

Capturing the Sustainable Impact of Early-stage Business Models: Introducing esSROI



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Article

Capturing the Sustainable Impact of Early-stage Business Models: Introducing esSROI

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Abstract In this paper, we present an early-stage Sustainable Return on Investment (esSROI) measurement tool to evaluate the impact of early-stage business models. The main objective for developing the tool is to capture the holistic sustainability-related impacts of the incubation process from start-ups already during the conceptualization and pre-seed phases. An early, holistic impression of sustainable potential offers many opportunities to iteratively improve the degree of potential sustainable impact. The scope of designing and alternating business models is the widest early in the process before narrowing it down. This very early application differentiates esSROI from other tools that are used later in seed phases. Applying the tool in the conceptualization phase might make it even more usable already among (student) teams before incubation/acceleration. The quantitative measurement tool esSROI consists of a questionnaire design and follows a triangulation and long-term approach that includes three measurement points that capture the iterative progress. A preliminary study has been conducted in 2022 and shows that the tool is easy to use and accepted by founders.

Keywords sustainability measurement; pre-seed, early-stage; sustainable return on investment; business model; pilot study

1. Introduction

The worldwide attention to shift towards a more sustainable society has increased in recent years [1]. Contributing to sustainable development has gradually become a strategic goal for governments and businesses alike [2]. Start-ups are attributed a critical role in advancing sustainable development due to the ability to innovate technologies and develop new business models that can alleviate social and environmental problems [3]. Consequently, entrepreneurs and start-ups play a vital role in advancing environmental and social innovation and fostering sustainability transitions, even during the very early stages of their ventures. Therefore, the analysis and prediction of the impact generated by these entrepreneurial endeavors hold immense importance in the realms of management and entrepreneurship research. Furthermore, substantial attention has been devoted to assessing the sustainability performance, value, and impact of both established firms and their products and services. Nevertheless, the research literature has largely overlooked the assessment of sustainability impacts specifically pertaining to new ventures, such as start-ups [4]. Start-ups with new business models that reduce market inefficiencies are seen as having a high potential for supporting more sustainable production and consumption [5,6]. Fundamentally, this should lead to an increase in sustainable impact in emerging business ventures.

However, entrepreneurs that strive to promote a sustainability transition, face the complex task of addressing sustainability, on top of creating a venture that survives and grows [7]. This combination may be considered challenging because the most innovative start-ups with the highest (ex-ante) potential for growth and impact are often also the type of start-ups that have the highest (ex-post) failure rate [8]. Entrepreneurs' motivation to engage in sustainability is also likely suppressed, as they lack broad, interdisciplinary expertise and skills, as well as the authority and resources necessary to resolve the sustainability transition alone [9]. Furthermore, entrepreneurs are faced with numerous external barriers when aiming to plan for sustainability in their business models given the strength of market forces and rigidity of current regulatory regimes [10] as internalizing common good externalities often implies higher costs, increased complexity,

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stakeholder dependency, and low buy-in [11]. Public funding programs are also found to support start-ups that concentrate on economic goals rather than social and environmental sustainability goals [12]. When assessing the current state of affairs, [13] we find that most sustainability goals are reflected only minimally in entrepreneurial activity in Germany. Additionally, this is again confirmed by Tiba et al. [14], who find a comparably low rate of sustainability orientation in start-ups in the Berlin entrepreneurial ecosystem—the start-up capital of Germany. Underscoring the need for further investigation, early-stage research also indicates that many new ventures start as value-based firms, reflecting a general awareness and intention to initiate social and environmental change in society, but shift their focus towards conventional market logic as they age. By addressing the research gap in the sustainability impact assessment of early-stage start-ups, we offer a tool capturing the anticipated sustainability impact potential.

The paper is structured as follows, after an introduction to the state-of-the-art literature, an overview of existing approaches to impact measurement is presented and discussed. In Section 4 preliminary results are presented followed by a discussion in Section 5. This paper closes with a conclusion including theoretical and practical implications as well as an overview of the limitations.

2. State-of-the-art of Impact Measurements and Differentiation

Identifying business models with high sustainable impact and distinguishing them from business models with low sustainable impact, e.g., in a large pool of business models using human experts, is both time-consuming and cost-intensive [15]. For large idea pools (e.g., business plan proposals submitted to an incubator) expert panels that review and select relevant submissions often represent impractical means [16]. Given the complexity and time constraints, expert judgments may suffer (e.g., repetitive, exhaustion, analytical limitations) relying on potentially biased assumptions or simple “gut feelings” that function as shortcuts [17]. In their review of indicators and metrics applicable to judge sustainable impact in the social business sector, Bengo et al. [18] distinguish between the following three categories of accounting frameworks. First, scorecards in which start-ups gather Key Performance Indicators (KPIs) to track their performance [19]. Second, process-based approaches that collect data structured along an input-output-outcome-impact logic [20]. Third, synthetic indicators which allow the comparison of impacts between different organizations by providing a global measure of a venture’s performance [21]. The most famous of the latter category is the SROI (social return on investment) indicator that uses self and expert assessment in a longitudinal approach to evaluate different types of impacts.

