Startups' contribution to SDGs: A tailored framework for assessing social impact

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Abstract

Startups play a crucial role in advancing the Sustainable Development Goals (SDGs) through their innovative solutions that increasingly focus on sustainability. However, they face significant challenges in effectively assessing their contribution to the SDGs. In our study, by adopting an action-research methodology, we develop and introduce Prosper, i.e., a tailored social impact assessment (SIA) framework for startups. First, we conducted a comprehensive review of existing methods and standards for assessing social impact to establish an initial foundation of Prosper. Second, we refined Prosper based on an empirical validation on five startups. By embracing action research, we aim to empower startups with a robust and user-friendly tool, which facilitates SIA and representation. We also contribute to the literature aimed at overcoming the existing sustainability barriers for startups and to respond to the call for assisting them in reporting about SDGs. We also discuss practical implications and future research avenues.

Introduction

The concept of Sustainable Development is at the heart of most debates about the future of the planet and humankind (Sachs, 2015). Defined as the 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland, 1987, p. 24), it requires a proactive and adaptive approach by all kinds of organizations aimed at holistically fulfill its three interdependent dimensions, i.e., economic prosperity, social equality, and environmental conservation (Barbier, 1987).

To provide practical guidance for its implementation, in September 2015, the United Nations adopted the 2030 Agenda for Sustainable Development, introduced by the General Assembly (2015, p. 2) as 'a plan of action for people, planet and prosperity'. It contains a set of 17 transformative Sustainable Development Goals (SDGs) that aim to eradicate poverty and hunger, safeguard the planet from degradation, guarantee that all humans can enjoy a fulfilling and prosperous life and promote peaceful, just and inclusive societies free from fear and violence (General Assembly, 2015). The SDGs represent an urgent and global call for action to be embraced in partnership by the various actors in society, including governments, universities, citizens, public, and private organizations.

Among them, the business sector is increasingly recognized by both scholars and practitioners as a crucial sector for the full achievement of the 2030 SDGs (Macht, Chapman, & Fitzgerald, 2020; Mio, Panfilo, & Blundo, 2020; Pizzi, Caputo, Corvino, & Venturelli, 2020), given its potential to foster positive social impact (Fiandrino, Scarpa, & Torelli, 2022), industrial ecology

(Sullivan, Thomas, & Rosano, 2018), new sustainable ventures (Horne, Recker, Michelfelder, Jay, & Kratzer, 2020), and CSR activities (Xia, Olanipekun, Chen, Xie, & Liu, 2018). These outcomes have been scholarly analyzed under the lens of business contribution to SDGs, advancing the scientific knowledge on the dynamics through which private corporations tackle the sustainable development challenge (Mio, Panfilo, & Blundo, 2020; Pizzi, Caputo, Corvino, & Venturelli, 2020).

However, a close look to the scientific production on this topic reveals that most studies focused on large and multinational corporations (Bowie, 2019; Kolk, Kourula, & Pisani, 2017; van der Waal, Thijssens, & Maas, 2021; van Zanten & van Tulder, 2018). For instance, Bowie (2019) discussed the various possibilities through which multinationals enterprises can act as a civilizing force in our cosmopolitan, capitalistic economy. Adopting an optimistic perspective, he claims that SDGs represent a 'perfect opportunity' to *do well by doing good*, i.e., making profits while having a positive social impact (Bowie, 2019). Accordingly, van Zanten and van Tulder (2018) used the institutional theoretical lenses to empirically explore how international businesses can contribute to SDGs, revealing that internally actionable SDG targets are preferred to externally actionable SDG targets and that SDG targets that intend to avoid harm are preferred to SDG targets that intend to actively do good.

As a matter of fact, although large corporations are certainly important to address the sustainable development challenge, extant literature has largely overlooked the role of small and medium enterprises (SMEs) (Dalton, 2020; Mio, Panfilo, & Blundo, 2020; Perrini, Russo, & Tencati, 2007). In some areas of the globe, SMEs are the engine of socioeconomic growth and also the main source of social and environmental impact, both positive and negative. For instance, European Union SMEs, defined as companies with fewer than 250 employees and less than 50 million euros in turnover, account for 99% of all businesses and more than half of Europe's Gross Domestic Product (GDP), employing around 100 million people (European Commission, 2020).

