and stakeholders (Lubberink et al. 2019). Moreover, for certain start-ups, responsibility and positive social change are underpinning reasons for their very existence (Roelofsen, Blok, and Wubben 2015; Long, Looijen, and Blok 2018, 90). Nevertheless, RI practices in start-ups occur primarily in an *ad hoc manner* (Lubberink et al. 2019): small firms in which the founder plays a key leading role have a multitude of informal ways to establish an RI culture, rather than resorting to resource-consuming formal RI protocols (Long and Blok 2021; Roelofsen, Blok, and Wubben 2015). This approach, however, lacks scalability. While it may initially be easy to set up an RI culture, it becomes increasingly challenging to maintain it as the start-up grows: formal techniques, dedicated personnel to ensure RI, and guidelines that staff can follow, will eventually have to come to rescue (Roelofsen, Blok, and Wubben 2015).

To address this drawback, the RRIstart project has proposed the Social Responsibility for Start-ups Model (SRSM): a formal approach that is founded upon the idiosyncratic nature of STEM start-ups and which may be used for qualitatively assessing the adoption of responsibility in STEM start-ups, but also for guiding its institutionalisation.

## The Social Responsibility for Start-ups Model

The SRSM perceives innovation as a complex phenomenon that results from the engagement of a multitude of actors and has far-reaching impacts that affect a broad range of stakeholders. It is based on three main components: RI, the Lean start-up approach (Blank 2013; Ries 2011), and the Quadruple Helix (QH) approach. This section outlines how the SRSM blends these components and reviews different approaches that could be used to test its effectiveness. A fuller account of the SRSM can be found in (Ryan et al. 2023).

The SRSM concedes that only using RI's focus on ethical, social, and environmental impacts is challenging for businesses and especially start-ups. To overcome this obstacle, it cross-fertilises RI with the Lean start-up approach (LSA), which is a distinctly business-oriented approach suitable for start-ups that emphasises a dynamic and iterative testing process. The so-called 'build-measure-learn' loop (see Figure 1) aims at continually validating and refining both a start-up's action plans and its overarching objectives (Blank 2013; Bortolini et al. 2021). This iterative approach fosters adaptability to changing market dynamics and stakeholder feedback, enhancing the likelihood of success for emerging ventures (Frederiksen and Brem 2017, 178; Gbadegeshin and Heinonen 2016). It also highlights the importance of *context*, emphasising collaboration and information exchange with diverse stakeholders. It is thus attuned to a basic principle underlying RI institutionalisation, namely *multi-stakeholder engagement*.

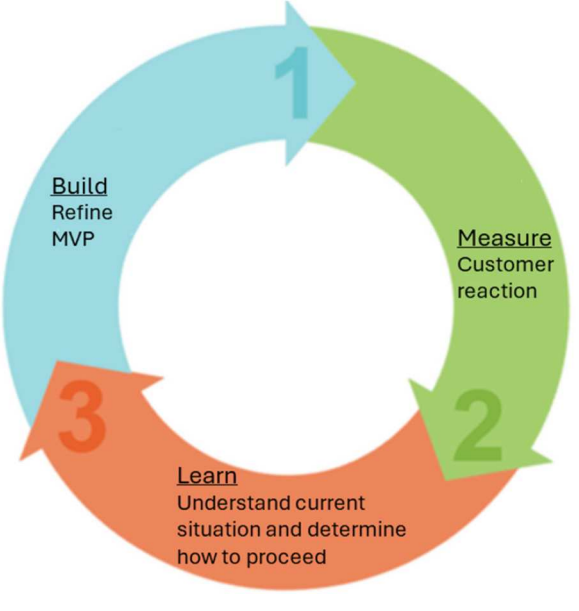


**Figure 1.** The Build – Measure – Learn loop.

In the SRSM, this cross-fertilisation between RI and LSA takes place through the QH approach i.e. through a systemic method that emphasises four interconnected subsystems, or *helices*, in innovative practices: *societal*, *business*, *research*, and *political*. The SRSM advocates a *processual interpretation* of the QH approach, focusing on the actual processes through which stakeholders seek to create value across each helix during the innovation process (Popa, Blok, and Wesselink 2020). A helix thus represents a *behaviour* directed at a specific value (see Table 4). STEM start-ups should ideally direct their innovation activity towards all four types of value, for they provide a link between the social and research-focused world of RI and the economically driven world of the LSA. A link that enables start-ups to operationalise their social responsibility ambitions without neglecting economic logic.