Impact assessment, also known as environmental impact assessment (EIA) or social impact assessment (SIA), is a process of evaluating the potential positive and negative consequences of a proposed project, policy, or development on the environment, society, and economy. It is a systematic analysis that helps decision-makers understand the potential effects of their actions and make informed choices. The goal of impact assessment is to identify and assess a project’s potential impacts before it is implemented and to propose measures to mitigate or minimize any adverse effects. Sustainability impact assessment is a systematic process that strives to achieve sustainability objectives by clarifying and comprehensible sustainability concerns. It employs a decision-guiding approach that assists in identifying, organizing, and assessing the sustainability impact of past, present, and/or future actions. The primary goal is to ensure that the potential effects on sustainability are thoroughly evaluated and taken into account during the decision-making processes [22–25]. To achieve a sustainable impact, it is relevant to follow the triple bottom line. The triple bottom line is a concept that considers three key aspects, namely, people, planet, and profit when evaluating the overall performance of an organization. It emphasizes the importance of social, environmental, and financial factors in achieving sustainable practices and success [26].

The unit of analysis of impact in this paper is the business model of a start-up in the conceptualization and pre-seed. Referring to sustainable impacts, a business model for sustainability is used for “...describing, analyzing, managing, and communicating (i) a company’s sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, and (iii) how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries” [6].

For this paper, we are especially interested in the conceptualization phase and pre-seed phase of a start-up. The conceptualization phase is the initial period of a start-up in which the founders develop their business idea, analyze the market, create a business model, draw up a business plan,

and plan the required resources. In the pre-seed phase, initial funding could be secured, a minimal viable product (MVP) is built and the first steps towards founding are taken.

Di Vaio et al. [27] investigate the role innovation plays in the life cycle of entrepreneurial ventures seeking to create sustainable business models and tools for measuring the social impact of such ventures in sustainability assessment systems designed to help achieve the Sustainable Development Goals (SDGs) adopted by the UN 2030 Agenda. The findings emphasize the significance of constructing business models that actively contribute to achieving the United Nations's Development Goals, by incorporating sustainability assessments throughout the various stages of innovative entrepreneurial ventures' life cycles.

Recently, Trautwein [22] summarizes the applied impact assessment of start-ups based on extensive literature research. The author identified 23 assessment methods, from which half were more scholarly developed and the other half were classified as applied. From these 23 assessment methods six were particularly developed, applied among start-ups, and resulted in quantitative output, whereas only two are capturing the entire breadth of sustainability (SROI Social Return on Investment and Triple-Bottom Line Impact Analysis). The following, five of these tools are described in more detail. The first tool described focused on social responsibility is Social Return on Investment Analysis SSROI [28]. This measurement is applied after the legal constitution and running activities of start-ups. The analysis requires performance and accounting data and is based on sensitivity analysis taking into account planning uncertainty. SSROI cannot be applied in early-stage phases as the required data are missing. The second tool described is Impact Investment [29]. The tool focuses on the product/service offered and their development stage at five levels of degree. Impact investment does consider the business model as enabling factor and is depending on already executed product or service development. Impact Investment can only capture early-stage start-ups at level 1 as all other levels require data from product/service users or financial performance reports on level 5. Another applied tool is the Sustainable Quick Check (SQC) model [30]. SQC is an IT and web-based analytic tool, which can be readily applied. However, the tool can only perform when small and medium enterprises (SMEs) or start-ups have running activities and a fully employed business model. This tool is also not applicable to early-stage start-ups. The next tool illustrated is Life Cycle Assessment (LCA) [31]. The LCA is executed in five steps together with the SMEs or start-ups and requires a fully developed business model and performance data. Thus, LCA can only be applied in later stages, but not in phases of conceptualization or pre-seed. The fifth measurement tool is the Triple-Bottom-Line Impact Analysis TBL [32]. This analysis serves as a framework for fintech companies to include sustainable measurements in their assessments and evaluations. The framework contains the direct and indirect TBL value creation elements of fintech organized along their economic, social, and environmental impact and can be used as a simple, yet effective assessment tool for analyzing the TBL impact of fintech, helping to make TBL-related adjustments, improving upon currently offered solutions, or aiding in the design of financial new products with TBL value-creation elements. The framework requires financial data based on a running business and therefore can only be applied to later phases of start-ups.

The overview clearly exemplifies that measuring sustainable impact so far is only applicable in seed phases of start-ups and that there is a significant gap and serious demand to measure potential sustainable impact much earlier, before incubation, during conceptualization, and pre-seed incubation (Figure 1).

According to Clarke-Sather et al. [33] and Hörisch et al. [34], the evaluation of sustainability impacts in start-up or early growth phases relies more on predictive, modeling-based, ex-ante assessment (forecasting) rather than retrospective, experience-based, ex-post evaluation, which is commonly used for established companies. This is because early-stage ventures possess distinct characteristics that pose unique challenges when assessing their impact [35]. Therefore, it is more beneficial to focus on assessing the potential future sustainability impacts of new ventures, considering their specific circumstances and challenges. Specifically, regarding start-ups, four problems of measurement have been highlighted by Horne et al. [36]: 1). the dynamic environment of start-ups; 2). Financial constraints; 3). limited human capital; and 4). poor data management systems. These conditions can only be met by applying "early-stage Sustainable Return on Investment" (esSROI) measures specified and adjusted for start-ups' early stages or in conceptualization.