In particular, among SMEs, startups increasingly play a vital role in the advancement of the SDGs (Bocken, 2015; Horne et al., 2020; Trautwein, 2021). Startups are crucial business actors to drive the sustainable transition due to their unique characteristics and capabilities. One key aspect is their inherent capacity for innovation (Sehnem, Provensi, da Silva, & Pereira, 2022) which, in the context of sustainability, generates new technologies, products, and services that address pressing environmental and social challenges (Trautwein, 2021). By challenging the status quo and introducing disruptive solutions, startups can catalyze change and provide alternatives to unsustainable practices (Horne et al., 2020; Pizzi, Caputo, Corvino, & Venturelli, 2020). Moreover, startups possess a distinct advantage in terms of agility and flexibility (Surana, Singh, & Sagar, 2020). Being smaller and less burdened by bureaucratic processes, they can swiftly adapt to market demands and changing circumstances (Sehnem et al., 2022; Surana, Singh, & Sagar, 2020). This agility enables them to experiment with novel approaches and quickly pivot their strategies to explore and implement environmentally friendly or socially responsible practices more rapidly than larger organizations, driving the adoption of sustainable principles and technologies at a faster pace (Agudo Valiente, Ayerbe, & Figueras, 2012; Sehnem et al., 2022).

However, some of the characteristics that favor startups' contribution to SDGs, such as smaller size, flexibility, and less bureaucratization, are also the ones that increase the inherent complexity to operationalize, monitor, and assess SDGs at small organizational level (Gusmão Caiado, Leal Filho, Quelhas, Luiz de Mattos Nascimento, & Ávila, 2018; Macht, Chapman, & Fitzgerald, 2020; Pizzi, Rosati, & Venturelli, 2021; Schaltegger, 2018).

In response to this complexity, several scholars have emphasized the importance of deepening the topic of social impact assessment (SIA) in the case of startups. Vives (2006) argues that small organizations' behavior toward corporate social responsibility can have a significant impact on society and the environment as a whole and thus proposed measures to enhance and promote corporate social responsibility in SMEs. Similarly, Barraket and Yousefpour (2013) suggest that promoting social impact evaluations of startups and small organizations can contribute to their success and the fulfilment of their corporate purpose. Additionally, as consumers become more conscious of the ethical implications of their purchasing decisions, startups with demonstrable positive social impact stand

to gain a competitive edge (Horne & Fichter, 2022). A robust SIA framework can provide them with a powerful marketing tool, helping to build trust and loyalty among consumers who increasingly value companies committed to 'making a difference beyond profits'. Moreover, it would also provide governments and policymakers with critical data to design and implement incentives, subsidies, and regulations to encourage socially responsible business practices (Hirschmann & Block, 2022).

However, the insufficiency of a robust, widely accepted and independent framework for SIA increases the degree of complexity that SMEs face in undertaking SIAs (Dalton, 2020; Mio, Panfilo, & Blundo, 2020; Pizzi, Rosati, & Venturelli, 2021; Rosati & Faria, 2019a). As a matter of fact, this is especially true for startups which do not possess the same organizational structure, accounting procedures, and monitoring capabilities of larger companies (Dalton, 2020; Macht, Chapman, & Fitzgerald, 2020).

In particular, researchers striving to develop SIA frameworks for startups must consider a variety of factors that influence research design and outcomes. One of the greatest challenges in assessing social impact for startups lies in their unique characteristics and rapid growth trajectories (Sommer, Loch, & Dong, 2009). In fact, unlike established SMEs, startups often operate in dynamic and uncertain environments, facing resource constraints and high levels of uncertainty regarding their business models (Burnell, Stevenson, & Fisher, 2023). This dynamic nature makes it challenging to establish standardized metrics for evaluating social impact, as startups may pivot or change their objectives frequently in response to market feedback (Burnell, Stevenson, & Fisher, 2023).