The SRSM offers a set of indicators (Ryan et al. 2024) that function as a tool for a broad range of evaluative standpoints, and as a guide on implementing responsible behaviour in the early life-cycle stages of a start-up. Through their use, the members of a start-up and their external partners seek to create value in each helix during the innovation process.

The SRSM aspires to trigger change that ultimately leads to the institutionalisation of RI in early-stage STEM start-ups. It adopts an *organisational institutionalism* perspective, emphasising the influence of societal and institutional factors in shaping organisational behaviour. It focuses on the interconnectedness between start-ups and the institutions (laws, regulations, cultural and societal norms and practices) (Greenwood et al. 2017), crucially recognising the latter's role as a primary source of endorsement, authorisation and legitimation of logic, behaviours and practices that characterise the start-up innovation process (Greenwood et al. 2017; Scott 1995). This is of utmost importance given the multi-dimensional dependence of start-ups on the external environment for sensing market dynamics and trends through MVP[5] cycles, hence for positioning their offerings more effectively, and for granting access to resources including capital, talent, suppliers, and distribution channels. Organisational institutionalism is important for one more reason: by shifting focus to the external environment, it largely circumvents the issues associated with the idiosyncratic nature of start-ups.

Nevertheless, the SRSM concedes that an organisational institutionalism perspective does not lead to (RI-oriented) change, for such change also depends on *internal factors*, specifically on how incumbents – start-up entrepreneurs – respond to external influence. This is corroborated by the literature, which recognises a critical need for effective institutional entrepreneurship by those who have sufficient agency to overcome structure and test new behaviours (Dacin, Goodstein, and Richard Scott 2002; DiMaggio 1988; Greenwood et al. 2017; Hardy and Maguire 2017; Owen et al. 2021; Smets, Aristidou, and Whittington 2017).

**Table 4.** Processual interpretation of QH.

| Helix | Value | Prototypical behaviour |
|---|---|---|
| Industry | Business | Starting a business, investing in a business, mergers and acquisitions, managing a business |
| Policy | Political | Formulating supportive policies, establishing technology transfer offices, establishing regulatory frameworks (e.g. IP legislation, data privacy and security, ethical standards in research, etc.), allocating resources according to innovation priorities |
| Research | Research | Researching and disseminating scientific work |
| Civil society | Societal | Abiding by relevant legislation, innovating with and for the public, innovating based on supportive policies and resources |

## Responsible innovation through collaborative problem solving

Collaborative problem-solving approaches are crucial in facilitating RI practices (Adomako and Tran 2022; Bommert 2010; Timmermans et al. 2020; Voegtlin and Andreas 2017). They emphasise collaboration, co-creation, co-design, shared decision-making, and collective action to leverage diverse perspectives, knowledge, and expertise when addressing the ethical, social, and environmental dimensions of innovations. They thus enable organisations to identify and address potential risks and knowledge gaps, whilst promoting interdisciplinarity and transparency (Greer and Lei 2012). They can be applied to various contexts, including community development, public policy, business innovation, and social change initiatives.

Several collaborative problem-solving approaches have been proposed, including Participatory Decision-Making, Innovation Labs, Living labs, and Social Labs (Bryson, Crosby, and Stone 2015; Pollastri et al. 2013). Participatory Decision-Making is implemented through a short-lived process that focuses on reaching stakeholder consensus on a specific matter. Innovation Labs are physical or virtual spaces dedicated to fostering creativity, collaboration, and experimentation; they emphasise identifying pressing problems, generating new ideas, and developing innovative solutions based on these ideas to address the problems. Living Labs (Følstad 2008) focus on co-creating, testing, and validating innovative solutions to complex challenges, often within specific domains such as urban development, healthcare, or transportation (Criado et al. 2021; Hossain, Leminen, and Westerlund 2019).

None of these approaches, however, are designed to address *complex* societal problems on a *systemic level*, i.e. problems whose solution is not confined within the locus of control of any single organisation but requires interdisciplinarity sourced from a range of external stakeholders with diverse expertise and backgrounds. In this respect, they are inappropriate for testing the effectiveness of an approach such as the SRSM that takes an organisational institutionalism perspective when shaping RI-oriented change (see Section 3).