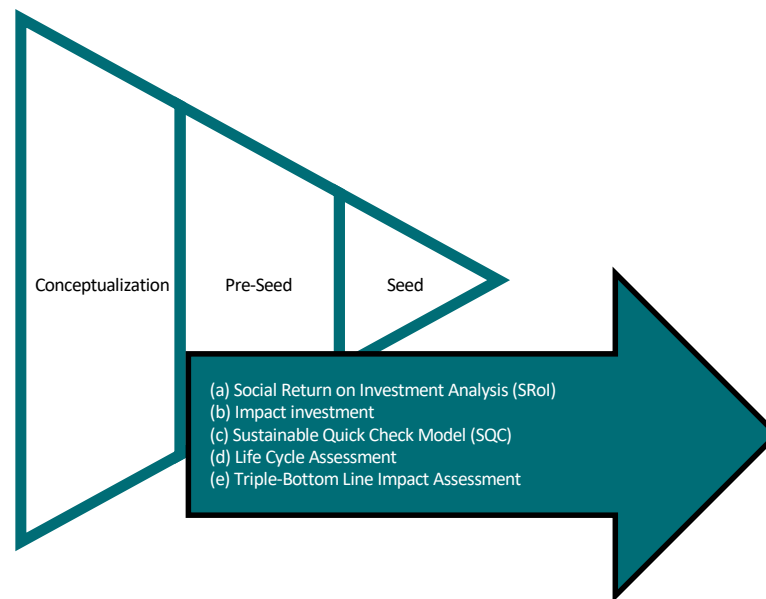


Figure 1. A selection of tools for impact measurement in start-ups.

Sustainable Return on Investment (SROI) is a concept that expands on the traditional financial return on investment (ROI) by incorporating sustainability considerations. It aims to measure and evaluate the social, environmental, and economic impact of an activity, project, or business. It takes into account outcomes across various sustainability dimensions and employs a process of monetization that facilitates both internal and external benchmarking [37].

To capture the sustainability potential of business models in the early stages, measurement tools need to take into account the dynamics and uncertainties of this phase. A promising approach seems to be integrating effectuation theory and the Lean Start-up approach into the tool development as suggested by Horne et al. [36]. Sarasvathy's effectual theory distinguishes between two models of decision-making causal vs. effectual. Effectual thinking is an iterative process. Effectual entrepreneurs begin with an assessment of their available means and the resulting opportunities/solutions [38]. Developing new technology inherently refers to a limited set of solutions and within systematic design methods, the most promising one is chosen [39,40]. For an effectual entrepreneur, the hypothesized solution is not permanent as the systematic design process will change the available means and create new opportunities [38]. In the sequence of new means and opportunities, old hypotheses can be rejected and more promising hypotheses can be developed [39]. This leads to an iterative process around the identification of available opportunities, the selection of the most promising solution, execution, learning, and development, and again the review of the now available opportunities.

To adapt impact measurement to the effectual conditions of entrepreneurs, Horne et al. [36] propose to integrate SROI into the Lean Start-up approach. Lean Start-up is widely used among entrepreneurs to improve their business model [41,42], it is increasingly used in a wide range of public and private organizations as a way to create innovation [42–44], and it shares key ideas of effectuation theory [39]. Similar to effectuation theory [38], Lean Start-up sees uncertainty as a major constraint for entrepreneurs [41]. To minimize this constraint, Lean Start-up seeks more control over uncertainty through iterative experimentation, customer feedback, and data collection so that key business hypotheses can be tested and improved [39,41,42]. The process is called validated learning (Lean Start-up principle 3) and it is organized in the build-measure-learn cycle (Lean Start-up principle 4) [41]. Depending on the tests' outcomes, the business model needs to be changed in so-called pivots (cf. Figure 2). To keep everything well structured, measure progress, and plan work efficiently, Lean Start-up calls for innovative accounting (principle 5) [41]. This process resembles the iterative effectual process described in the solution circle (Figure 2). Therefore, Lean Start-up provides a suitable effectual vehicle for impact measurement & management in new ventures. One key advantage is that the focus on hypothesis development and quantitative testing in Lean Start-up [45] can be linked to esSROI, including the data gathering that is necessary to validate and substantiate impact [37].

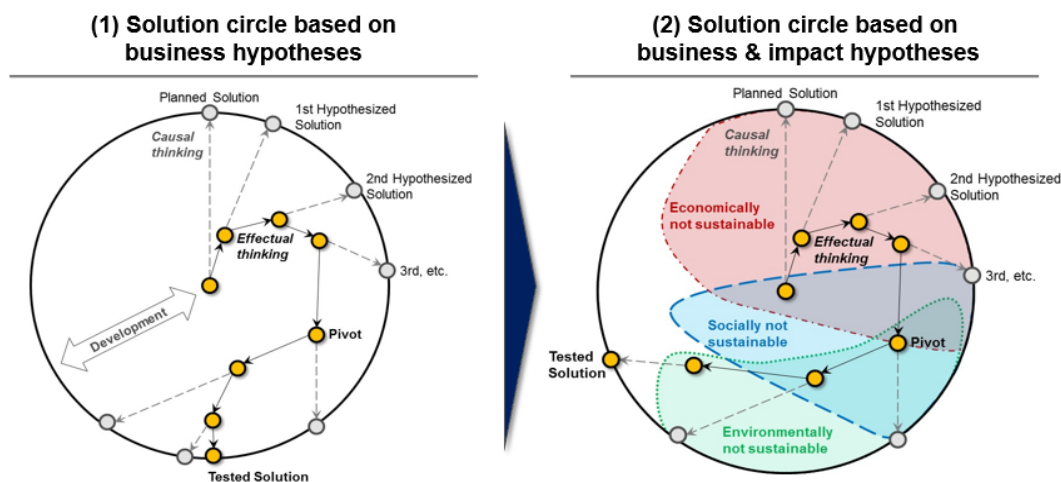


Figure 2. Illustration of the solution circle based on (1) business and (2) business & impact hypotheses (adjusted from [39]).