Additionally, startups often have limited historical data available for analysis (Festel, Wuermseher, & Cattaneo, 2013). Traditional impact assessment methodologies rely heavily on historical data to establish baselines and track progress over time. With startups, this data scarcity can hinder the accurate assessment of their social impact, as there may not be sufficient data points to demonstrate meaningful trends. Furthermore, the diverse range of industries and business models within the startup ecosystem adds another layer of complexity (Bocken & Snihur, 2020; Burnell, Stevenson, & Fisher, 2023). Unlike larger corporations or more established SMEs, startups often pursue innovative and disruptive models, making it difficult to apply one-size-fits-all metrics. Customizing impact assessment tools for each unique startup context would require substantial time and resources. Researchers in this field, therefore, face the arduous task of developing adaptable SIA frameworks that can account for the idiosyncrasies of startups.

To this regard, an action research study of five Australian SMEs that engaged in SIA revealed the different challenges faced in undertaking such assessment (Barraket & Yousefpour, 2013). To assess SMEs' social responsibility efforts, Agudo Valiente, Ayerbe, and Figueras (2012) proposed an empirical methodology that evaluates SMEs' corporate social performance based on a survey of firm managers' opinions, without specifically addressing the assessment of social impact. In this regard, an empirical case study using retrospective data on sustainability performance of a small company operating in the entertainment sector revealed the existing frameworks for assessing and reporting social and environmental impact, such as the SDG Compass tool, lack of clarity, and ease of application for smaller organizations (Dalton, 2020).

Most generally, startups may be resistant to engage with SDG practices and accounting because they should navigate the complexity of an overwhelming number of methods, tools, websites, and guiding principles, and the decision on the appropriateness between various SIA frameworks is difficult and time-consuming (Bebbington & Unerman, 2018; Dalton, 2020; Schaltegger, 2018).

Assessing business contribution to SDGs is challenging because it requires a differentiated approach that considers their organizational factors, interrelationships, and industry-specific challenges (Rosati & Faria, 2019b; Schaltegger, 2018; Wu, Chen, Qi, Jiang, Gao, & Tseng, 2019). For instance, Rosati and Faria (2019b) found that early adoption of SDG reporting is related to a larger size, a higher level of intangible assets, and a higher commitment to sustainability frameworks and external assurance, which are features that do not characterize startups. About the obstacles for SMEs to perform SDGs reporting, Wu et al. (2019) found that SMEs have difficulties in assessing their sustainable performance due to their narrow focus on strategic and financial management

in the early stages of their business life. To address this issue, Sinkovics, Sinkovics, and Archie-Acheampong (2021) suggest the importance to assist SMEs with resources and multi-stakeholder initiatives regarding SDGs both by larger companies and policymakers. In particular, interactions with larger companies that adopted sustainability standards to evaluate their contribution to SDGs may assist startups to assess their social impact.

Startups, in particular, are the SMEs that face the greatest challenges in assessing and reporting their contribution to the SDGs (Bocken, 2015; Trautwein, 2021). In particular, 'the literature search reveals that the majority of approaches to assessing sustainability impact do not give specific attention to the maturity and size of organizations and companies' (Trautwein, 2021, p. 2).

Thus, the research gap – as well as the puzzle from a practitioner perspective – is to find a balance between easiness of use and exhaustiveness of the SIA framework in order to account for the startups' contribution toward SDGs.

The challenge is to assist startups to 'plan, implement and report on their progress toward the SDGs in a way that can succinctly engage its stakeholders' (Dalton, 2020, p. 992), developing a simpler, clearer but still reliable and relevant SIA framework suitable for them.

Our research aims to tackle this challenge in two steps. First, we attempt to bring order about the great diversity of existing SIA frameworks through a review of the most acknowledged methods and standards to assess social impact generated by companies. Second, we try to synthesize such knowledge into a new, exhaustive, and clear SIA framework – *Prosper* – applicable to our unit of analysis, i.e., startups, which has a specific focus on their contribution in terms of social impact to SDGs.