*Social Labs* (*SL*s), on the other hand, are designed exactly for that purpose (Dessers et al. 2014; Hassan 2015; Kieboom, Sigaloff, and van Exel 2015; Romero-Frías and Robinson-García 2017). They offer a real-life, albeit controlled, environment within which stakeholders may collaboratively diagnose challenges, appraise current practices and tap into the collective wisdom through *mutual learning* (Rodrigues, Cubista, and Simonsen 2015). SLs are rooted in the philosophy of pragmatism whereby complex social problems can be tackled successfully only through a process of *experimentation* i.e. by transforming knowledge and understanding through the interplay that occurs between experience and conceptualisation; an interplay that should be as *inclusive* and broadly sourced as possible, including a multitude of stakeholders. SLs, therefore, advocate Kolb's experiential learning (1984), fostering an iterative learning process that integrates concrete experience and encourages active experimentation. As depicted in Figure 2, this process unfolds along four steps: active experimentation, concrete experience, reflective observation, and abstract conceptualisation.

SLs have been applied to address sustainability (Rodrigues, Cubista, and Simonsen 2015), poverty alleviation (Hassan 2015), social cohesion in municipalities (Kieboom 2014), and for gathering empirical evidence for mainstreaming RRI (Timmermans et al. 2020).

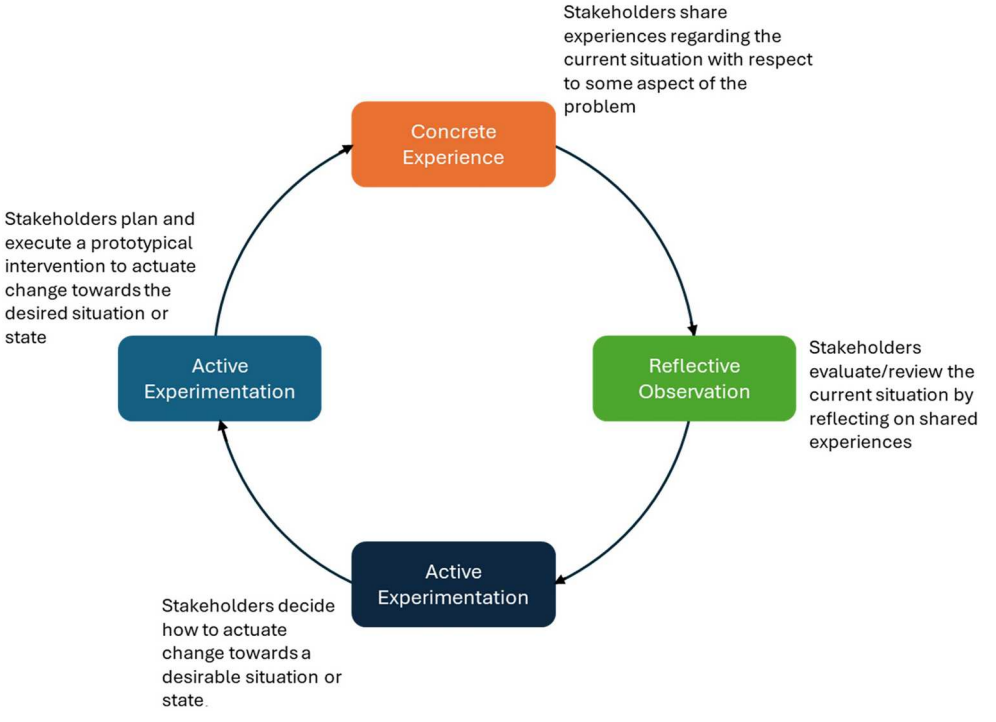


**Figure 2.** Kolb's experiential learning.

## Case study

The RRIstart project assessed the effectiveness of the SRSM by testing its ability to institutionalise RI in early-stage STEM start-ups, and to guide impact investment. The research methodology was based on SLs, and testing was accomplished through a case study. This section presents the case study, describes the setup of the SLs, and outlines the methodological process followed.

The case study involved an empirical and translational 'from-lab-to-market' approach organised around three distinct innovation ecosystems: advanced materials in Italy; bioeconomy (agrifood) in Greece; and environmental sustainability in Northern Europe. The rationale behind the geographical spread of the ecosystems was to test how institutional, regulatory, and ecosystem capacities in the North and South of Europe affect transitioning to RI-oriented STEM startups and impact investment. Two distinct pilots were set up in each ecosystem. Each pilot involved a start-up, public/private investors, and stakeholders from all four helices of the QH model, collectively assessing, through practical experimentation, the ability of SRSM's indicators to diagnose the level of responsibility in the start-up innovation process and facilitate its embedment. The pilots are further elaborated in Table 5.