In this paper, we aim to explore and answer what approaches can be employed to effectively measure the comprehensive sustainability impact of pre-seed business models in the very early phases. We further want to shed light on the contribution of sustainability impact assessment to impact potential in the initial stage. To our knowledge, no previous study has presented an impact measurement tool for pre-seed phases business models following an early-stage Sustainable Return on Investment approach relying on the lean start-up method and effectuation theory.

3. The “early-stage Sustainable Return on Investment” (esSROI) Measurement Tool

Despite a variety of existing approaches to impact measurement most turned out to be too complex, extensive, and partly not relevant for the founders in the early phase of the start-up. Therefore, the aim was to find a streamlined solution for the very early start-up teams. Consequently, the main goal of the measurement tool is to capture the holistic sustainability-related impact of the incubation process (pre-seed phase) at the academic incubator and raise awareness of sustainability issues between entrepreneurs and coaches.

The Impact Measurement Tool for pre-seed phased start-ups was developed at the Centre for Entrepreneurship (CfE) of Technische Universität Berlin (TU Berlin) together with the Department of Entrepreneurship and Innovation Management at TU Berlin. It is based on research at CfE [13,36] and insights from the evaluation of start-up support (Borderstep Institut), as well as the DIN SPEC 90051 Standard [46] of sustainability impact measurement for companies. A lean design was deliberately aimed for and limited to essential parameters. To ensure transparency, software was used that visualizes the results in real-time and makes them accessible. The underlying principles, requirements, and frameworks of the esSROI can be found in Table 1.

Table 1. Underlying framework of esSROI.

Principles of SROI	involve stakeholders, understand what changes, value things that matter only include what is material, do not over-claim, transparency, and verify the results [37]
Measurement requirements impact assessment new ventures	measure at the impact level, cover all three dimensions of sustainability, provide forecasts, allow for benchmarking, and create low effort for start-ups [29]
Theory of change	Input-Outputs-Outcomes-Impact perspective
DIN SPEC 90051-1	standardized framework for sustainability assessment of start-ups [46]

By focusing on the early-stage of a start-up (Figure 3) this study offers an original and unique measurement tool. In fact, the proposed early-stage Sustainable Return on Investment measurement tool fills an existing gap. The longitudinal measurement captures the sustainable impact potential of business models along the dimension of social, ecological, and economic impact and concrete SDG ambitions, sustainable leadership/management approaches, sustainable business model, sustainable stakeholder involvement, sustainable KPIs, start-up and team competencies, sustainable revenue streams, and finance. By applying measures including circular approaches,

fair working conditions, and psychological sustainability, the tool presents a further development of existing ones like the DIN SPEC 90051 [46]. The measurements in the planned tool are based on both self-evaluations and external evaluations from business coaches and experts using questionnaires and qualitative data analysis of pitch decks, business plans, and other material provided by the founders. The tool will be applied three times during an incubation period of one year in order to evaluate the state-of-the-art sustainable impact potential and all developments during incubation towards higher degrees of sustainability.

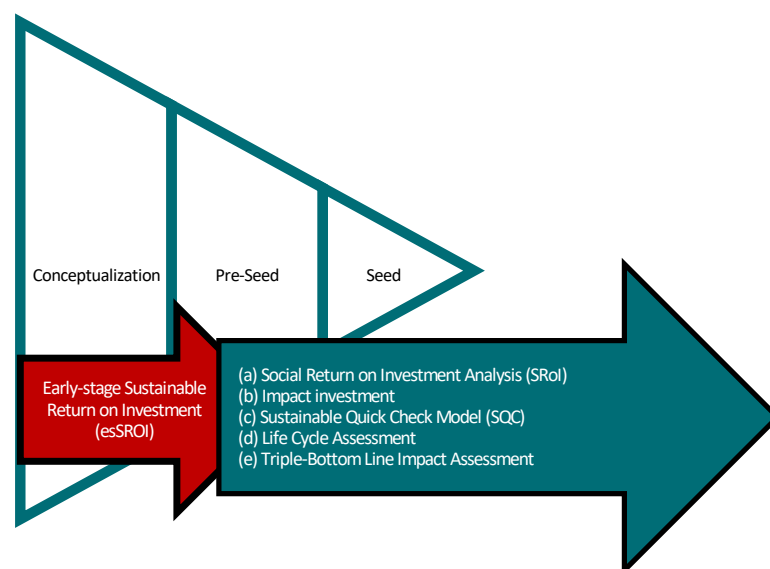


Figure 3. Proposed tool for the conceptualization phase (early-stage) of a start-up.