Review of frameworks of SIA

We mapped existing frameworks to assess social impact that emerged from a review of both scientific and gray literature. To identify the final sample of SIA frameworks to be included in the analysis, we adopted a three-step procedure that allowed us to structure the review, code the contributions, and consolidate the review results (Debellis, Rondi, Plakoyiannaki, & De Massis, 2021).

First, we used specific search strings to select the appropriate starting sample of documents for both sources (see Table 1). Regarding scientific literature, we entered a single SIA-related search string into the Scopus database for academic articles containing words such as 'social impact', 'evaluating social impact', and 'social impact indicators', combined with terms relevant to our unity of analysis in the title, abstract, or keywords, including 'business', 'firms', and 'companies'. To capture multiple variants of the keywords, we also adopted wildcard suffixes. For the gray literature, we entered ten different search strings into the Google search engine related to SIA topic and we selected the top eight results returned by Google for each string. We obtained 80 webpages and 280 scientific documents as starting sample for the analysis.

Second, to focus on SIA frameworks that were pertinent to our research objectives, we employed a search approach that restricted the applicability of findings to the field of management and business organizations. To compile a refined collection of relevant scientific articles, we identified a selection of journals in the management and related disciplines by limiting the search for the following subject areas in the Scopus database: 'Environmental Science', 'Social Sciences', 'Business, Management and Accounting', and 'Economics, Econometrics and Finance'. We excluded subject areas such as 'Engineering', 'Energy', or 'Computer Science'. We obtained a total of 235 scientific articles. Moreover, to further restrict our results to existing SIA frameworks concerning firms or private organizations, we discarded both gray or scientific contributions with an exclusive focus on SIA of public intervention or similar organizations. We read and filtered 235 abstracts and 80 search engine results pages (SERPs) on Google, excluding 79 articles and 27 SERPs.

Third, we established specific inclusion and exclusion criteria to guide the final sample identification of SIA frameworks to be analyzed. We carefully scrutinized the title, keywords, and abstract of each article, applying two specific criteria for inclusion in our sample: (1) SIA frameworks had to

Table 1. Search strings for the starting sample of social impact assessment frameworks

	Gray literature	Scientific literature
Search source	Google search engine	Scopus database
Search strings	1. *social impact assessment* 2. *evaluating social impact* 3. *social impact metrics* 4. *social impact standards* 5. *social impact measurement* 6. *social impact indicators* 7. *framework social impact* 8. *social impact methodologies* 9. *social impact frameworks* 10. *social impact methods*	*(TITLE-ABS-KEY ('social impact measur*') OR TITLE-ABS-KEY ('social impact assess*') OR TITLE-ABS-KEY ('social impact evaluat*') OR TITLE-ABS-KEY ('social impact method*') OR TITLE-ABS-KEY ('social impact framework*')) **AND** (TITLE-ABS-KEY (compan* OR firm* OR busines*))*
Search results	80 webpages	280 documents

include or mention their contribution or linkage with SDGs, excluding those where the element of SDGs was only tangentially relevant; (2) SIA frameworks had to directly and explicitly refer to SIA, and not social impact strategy, sustainability performance, or similar concepts. Following this meticulous process, we identified 77 articles and 32 SERPs that satisfied both inclusion criteria. Out of the valid scientific and gray literature, we identified a final sample of 15 unique SIA frameworks to be reviewed and mapped.

We soon realized the presence of a clear distinction between two types of SIA frameworks in terms of *methods* and *standards*. SIA methods define the strategic monitoring process that a company may follow to assess social impact, specifying consequential activities to monitor positive social change. On the other hand, SIA standards define metrics and indicators to qualitatively and/or quantitatively assess social impact, often aimed at sustainability reporting and corporate disclosure. In a nutshell, SIA methods mostly concern monitoring processes, while SIA standards concern assessment process. We decided to separately review them, both for the different dimensions to map and to facilitate the acquisition of useful knowledge for the second step of our work, i.e., designing an SDG-oriented SIA framework valid for startups.