### *Social lab setup*

#### *Social lab roles*

SL participants may assume the following roles: case owner, researcher, facilitator. Case owners are stakeholders who are interested in implementing SL methodology within

**Table 5.** Pilots per ecosystem.

| Ecosystem | Pilot 1 | Pilot 2 |
|---|---|---|
| 3D printing and advanced materials in Italy | Focused on a start-up in the field of nano-structured bio-materials with the aim of bringing to life truly sustainable and natural products and solutions made from renewable resources and food waste. The start-up deals with nanomaterials in the circular economy, and with the cultivation and realisation of the 'Vegan Skin' based on a bacterial nanocellulose called Scobyskin and waste from wine, beer, tea and others. | Focused on a start-up that aims to contribute to individual well-being by designing and developing high-quality and innovative medical devices, dermo-cosmetics, and food supplements, with particular attention to sustainability and the environment. The start-up envisions to transform the urban environment into a productive environment (urban farming) with very low energy consumption, using food waste and agricultural by-products to produce raw materials. |
| Bioeconomy (agrifood) in Greece | Focused on a start-up that specialises in technological solutions for all types of agri-business (from producers to consultants and processors), and focuses on the development of IoT and AI applications for the holistic assessment of the information collected in the field from a heterogeneous range of sensors. | Focused on a company venturing into the agrifood sector, working closely with agronomists (regarding plant sickness, validation of data from sensors, etc.). They have developed an innovative digital advisory tool providing advice for thousands of farmers in Greece and abroad. |
| Environmentally sustainable start-ups from Northern Europe | Focused on a very early-stage Paris-based start-up active in the SpaceTECH sector. The start-up specialises in creating sustainable cultivation solutions on earth and regenerative life-support in space. | Focused on a very early-stage Potsdam-based start-up specialising in conducting research in the agricultural technology sector. |

their process and are hence expected to carry out interventions.[6] In the context of this work, case owners are the pilot start-ups implementing SRSM-driven interventions, as well as the stakeholders from each QH with whom they interact as part of these interventions. Researchers participate in the SL because they want to understand the phenomenon in question, and they want to draw more general lessons that can be applied beyond that case. They can contribute with knowledge of communication models (discussion formats) and actual knowledge of the field pertaining to the 'complex problem' being tackled. Finally, facilitators are stakeholders who are burdened with the organisational and management side of an SL. They are responsible for formulating meeting agendas and for driving and facilitating discussions with case owners.

### *Social lab cycles*

An SL case i.e. an active SL experimentation, comprises multiple *SL cycles*.[7] Each SL cycle consists of a *case meeting* in which participants interact to obtain insight into the current situation of the case, to identify a set of problems, and to develop action plan prototypes for experimentation. Therefore, each case meeting comprises the following sequence of tasks: *Describe*, *Evaluate*, and *Prescribe*/*Refine*. The aim of a '*Describe*' task is to enable case owners to *share* their viewpoints regarding the situation/problem at hand. The aim of an '*Evaluate*' task is to enable case owners to evaluate the capacity of the SRSM to diagnose, through its indicators, the current level of responsibility in the start-up innovation process. The task also guides the startup process towards more responsible forms of innovation, by implying, along each helix, courses of action that aim at establishing *cross-helix accountability* in

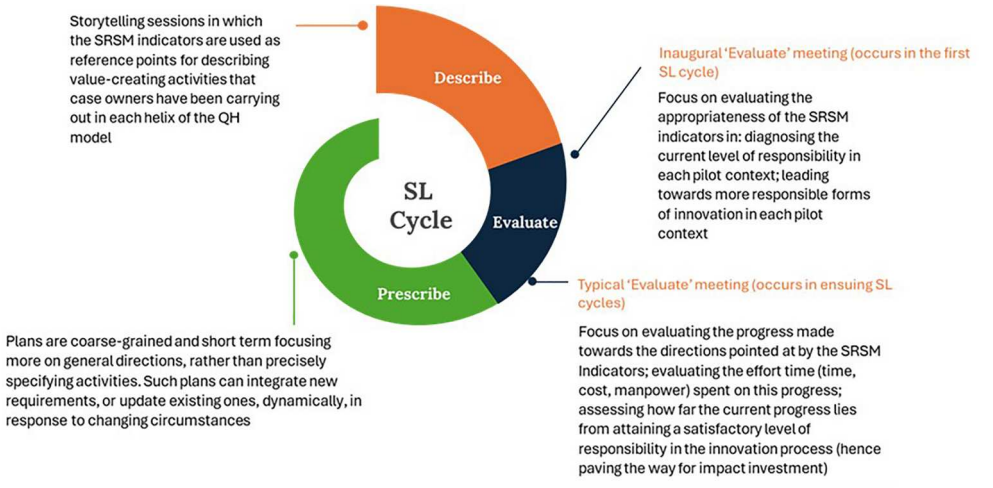


**Figure 3.** Case meeting tasks.

research and innovation activities. In a '*Prescribe*' subtask, stakeholders agree upon, and commit to, a plan of action. This plan is not intended to be highly detailed but is rather a coarse-grained, short-term plan focusing on the directions of the transition process rather than precisely specifying its constituent activities. These tasks are depicted and further elaborated in Figure 3.