An esSROI analysis leads to a comprehensive view of social, environmental, and economic impacts and how they are valued by stakeholders [47,48]. In addition, esSROI fulfills the requirements of impact measurement of start-ups; (a) the measure of sustainability is on the impact level [47], (b) the measure captures all three dimensions of sustainability [47], (c) the measure serves as a forecasting method [37], (d) the measure includes an internal and external benchmarking [37] and finally (e) the measurement effort is manageable [49]. The Impact Measurement Tool includes four different dimensions of sustainability and impact. Thus, the sustainability-related effects on the environment, on society, and the financial sustainability of the early start-ups are considered. In addition, psychological sustainability in terms of thriving is measured as a fourth dimension, which is a novel approach and goes beyond the requirements for assessing the impact of start-ups.

3.1. Impact Measurement Instrument

In total, the first part of the impact measurement tool is a questionnaire consisting of 33 questions and follows the measurement of “sustainable business” in the entire range of sustainability aspects [46] such as social/societal impact, ecological impact, economic impact, sustainability in management/business model, stakeholder engagement, use of sustainability-related KPIs, contribution to the Sustainable Development Goals (SDGs), existing team/competencies, and sustainable financing and needs. Furthermore, contributions and competencies in the circular economy and fair work are included (see Table 2). In line with the conditions of sustainable business models, it involves the measurement of multiple value creation and stakeholder integration [6]. All the questions are answered openly so that coaches and team members can see and discuss the results. In addition to the first questionnaire, a second one is distributed including 10 questions on psychological well-being. In contrast to the first part, the questions on well-being are anonymous and cannot be tracked back to the individuals. At the end of the funding period of the start-ups, feedback is collected in order to have a final evaluation of the program offered by the academic incubator. The majority of questions are measured with a 5 Point Scale Likert scale (1 = “do not apply at all”, 2 = “rather do not apply”, 3 = “partly/partially” or “neither”, 4 = “rather apply”, 5 = “completely apply”).

Table 2. Indicators of esSROI.

Category	Scale	Indicators
<i>Assignment Sustainability Dimension</i>	6 items, bipolar scale	social solution—profitable business; profitable business—ecological solution; ecological solution—social solution; community—stakeholders; awareness of the issue—increase sales; scale impact—scale profitability
<i>Sustainability in corporate management/business model</i>	5 items, 5-point Likert scale	ecological aspects of management, social corporate governance, social & environmental value proposition, environmental added value of product/service, social value-added of product/service
<i>Stakeholder</i>	1 item, 5-point Likert scale	variety of stakeholder integrated
<i>KPIs</i>	2 items, 5-point Likert scale	sustainability in KPI, quantifying positive effects on the environment & society
<i>Sustainable Development Goals</i>	2 items, 5-point, Likert scale	most important SGDs contribution, ranking
<i>Team/competencies</i>	6 items, 5-point Likert scale, 2 open	existing competencies in relation to sustainability; assessment of skills, motivation, needs, knowledge SBM, open response: list competencies and needs
<i>Circular economy</i>	4 items, 5-point Likert scale	circularity in BM, attitude towards circularity in the design of product/service, production & end-of-life phase
<i>Fairwork</i>	5 items, 5-point Likert scale	intention to fair salary of employees, minimizing task related risks, improve work conditions, quality in decision-making processes related to employees, freedom of association
<i>Funding</i>	1 item, 5-point Likert scale	knowledge impact investing
<i>Well-being</i>	10 items, 5-point Likert scale	appreciation, belonging to a community, fulfillment, optimism, goals, well-being, energy, self-esteem

3.2. Applied Impact Measurement Method

The evaluation takes place during the period of support in the academic institution: at the beginning of the support process, during the support at regular intervals of three months, and at the end of the support of the start-ups (see Figure 4). The same questionnaire is always used to observe the development over time and capture the dynamics. The results of each questionnaire flow directly into the implementation of measures, such as feedback or the recommendation of further training offers and other recommendations for action. Thus, impulses are given in the orientation of qualification modules, coaching focal points, and references to relevant external further training.

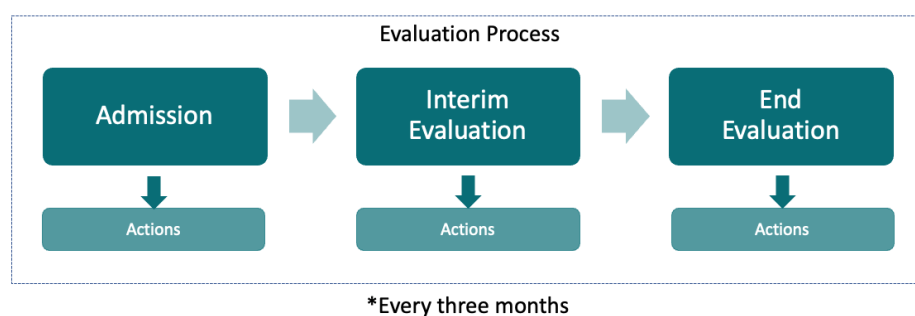


Figure 4. Longitudinal evaluation process*.