Mapping dimensions

To organize and categorize the identified SIA methods and standards, we included specific mapping dimensions to allow for a structured analysis and provide a deeper understanding of the frameworks' characteristics and applicability. We here present and justify the mapping dimensions included: (1) *sponsoring organizations*, which identifies the organizations that developed or promoted the framework, included because understanding the origins and actors behind the frameworks helps contextualize their development and potential biases associated with their implementation; (2) *key characteristics*, which captures the focus, principles, and requirements of SIA methods, as well as the types and characteristics of metrics in SIA standards, included because provides insights into the fundamental aspects and features of the frameworks under review; (3) *scope of applications*, which specifies the purpose of the SIA framework and the contexts in which it could be used, included because elucidates the intended applications and potential areas of impact assessment for each framework; (4) *unit of analysis*, which considers the specific unit of analysis for the SIA framework, such as business activities of startups, SMEs, large firms, public programs, products, or investments, included because understanding the target entities or activities of the framework facilitated its alignment with the entities being assessed; (5) *SDG focus*, which evaluates the level of alignment – strong, medium,

and low – between the SIA framework and the SDGs, included because facilitates immediate understanding from businesses of how the framework supports the assessment of their contribution to sustainable development; (6) *metric descriptions* (for SIA standards only), which specifies (a) whether the social impact metrics and indicators are unique for the standard or a collection of other standards and (b) whether the standard provides qualitative, quantitative, or mixed social impact metrics; (7) *reference*, which provides the bibliographic or online reference where each SIA framework was found, included to ensure transparency and allow readers to access the original sources for further exploration.

The inclusion of these mapping dimensions facilitated a comprehensive analysis of the SIA landscape, enabling us to understand the diverse characteristics, scopes, and potential contributions of the frameworks in assessing the impact of firms on sustainable development.

SIA methods

We identified nine SIA methods to be reviewed, which are fully mapped and described in Table 2. We briefly describe here the salient characteristics of each method we found, also discussing their relation with SDGs and their applicability to startups.

The theory of change (ToC) is one of the earliest SIA methods conceived to guide organizations in achieving desired social change. It applies a processual logic of back casting, starting from the long-term goals and ending up with the necessary conditions to meet them. It is mostly applicable for programs and interventions of public and private organizations of large size. The connection with SDGs is poor, also given the antecedents of ToC over SDGs. Likewise, the SIA is suitable to evaluate the positive and negative impact of pre-planned interventions, such as public or industrial programs. Its peculiarity is that it was been introduced by the U.S. National Environmental Policy Act in 1970 as a legal mandate to perform evaluations of social impacts of new interventions. It is hardly applicable to startup programs or interventions, and the linkage with SDGs is low.

More focused on business activities are the Measuring Impact Framework Methodology and the Impact Management Norms. The first is applied to evaluate ex-post the social impact of business activities by iterating four consequential steps, while the second evaluates social impacts among five core dimensions, specifying categories of impact assessment. They are both sponsored by private organizations and moderately connected with SDGs, even though they did not explicitly cite them. They can be applied to startups, even though their implementation takes time and is not immediate.

Two out of eight SIA methods have a strong focus on the SDGs, i.e., SDG Impact Assessment Tool and SDG Impact Standards enterprises. They provide guidance on how to strategically maximize positive impact, contribute toward SDGs, and transparently report SDG performance. However, they do not distinguish by company size and both leave to companies the choice about indicators and reporting methods.

The social life cycle assessment (S-LCA) is applied for evaluating the social impact of products throughout their life cycle, complementing the environmental LCA. It has been sponsored by United Nations Environmental Program, and it makes use of generic and site-specific data that are not always available to startups. SDGs are not directly mentioned in the method.

The social return on investment (SROI) is an SIA method that tries to provide a monetary assessment of social and environmental value created by companies' investments. It is applicable both in the planning and ex-post phase of investments but mostly for medium and large companies that possess quantitative data. The linkage with SDGs is very low, since it focuses on monetary assessment of social impact.