## *Methodological process*

Case meetings were recorded, and minutes were kept. The minutes were analysed using the *documentary method* (Ahmed 2010) that entails a systematic collection and analysis of existing documents about topics that are subject to investigation. In our work, a *deductive manual coding* process was adopted comprising the following main phases (Miles and Huberman 1994).

**Data reduction**. This phase summarises, simplifies, and abstracts the data. This process was necessary to refine the collected data and make them easily accessible and manageable, as well as to eliminate any insufficiently clear or irrelevant data from the study.

**Data coding**. This phase compresses the information by organising data excerpts around codes to extract 'findings' i.e. short descriptions of facts that surfaced during the implementation of the SRSM. In our work, the following codes were considered:

- Perception of entrepreneurial group on responsibility.
- SRSM-based assessment of current status of RI in start-ups.
- Challenges of implementing RI in start-ups.
- SRSM-based formalisation in start-ups.

The analysis was performed by the SL facilitators and the outcomes of each SL cycle with respect to the above aspects were consolidated in three project deliverables (RRIstart

2023a; RRIstart 2023b; RRIstart 2023c; RRIstart 2023d). The following section summarises the most important results from the six SL cases.

## Results

### *Perception of entrepreneurial group on responsibility*

All start-ups stated that they felt strongly about developing socially responsible products and services. Besides the intrinsic benefit of doing good, the start-ups mentioned that their primary business motivator was to make research results easily accessible through hands-on products and services (SL case 2). Thus, if socially responsible practices within the organisation would allow for better and more effective products and services, they were indeed interested in further developing this area of their business. However, they emphasised that their relatively small budget and workforce constrain this development.

A reason for implementing socially responsible practices is *instrumental*: by enhancing positive societal impact, start-ups become attractive targets for investors inclined towards social responsibility (SL case 3). Another (instrumental) reason for integrating socially responsible practices in start-ups is that it `makes good business sense'. For instance, the start-ups in SL case 2 stressed that a deep dive into the societal aspects of the farming community is a prerequisite of making their services more effective. It would require, they stated, understanding a broad spectrum of societal characteristics including education, age, specificity of operations, and location. This would alleviate contrasts and conflicts regarding client acceptance, while minimising the 'patchwork' required during service deployment. They advocated that future start-ups should be focusing intensely on such societal aspects to reduce risk, anxiety, and indecisiveness at the organisational level (SL case 2). This corroborates that a significant driver for implementing socially responsible practice is that it alleviates issues that may arise if these practices are not implemented at an early stage of product/service development.

### *Current status of responsible innovation in the start-ups*

Many of the start-ups had socially responsible practices already implicit within their business model and were implementing RI practices in an ad hoc manner. This is largely the result of the make-up of the start-up and products they developed. Some start-ups mentioned that sustainability and ensuring positive social change were underpinning reasons for creating their businesses in the first place.

Nevertheless, despite the positive reactions and enthusiasm about the benefits of RI, there was a low level of implementation of formally expressed socially responsible practices. For example, the main case owner in SL case 1 noted that despite the start-up's strong social/environmental-oriented character, there are no standards or protocols related to ethical issues or social/environmental impacts. This was also true in SL case 2 and 3.

### *Challenges of implementing responsible innovation in start-ups*

While many SL start-ups and venture capitals (VCs) claimed to be interested in ethical and socially responsible practices, cost considerations limit their ability or willingness to

implement them (SL case 3). For example, start-ups noted that they struggle to balance their social and environmental goals with their financial and operational needs, especially in early stages of development, as they largely depend upon investors' values and whether these match their own (SL case 3). To reconcile tensions between economic and social logics, investment decisions are often based on complex and vague KPIs. For example, the start-up in SL 6 stated that evaluators responsible for releasing funds used a very complex SDG-based evaluation system. Another challenge relates to the *evaluation* of social impacts. This was an issue in most SLs, with start-ups and investors stating that they often lack the knowledge, skills or tools to accurately measure, assess and manage the ethical and social impacts of their innovations (SL case 3).

An additional challenge relates to the structure, size and composition of the start-ups. It is often hard to establish a common set of minimum values among all people who work in a start-up (SL case 1). Start-up entrepreneurs maintained that start-ups differ from other enterprises because their employees are seen as entrepreneurs themselves, thus making it difficult to implement a top-down code, or set of values, that everyone abides by (as they are seen as being on the same level as one another – SL case 1).