Taking the difficulties of the measurement and building upon the SROI we aim for triangulation by collecting data from three different perspectives, namely, (1) on the self-assessment by the founders of the team, (2) external assessments by the supervising coach at the university, (3) evaluation by external experts (see Figure 5). All three parties, namely founders, coaches, and experts have to fill in a questionnaire. For the experts, a qualitative data analysis based upon available documents has to be carried out prior to filling on the questionnaire. Consequently, the qualitative data analysis and the questionnaires together built the data basis of the esSROI tool. Team members have access to their own results, the results of their team members, and team-level results. The questionnaire is conducted online, digitally, and automatically via the people engagement platform Leapsome (<https://www.leapsome.com>). Leapsome is an all-in-one

platform for people enablement, which can be used to track objectives and key results OKRs, Performance Reviews, Engagement Questionnaires, Learning, and more. It has the features to schedule questionnaires and send automatic reminders, that recur independently, track different groups, and visualize the results. This platform allows the collection of all the data in one place, and results are generated in real-time and visualized automatically. The platform works with heatmaps, which enables the viewer to detect the strengths, weaknesses, and deficits immediately. Furthermore, graphs are shown to track the development over time as well as benchmarks between teams. Questions with high scores and low scores can easily be identified on the results dashboard. Another advantage of the solution is that participants can choose from different languages in this case English and German. The tool enables the identification of sustainable teams that can be used as a benchmark. Finally, the tool enables data to be documented in compliance with data protection regulations and promotes transparency. With this tool, we aimed for collecting data and providing the coaches and founders with a tool that they can use.

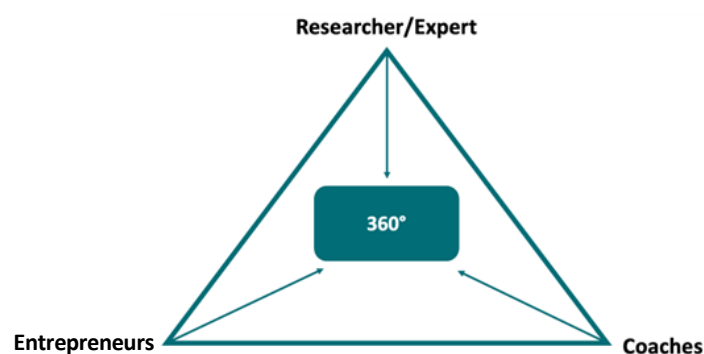


Figure 5. Triangulation approach.

The presented impact measurement tool goes beyond existing approaches because it takes into account the dynamics and uncertainties in the early phase of start-ups and business modeling and creates transparency through a multi-level assessment approach. It helps to create a shared vision about the business model's impact potential and develop a broad sense of sustainability impact potential during the early phases. Through its digital, easy-to-use design, it provides a low effort to fill out. Particularly with its longitudinal design esSROI allows for enhancing the scope of sustainability during the incubation process. Based on the first measurement different hypotheses can be set up to gradually improve the business model between the measurement points. This iterative approach to refining business models in incubation is common nowadays and follows the design and logic of the lean entrepreneurship approach [41]. The impact measurement tool is the first step for the development of an early-stage SROI and provides valuable insights into sustainable value creation and measurement.

4. Pilot Study and Preliminary Results

The pilot study started in early 2022 as part of the project Science & Start-ups - Sustainable City in Berlin, Germany. Science & Start-ups is the association of the start-up institutions of the Berlin universities, Technische Universität Berlin, Freie Universität Berlin, Humboldt-Universität of Berlin, and Universitätsmedizin Charité (<https://www.science-startups.berlin>). In the project "Science & Start-ups - Sustainable City", scholarships are awarded to founders in addition to advice, qualification, networking, and office space. The Berlin Start-up Scholarship is a funding program for start-ups from the university environment that is financed by the state and the European Union/European Social Fund. The scholarship supports technology-oriented founders to develop an innovative product to market maturity on the basis of the qualification offered and to be able to place it on the market in the long term. The scholarship is awarded in batches for a period of six to 12 months. In total, there were four cohorts in the project, each with 7–10 teams with two to four team members. The founders receive a scholarship to cover living costs as well as training, advice, and free office space in the incubators. The teams' founding ideas came from a wide variety of fields. A total of 105 participants (30.5% female) from 36 teams and 200 completed questionnaires form the basis for the first evaluation. The available data results from three questionnaires as well as a final questionnaire from batch I, two questionnaires from batch II, and one questionnaire from batch III. Meaning that batch I completed the

questionnaires in all three stages as shown in Figure 4 batch II completed two questionnaires, and batch III one questionnaire. This is due to the sequential admission to the program of the batches. At the beginning of the implementation process of the tool, only founders were asked to fill in the questionnaire. In the second step of the implementation process coaches are brought on board by using an initial presentation and several Q&A rounds. Finally, access is granted to the documents for the assessment by the experts. The pilot study addresses only the results of the questionnaire by the founders since no external assessments by coaches and external experts were carried out yet. To accompany the questionnaire in the sample, the tool was presented personally at information events at the beginning of the funding in order to promote the acceptance and participation of the founders. Furthermore, results were prepared and shared with relevant stakeholders.

4.1. Preliminary Results

We started out with a response rate of 87.8% for the first questionnaire, which fell to 60.75%, with greater differences between the batches. In the third questionnaire, a response rate of 50% was achieved. The decrease in participation is to be expected in longitudinal studies.

First, the founders have to allocate their business idea into the triple bottom line by indicating if their idea is focusing on social value creation or economic sustainability, environmental aspects versus social impact, etc. The results on the allocation of the triple bottom line show that especially social impact is crucial to the founders (see Figure 6). The response trends of the individual batches are relatively close around the midpoint of 2.5. Differences in the batches are nevertheless visible and benchmarks are possible. It can be seen that the founders address all three sustainability dimensions on average.