Finally, the Sustainable Development Goals Disclosure Recommendations is an SIA method that aims to incorporate the evaluation and disclosure of SDG performance by businesses of different dimensions. It is a method aligned with other international standards and tries to bring clarity and transparency on reporting practices on sustainability issues by providing specific recommendations.

Table 2. Review of social impact assessment methods

	(1) Sponsoring organizations	(2) Key characteristics	(3) Scope of application	(4) Unit of analysis	(5) SDG focus	(7) References
Theory of Change (ToC)	Carol Weiss, a member of the Aspen Institute's Roundtable on Community of Change	ToC is an SIA method used to achieve desired social change. ToC starts with defining desired long-term goals and proceeds backward to identify the conditions that must be satisfied to achieve those goals. It includes a measurement phase through metrics that have to be selected according to the desired social change.	ToC is applied when an organization is clear about (1) the social change it wants to achieve by declining into long-term goals and (2) wants to apply a processual logic of backcasting.	Public interventions, non-governmental programs, and business activities of medium to large enterprises	Low	(Cathy, 2011; Weiss, 1995)
Social Impact Assessment (SIA)	U.S. National Environmental Policy Act (NEPA)	SIA is an SIA method used to analyze, monitor, and manage social impacts resulting from specific pre-planned interventions. It consists of 10 consequential steps aimed at mitigating of negative effects or unexpected consequences. It includes the active involvement of communities and stakeholders impacted by the planned intervention in the assessment process.	SIA is applied when (1) there is a plan, policy, or planned intervention and (2) the positive and negative impacts of that intervention on society are to be assessed.	Public development programs (tourism, local community development) or industrial development projects (infrastructure, natural resource extraction projects)	Low	(Esteves, Franks, & Vanclay, 2012; Freudenburg, 1986; Vanclay, 2003)
Measuring Impact Framework Methodology (MIFM)	World Business Council for Sustainable Development & International Finance Corporation	MIFM is an SIA method that provides guidelines for firms that want to assess ex-post their impact on society, and thus, it does not require planning for an intervention. It consists of four cyclically iterative steps: set boundaries, measure direct and indirect impacts, assess contribution to development, and prioritize management response.	MIFM is applied when firms' decision-makers want to analyze their main business activities (see units of analysis) at any stage of the product or site life cycle.	Businesses activities of all sizes: governance & sustainability, assets, people, and financial flows	Medium	(World Business Council for Sustainable Development, 2008)

(Continued)

Table 2. (*Continued.*)

	(1) Sponsoring organizations	(2) Key characteristics	(3) Scope of application	(4) Unit of analysis	(5) SDG focus	(7) References
Impact Management Norms (IMNs)	Impact Management Project	IMNs are an SIA method that provides guidelines for firms that want to assess their impact on people and planet along five dimensions: what, who, how much, contribution, and risk. For each of the five dimensions, they specify categories of data on which to assess impact, with an associated template to be filled out.	IMNs are applied when businesses want to (1) monitor and manage their impact on people and the planet and (2) be classified by investors for their impact.	Business activities of medium to large size	Medium	(Impact Management Project, 2018; Impact Management Project, 2022)
SDG Impact Assessment Tool (SDG IAT)	Gothenburg Centre For Sustainable Development	SDG IAT is a self-assessment SIA method made of five consequential steps. Each SDG is assessed according to the categories of direct positive, indirect positive, no impact, direct negative, indirect negative, and more knowledge needed. The method does not provide steps to be followed.	SDG IAT is applied when organizations want to perform a self-assessment of their SDG impact without indications on how to evaluate SDGs contribution.	Research activities, organizations, projects, or other initiatives of all sizes	High	(Eriksson, Ahlbäck, Silow, & Svane, 2021)
SDG Impact Standards (SDG ISs) enterprises	United Nations Development Programs (UNDPs)	SDG IS for enterprises is a voluntary SIA method that helps business in embedding SDGs in their management systems and decision-making practices. They are divided into four standards: strategy, management approach, transparency, and governance, and contain 12 enterprise actions to embed SDGs.	SDG IS for enterprises is applied when businesses want to increase the likelihood to operate sustainably and contributing positively to the SDGs.	Business activities of all sizes	High	(United Nations Development Program, 2021)