All the start-ups mentioned that they were interested in further developing their social responsibility but, due mainly to their small size and fuzzy structure, are burdened by the costs of doing so, the time required to implement it, and the resources to help them do so.

### *Formalising responsible innovation in start-ups*

Start-ups emphasised that they did not know where to begin when it comes to adopting guidelines or frameworks to implement as proactive measures for social responsibility. Hence their positive reaction to a paradigm such as the SRSM that could help them in this direction.

Despite the overarching positive feedback about the SRSM, a business angel (SL case 3) with many years of experience in the field began by stating that the investment of business angels is at a very early seed stage and these start-ups do not have sufficient human or financial resources to consider implementing a methodology such as SRSM.

His opinion was not universally accepted within the SLs. A broad range of investors in his and other SLs maintained that social responsibility was very important to them. In particular, the investor participating in the first SL of case 3 stated that the start-ups she works with directly have a more social objective and that she was very interested in the SRSM. She mentioned that she would like to use the model with some of the start-ups she works with. After this intervention, the participant who was very dismissive of the model replied that he would like to use the model but needed extra support to get the message across to the start-ups so that they fully understand the purpose of it. He stated that: 'The desire is there but it needs more support. Maybe we should focus on this at a Later Stage?' (SL case 3).

In relation to the SRSM indicators, many of the start-ups stated that the social indicator S2[8] was most relevant for them, probably because of their heavy focus on sustainability.

The main case owner in the 2nd SL of case 2 observed that they had already discussed some indicators, such as S2. The reason for this is because of the start-up's line of business (medical area). They felt that they had a much closer connection with social

indicators and issues (in a similar way that social entrepreneurs have a close connection with RI because of the nature of the company, compared with purely growth-oriented entrepreneurs) and declared a specific interest in trying to apply the 24 indicators (SL case 1). The participants also pointed out that the indicators should not be viewed chronologically as they were all important for generating positive social and environmental impacts (SL case 1). One criticism of the indicators was that some of the stakeholders felt that they were too focused on product-oriented, rather than service-producing, start-ups (SL case 1).

Other start-ups stated that they were trying to implement certain themes within the indicators e.g. inclusivity. However, they highlighted the difficulty of doing this in practice.

The start-ups viewed the creation of positive social outcomes as their raison d'étre because of the very nature of their product/company. This is an interesting finding as it points to the fact that if a start-up sets out to solve societal challenges and issues through its products/services, then there is a good chance that it will already place socially responsible practices in high regard (which is what we saw throughout all six SLs). Nevertheless, ad-hoc RI approaches are mainly based on instinct and performed in an ad-hoc manner rather than through an organised process of incorporating responsibility-related concerns into their operations (SL case 2).

One of the results from the SLs is that the participants noted that incorporating a responsibility agenda into business models is becoming increasingly crucial in today's society. To meet customer demands/needs and comply with regulations, many start-ups are now taking a proactive approach to incorporating ethical/environmental practices into their business models (as indicated in SL case 2).

Additionally, in SL 3, the investor indicated that early-stage start-ups get much feedback and are influenced by their investors to distinguish their business model and place in the market. However, if the product/service is not fit for the market or commercially viable, then no matter what impact is being delivered, it will not get off the ground or, at least, it will be very difficult to do so. This was a major issue identified with the start-up in SL1: although their product was very sustainable and would contribute greatly to society, they faced major difficulties during the early stages of business creation, for it was very challenging to identify how their product would be developed in a commercially viable way.

## Discussion

One of the most emphasised points during the SLs is the demand on start-ups to balance social responsibility with profitability. This is also reflected in the literature, with some claiming that a reason that venture capitalists do not invest in green start-ups is because they are presumed to have lower profitability than traditional start-ups (Fichter and Olteanu 2019) or socially responsible start-ups are viewed as 'higher risk' (Cumming, Henriques, and Sadorsky 2016; Kortenhorst and Kortenhorst 2017; Wöhler and Haase 2022). In addition to these challenges, there is also the potential that demands for profitability will lead to 'mission drift' of the start-up. Mission drift is when demands placed on the start-up impact their values or require them to change their principles towards more profitability. Their social responsibility mission 'drifts' away from its starting-place or the entrepreneurs' principles.