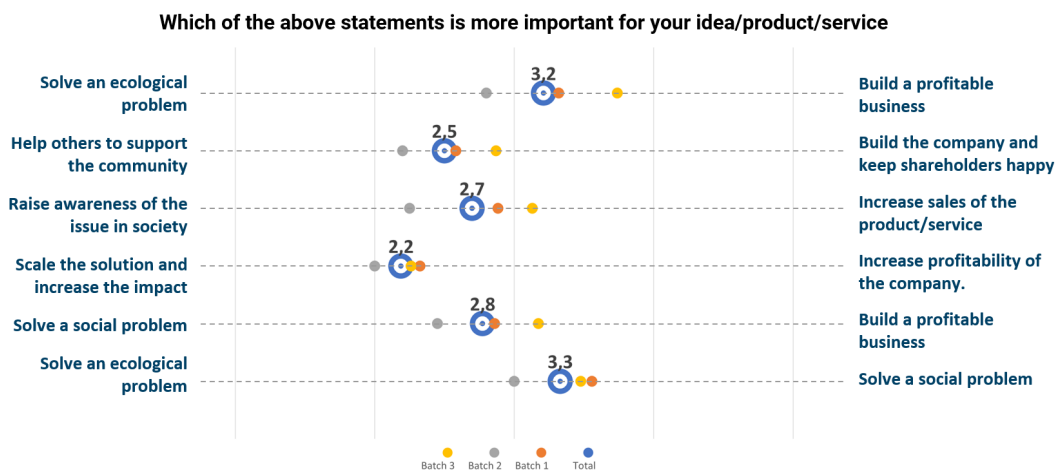


Figure 6. Allocation of sustainability dimension in pilot study.

The founders were asked to name the three most important SDGs that they address with their entrepreneurial behavior. The results show that health, sustainable cities, and education are the most common. The founding teams, therefore, contribute most to SDGs’ Health & well-being, Sustainable City, and Quality Education. This was to be expected as the funding program aims to promote the area of Sustainable City.

The areas where the founders rated themselves lowest were “The product/service has a clear added value for the environment” and “There is knowledge about impact investing in the team”. The data shows that the values increase by 2–8% over the course of the funding. Participants struggle to find environmental value and lack knowledge about impact investing. Possible measures include qualification offers in the field of impact investing and corporate carbon footprints. The implementation of measures from the results during the pilot project has not yet been carried out but is planned for 2023.

The founders rate themselves particularly highly on the issue of fair work. The respondents plan to pay future employees at least the minimum salary or more. They state that they minimize task-related risks and continuously improve working conditions. Fairwork is the highest-ranked category across all batches. As the questionnaire was conducted in Berlin, Germany (Europe),

where social working conditions are highly recognized and legally regulated, the result was to be expected. Moreover, the result refers to the future.

Developments between the two questionnaires are in the range of -0.1 and $+0.1$, strong trends are seen, for example, in batch 1 and its last questionnaires over the entire course of time. These preliminary results are solely based on the self-assessment of the founders themselves. Evaluations by the coaches and experts are in the making.

5. Discussion

The developed esSROI impact measurement tool as well as the insights of the preliminary study show that the holistic impact of early-stage business models can be measured by applying theories of SROI, effectuation, and lean start-up and therefore provide answers to our research questions. The results prove that start-ups contribute to sustainable transmission. Further, they underpin that impact measurement in the early phases of business models can be a fruitful way to manage sustainable impact.

The presented tool fulfills exactly this demand. In addition, the early-stage Sustainable Return on Investment (esSROI) Measurement Tool is easy to handle and accepted among start-ups. It is capable to produce quantitative results that can be longitudinal followed and interpreted as well as compared. Based on iterative approaches with or without lean framing this longitudinal design allows for gradual improvement of the potential sustainable impact throughout incubation periods. As business models can best be modified towards sustainability in the early stages the esSROI tool serves as a vital vehicle to facilitate the incubation of truly sustainable start-ups. In fact, all incubators and accelerators should monitor the sustainable footprint of start-ups from entering the final stages. Only this guarantees the focus on sustainability rather than solely on financial aspects. Moreover, the esSROI measurement tool might also be applied in business plan seminars among student teams. This creates a very early impression of the sustainable value of their proposed business models and transfers an impression about the breadth and depth of sustainability.

In general, the tool creates a baseline on which early-stage start-ups can measure, orientate themselves, give input for incubation and coaching, and valuable information for investors. The second large advantage for start-ups is that it creates authenticity right in the beginning. Carroll [50] puts it "... an organization is authentic to the extent that it embodies the chosen values of its founders, owners, or members rather than simply following convention by, say, pursuing profits". This is a rather new development and somehow contradicts classical business models that have the creation of revenues as a central ingredient. However, movements such as "Fridays for Future", "Extinction Rebellion" or "Last Generation" just like the rise of green movements in almost all developing countries will force start-ups to take organizational authenticity very seriously. In addition, the attribution of start-ups in online social networks is very fast, so when finding staff, partners, and customers is critical to surviving authenticity becomes increasingly important and is increasingly linked to sustainable behavior. It seems a matter of strategic management nowadays that needs to evolve further to accommodate a broader, systemic, and global focus that will yield authenticity in business sustainability [51]. For start-ups that means when aiming to build a sustainable corporate identity to address the start-up team, the business partners, the customers, and the products offered.