(*Continued*)

Table 2. *(Continued.)*

	(1) Sponsoring organizations	(2) Key characteristics	(3) Scope of application	(4) Unit of analysis	(5) SDG focus	(7) References
Social Life Cycle Assessment (S-LCA)	Society of Environmental Toxicology and Chemistry (SETAC) and United Nations Environmental Program (UNEP)	S-LCA is an SIA method used to assess the positive and negative impacts of products on society along its life cycle. It evaluates the extraction and processing of raw materials, manufacturing, distribution, use, reuse, maintenance, recycling, and final disposal. S-LCA complements the environmental LCA by making use of generic and site-specific data that can be quantitative, semi-quantitative, or qualitative.	S-LCA is applied to those companies that want to improve (1) their production decision-making processes, (2) their social performance, and ultimately (3) the welfare of their stakeholders.	Product and services of companies of all size	Medium	(Jørgensen, le Bocq, Nazarkina, & Hauschild, 2008; Petti, Serreli, & Di Cesare, 2018)
Social Return on Investment (SROI)	Social Value UK	SROI is an SIA method used to assess the environmental and social value created by a company's investments through assessment of monetary return against the resources invested. The guiding principles for applying SROI are involve stakeholders, understand what changes, value the things that matter, only include what is material, do not over-claim, be transparent, and verify the result.	SROI is applied for quantitative value assessment purposes both in the planning phase or in the ex-post evaluation phase.	Medium and large organizations	Low	(Perrini, Costanzo, & Karatas-Ozkan, 2021; Vik, 2017)
Sustainable Development Goals Disclosure (SDGD) Recommendations	International Federation of Accountants (IFAC)	SDGD Recommendations is an SIA method that helps businesses and other organizations to assess and monitor their contribution to sustainable development. It attempts to establish a best practice for corporate reporting on the SDGs and enable more effective and standardized reporting and transparency on climate change, social, and other environmental impacts.	SDGD Recommendations is applied for organizations that want to align their value creation with SDGs by improving their (1) management approach, (2) strategy, (3) governance, and (4) performance.	Business activities of all sizes	High	(Adams, Druckman, & Picot, 2020)

SIA standards

After the methods, we identified six SIA standards (Table 3).

We here describe their characteristics, linkage with SDGs and applicability to startups. The Global Reporting Initiative (GRI) Standards are suitable for medium and large organizations that aim to disclose their sustainability performance along the economic, environmental, and social impact dimensions. In the latest version of 2021, the GRI Standards include (1) the revised Universal Standards that apply to all organizations, (2) the newest Sector Standards that apply to around 40 sectors, and (3) the Topic Standards to report specific information on material topics, including social issues.

The Impact Reporting & Investment Standards (IRIS+) are designed to evaluate the financial, environmental, and social performance of investments. There are 50 impact metrics categorized by investments lenses and themes. They apply to both medium and large organizations or products and services. They do not include specific reference to SDGs and are hardly suitable for startups.

The B Impact Assessment is an SIA standard for companies of all sizes that want to voluntarily communicate their environmental and social impact. It assesses impact along five areas and includes three consequential steps. Companies achieving a score higher than 80 out of 200 can obtain the B corporation certification. It is strictly linked with SDGs, and it is also suitable for startups.

The SDG Compass – Business Indicators are jointly sponsored by different organizations, including the United Nations, as an SIA standard to monitor business contribution to SDGs. It is a collection of indicators gathered from existing standards that are categorized according to the 17 SDGs, suitable for companies of all sizes and including five steps to maximize SDG contribution.