Therefore, profitable investments can create tension between the desire to support responsible entrepreneurship and the need to make financially sound decisions. This cuts to the very heart of the matter: if there is no investment, there is no start-up. The start-up typically must be a profit-making endeavour, or at least have the future potential to be. If this is not possible, then no matter how socially responsible they are, their business will not survive. As one of the stakeholders in SL case 3 bluntly stated: `There is no research without money'. This point was also made clear in Long, Looijen, and Blok's (2018) empirical analysis of sustainable start-ups in the Netherlands, with many of them stating that without (the prospect of) profit, it is impossible to get sustainable businesses off the ground. In another empirical analysis, venture capitalists found it difficult to find start-ups to invest in with the right balance between positive climate impact and social values on the one hand, and profitability on the other (Long and Blok 2021).

This proved very challenging for the start-ups participating in the first SL of case 1. Despite having very strong social-responsibility goals and outcomes, they found it difficult to make the product commercially successful. This point is also supported by the literature: the 'entrepreneur' is (oftentimes) more of an idealist or researcher, rather than strictly a businessperson (Clarysse and Moray 2004; Houterman, Blok, and Omta 2014). Therefore, the first objective of an investor is to identify whether the entrepreneur is an entrepreneur who wants to make money with the investment, so the investor is often focused on the person, rather than the end product (Clarysse and Moray 2004; Houterman, Blok, and Omta 2014).

One point raised in the literature that became apparent during many of the SLs was that the 'academic' techno-entrepreneur was often more of a hindrance than a benefit as the start-up grows (Houterman, Blok, and Omta 2014). They are unsuitable to provide the required strategic ability and foresight for long-term growth (Burgelman 1983). However, they are unaware of this or refuse to step aside because they have a strong affinity with the start-up that they developed and believe that they are the only ones who can steer it in the right direction. High-tech start-ups outgrow their CEOs, and very often, entrepreneurs who are also partially employed at universities are a barrier to the start-up's growth (Doutriaux 1987; Houterman, Blok, and Omta 2014). The academic tech-entrepreneur may place an overemphasis on the technical, much to the detriment of the business components of the start-up (Franklin, Wright, and Lockett 2001).

Academic tech-entrepreneurs often have insular views and incorporation of stakeholders, focusing only on other academics or those within their own circles (Houterman, Blok, and Omta 2014). This can lead to a lack of interaction with non-technical people and those within the industry (Clarysse and Moray 2004). This lack of interaction may lead to oversights in the end-product but also result in greater difficulty getting funding to pursue expansion and growth (Lockett et al. 2005). As a result, investors may require that the CEOs step down or change roles to Chief Technical Officer (CTO) or advisor to allow the start-up to flourish (Houterman, Blok, and Omta 2014).

In the SLs, start-ups did not find it difficult to obtain funding, indicating that investors had confidence in either the product, the entrepreneurs, or the cause behind the product. Therefore, start-ups with a strong social responsibility focus, or whose products will create positive social benefits, may obtain funding, despite the absence of a clear business model

or commercially viable product. This was also reflected in the literature, with investors investing in start-ups based on the type of market they are focused on, or the investors' own particular investment preferences (Houterman, Blok, and Omta 2014). Nevertheless, this seems to be the exception, rather than the norm, as all investors in the SLs highlighted the importance of investing in start-ups that will confidently get back their return on investments, a point which was also supported in the literature (see also Houterman, Blok, and Omta 2014; Long and Blok 2021; Long, Looijen, and Blok 2018).

One approach that could help start-ups, and something that investors can propose to further encourage social responsibility, is by focusing on approaches that will lead to both profitability and improving social impacts of the start-up in a win-win strategy, which Garst, Maas, and Suijs (2022) term 'double materiality'. Double materiality focuses on the materiality of the business case (e.g. profitability) alongside the social responsibility of the start-up, an approach that is also supported by the European Commission (European Commission 2021).

Double materiality can occur when start-ups implement win-win approaches, ensuring the business case and social responsibility are complementary to one another, something that should be appealing to investors, also. Start-ups should try to achieve double materiality in win-win scenarios, where profitability and social responsibility are mutually compatible (Garst, Maas, and Suijs 2022, 83). Whenever there is tension or lack of clarity, 'tensions between organisational goals should not be eliminated but explored' (Garst, Maas, and Suijs 2022, 83).