Further, we suggest applying the impact measurement on a regular basis, here every three months, to track the development of the impact potential. In line with the lean start-up approach, direct actions after each questionnaire, help to improve the impact of the early-stage start-ups and their business models, which gives insights to answer the question of how impact measurement can contribute to fostering the impact potential in early phases.

The preliminary results should be treated with caution. It is a very comprehensive tool that is still in the trial phase. Furthermore, only a complete longitudinal data set of batch I is available ($n = 24$), which is based on self-assessment whereas the point of reference for the assessment differs between the founders. In addition to that more research is needed to find out why the founders tend to rate the ecological added value rather low. Whether it is due to a lack of knowledge or due to the products/services. The external assessment by coaches and external experts could provide information here. Moreover, a questionnaire of mid- and long-term impacts could prove the potential in the long run. Also, the size of the data set is quite small for statistical analysis.

The application of the tool is not without limitations. First, the measurement by the founders is based on self-assessment, which might be biased. To overcome this, all founders need to be on board and fill in the questionnaire to have a broader picture of the start-up. Second, start-up coaches need to be trained and aware of sustainability topics in order to be able to give a proper evaluation. Third, the experts base their evaluation on textual data without having the possibility to ask questions and get into a dialogue with the founders. Fourth, negative effects were not assessed. This could be a road for further development of the tool. Fifth, the instrument was tested in the incubation process of Science & Startups, which makes it difficult to generalize the results before further testing in other contexts and regions. Finally, information gets lost when using standardized questionnaires instead of individualized ones.

6. Concluding Remarks

This paper introduces an esSROI impact measurement tool for early-stage business models to assess their comprehensive potential sustainability impact. The tool incorporates Sustainable Return on Investment, lean start-up, and effectuation theories. The preliminary study findings demonstrate its effectiveness and the potential to manage sustainable impact. There are limitations and the need for further research. The tool has practical implications for start-up incubators and education, serving as an early measurement tool for orientation and sensibilization.

In this paper, we aim to explore and answer what approaches can be employed to effectively measure the comprehensive sustainability impact of pre-seed business models in the very early phases. We further wanted to shed light on the contribution of sustainability impact assessment to impact potential in the initial stage. To our knowledge, no previous study has presented an adequate impact measurement tool for pre-seed phases business models following an early-stage Sustainable Return on Investment approach relying on the lean start-up method and effectuation theory.

In this article, we present one of the first attempts to capture sustainable return on investments in the very early stages of start-up developments. In the European landscape, more efforts are made to measure sustainable footprints based on financial numbers and thus at much later development stages at which business models are much more stabilized. However, in order to be able to intervene and steer in the early phase of incubation, an indication of the degree and extent of sustainability for individual start-ups is urgently needed.

Our approach has implications for theory and practice. We contribute to the sub-field of impact assessment of early-phase business models by presenting a measurement instrument and method. The presented tool for start-ups measures the impact on three dimensions of sustainability and beyond that psychological sustainability. It allows benchmarks and a low effort for start-ups (own access, reminders, easy processing of results, multilingualism). The 360° measurement level consents to the comparison between self- and external evaluation. After each feedback loop, the data is used to implement the information in alignment with the goals and strategies. The visualizations in real-time allow immediate action. Therefore, the instrument and method represent a further development of existing tools. Furthermore, this tool can also be used in teaching for sensibilization and the development of sustainable business models because the requirements are kept very low. The tool has a broad practical implication by being able to be implemented in incubators and serve start-up founders as an early measurement tool for orientation. The insights gathered can be used to derive actions for further sensibilization and training.

In terms of theoretical implications, we have contributed to the discussion of sustainable return on investment by developing a tool for application in early-stage start-ups. The application of the tool might support us in monitoring the value-creation process of start-ups and identifying when start-ups shift their focus toward conventional market logic leaving the initial intention and awareness of creating social and environmental change. Furthermore, we contribute to the findings of Di Vaio et al. [27], who emphasize the significance of constructing business models that actively contribute to achieving the SDGs, by incorporating sustainability assessments throughout the pre-seed and seed phases of innovative entrepreneurial ventures. We also enhance the research on impact assessment of start-ups particularly the ones that are in the early-stage phase. The contribution opens a discussion of how to measure impact in this stage where results cannot be monetarized. Finally, we introduce a triangulation approach to impact measurement that is unique and provides us with insights from different perspectives.

In a nutshell, we present preliminary results from a pilot study among start-ups in Berlin and discuss the results as well as present theoretical and practical implications. With our developed

measurement tool, we make it easy to measure and detect the sustainable impact potential of start-up teams and their business models in early phases and give start-ups and stakeholders a guideline to perform impact management.

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Data Availability

The data cannot be accessed.

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Author Contributions

Conceptualization: J.K., K.F., & K.C.; Data curation: K.C. & K.F.; Formal analysis: K.C., & K.F.; Funding acquisition: K.F.; Methodology: J.K., K.F., & K.C.; Project administration: K.F.; Resources: K.F., & K.C.; Software: K.F., & K.C.; Supervision: J.K.; Validation: K.C.; Visualization: J.K., & K.C.; Writing – original draft: J.K., K.F., & K.C.; Writing – review & editing: K.F., & K.C.

Conflicts of Interest

The authors have no conflict of interest to declare.

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