In practical terms, investors and start-ups can use the SRSM and its indicators (RRIstart 2022a) to provide guidance on how to achieve double materiality in practice. As the SRSM and its indicators were based on striking a balance between the economic necessities of a start-up and its investors with implementing social responsibility, they provide insights about how double materiality can be achieved in practice (something which was demonstrated in the SLs). For example, one of the four helices specifically focuses on the business aspects needed to ensure a sustainable start-up. The SRSM also emphasises the need to implement social responsibility within the very business model of the start-up and to make it a key pillar in all the start-up's plans and actions. Furthermore, the Workbook developed in (RRIstart 2022b) was used throughout the SLs as an easy and effective method for start-ups to fill in and keep track of their social responsibility in practice and was used as a way to indicate to investors how start-ups could mutually balance profitability and social responsibility.

## Conclusion

One of the major findings from this study is the acceptance of the importance of socially responsible practices and guidelines within the start-ups that we focused on. There is also support for the SRSM model and its indicators. There was only one individual who was quite negative to begin with (an investor in SL case 3), but once the SLs progressed, he softened up to the RRIstart approach, his main grievance being not against the SRSM, but rather the stage at which the SRSM's indicators are applied (the early stages of a start-up were too early, according to his opinion, for considering responsibility matters).

As shown in SL case 1, it is often the case that a start-up is founded to tackle a specific societal issue, making the initial direction towards social goods implicit within the

organisation (while we accept that, of course, there can also be start-ups that make products or services that create social good but do so in a socially irresponsible way). There is, therefore, a justification for cultivating socially conscious entrepreneurs by educating them to create, design, and build products and services that tackle specific social issues and sustainability challenges.

In addition, we noticed that the start-ups we focused on were very receptive to external resources (information, guidelines, methods) to achieve positive social outcomes, and implemented SRSM's indicators even outside the SLs focus. For example, months after the SLs, the start-up of the first SL of case 3 stated that they had incorporated more responsible waste practices, provided free hardware to charitable causes (schools, etc.), tried to implement more reusability on their resources, and put a greater emphasis on recycling; furthermore, they stated that they intended to keep adopting responsible practices. Alongside the start-up from the 2nd SL of case 2, they also stated that they wanted to evolve their assessment processes by creating formal procedures for evaluating the potential impacts of their products/services. In a similar vein, the start-ups in both SLs of case 2 stated that they want to establish a formal stakeholder engagement plan that sets out the criteria for evaluating the impacts of their products/services.

Because of the long period of the SLs, the quite large use of human resources of the start-ups to attend and be involved in the labs, and the considerable time put into setting up, conducting, and managing the SLs, from the researchers involved, we were limited in the amount of SLs we could conduct, the number of countries that we could have SLs in, and the length of time given to the SLs.

For example, there were only three SL cases, which makes it scientifically challenging to compare and contrast our findings between them. We could make qualitative comparisons between the SLs but could not extrapolate quantitative findings because of the limited target groups. Future research on more SLs would provide further insights into social responsibility across Europe.

Secondly, only three regions were represented from Europe in the SLs. As a result, it was impossible to make geographical comparisons between the SLs. Future research would benefit from analysing more geographical regions in Europe.

Lastly, most of the start-ups involved already had a strong drive towards being socially responsible and their industries typically promote sustainability. This may have biased the results as it does not encapsulate start-ups with more neutral or negative attitudes toward social responsibility. Future research could examine less socially responsible start-ups.

## Notes

1. RI coincided with the European Commission's responsible research and innovation (RRI) framework (Shanley 2021). For ease of reference, we will refer to both under the heading of RI, as this is where most of the scientific research has been and contributed to over the past decade.
2. IRIS+ (iris.thegiin.org), Inrate (inrate.com), I.S.S. oekom (issgovernance.com), MSCI ESG Research (msci.com), Refinitiv (refinitiv.com), Sustainalytics (sustainalytics.com), Moody's ESG Data (esg.moodys.io), Bloomberg ESG Data (bloomberg.com), and RepRisk (reprisk.com).

3. I.e. companies that are founded based on innovations, products, or services rooted in the fields of Science, Technology, Engineering, and Mathematics.
4. https://rristart.eu/.
5. A Minimum Viable Product (MVP) is a simplified prototype of a product designed specifically for getting feedback from (potential) customers.
6. 'An intervention is an attempt to innovate within a certain organization: a business, a consortium or, more generally, within a socio-political network. An intervention is a sustained attempt to solve a problem perceived by some or all of those present in that organization' (RiCONFIGURE 2018).
7. There is no prescribed number of cycles. This naturally depends on the complexity of the case. Likewise, there is no prescribed duration for cycles. To give an indicative order of magnitude, it would be reasonable to expect that a cycle lasts several weeks or a few months.
8. According to this indicator: start-ups should reduce negative environmental impact and produce positive environmental impact by using sustainable materials, sustainable water management, using green energy sustainably, and reducing their carbon footprint.

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