The Sustainability Accounting Standards Board (SASB) Standards are SIA standards to make Environmental, Social, and Governance (ESG) disclosure of companies' investments, categorized according five dimensions and divided into eleven industries. The standards are applicable to companies that possess financially relevant data, which are usually medium and large organizations rather than startups. The SDG linkage is low. In particular, financial materiality constitutes a cornerstone in the SASB Standards, shaping the delineation of pertinent sustainability issues within corporate disclosures. Within this standard, sustainability is defined as encompassing ESG activities that bolster a company's capacity to generate value over the long term (Busco, Consolandi, Eccles, & Sofra, 2020). This interpretation underscores the significance of sustainability considerations in preserving and augmenting a company's financial standing. SASB Standards, thus, preside over the quantification, administration, and communication of such corporate endeavors.

The Future-Fit Business Benchmark is an SIA standard that is aligned with SDGs and evaluates the business contribution to sustainable development. It includes 24 break-even goals of minimum sustainable performance and 24 positive pursuits to accelerate sustainable transition.

Review insights and research gap

Five general considerations can be drawn from the results of the review of SIA frameworks to inform our next step of SIA framework design.

First, we confirm previous literature about the need to provide monitoring and accounting frameworks of social impact that are suitable for startups (Bebbington & Unerman, 2020; Dalton, 2020; Macht, Chapman, & Fitzgerald, 2020). In fact, well-established accounting standards that include social impact metrics, such as GRI, IRIS+, and SASB, are hardly suitable for startups, due to their complexity and time-consuming application. In our review, the unit of analysis of the examined SIA methods and standards rarely include startups, highlighting the need to adapt or design a new SIA framework that really fits startups' necessities. Startups are marked by a distinct desire to revolutionize established industries or introduce innovative solutions to existing problems. This inclination leads to a greater willingness to take risks, challenge conventional practices, and embrace uncertainty in pursuit of their objectives (Bocken & Snihur, 2020). Additionally, startups often function in resource-constrained environments, which place stronger emphasis on efficiency and effectiveness

Table 3. Review of social impact assessment standards

	(1) Sponsoring organizations	(2) Key characteristics	(3) Scope of application	(4) Unit of analysis	(5) SDG focus	(6) Metrics description	(7) References
Global Reporting Initiative (GRI) Standards	Global Sustainability Standards Board	GRI standards provide guidelines for reporting companies' impact and stakeholder engagement. They are modular and interconnected standards that are divided into universal standards (1–3), sector-specific standards (11–13), and topic-specific standards (201–207: economic, 301–308: environmental, 401–419: social). GRI standards define eight reporting principles (accuracy; balance; clarity; comparability; completeness; sustainability context; timeliness; and verifiability).	GRI standards are applied for sustainability disclosure when an organization intends to report on impacts related to specific economic, social, and/or specific environmental issues.	Medium and large organizations, both public and private	Medium	Exclusive; mixed	(Brown, de Jong, & Lessidrenska, 2009; Grushina, 2017)
Impact Reporting & Investment Standards (IRIS+)	Global Impacting Investing Network (GIIN)	IRIS+ standards provide a reporting system for impact investors with validated metrics aligned with more than 50 recognized impact standards. It assesses the environmental, social, and financial performance of an investment, categorizing metrics according to a thematic taxonomy of 16 impact categories and a variety of impact themes associated with each category. It also categorizes metrics according to five investment lenses that guide investors in evaluating their impact investments according to specific investment themes (gender, geographic setting, minority and disabled, poverty level, and small and medium enterprises).	IRIS+ standards are applied for impact investing when investors intend to use a system of accepted standards to measure the impact generated by their investments.	Medium and large organizations or products and services (a metric level filter is provided to select metrics according to the unit of analysis).	Low	Exclusive; quantitative	(IRIS, 2013)
B Impact Assessment	B Lab	B Impact Assessment provides standards for evaluating a company's impact on five areas (workers, community, environment, governance, and customers). The B Impact Assessment consists of the three stages of assess, compare, and improve. Assess is a baseline assessment of environmental and social impact through a questionnaire. Compare is a benchmark assessment of impact with the average score obtained by other companies for each impact areas. Improve is an impact improvement roadmap using free tools and guidelines provided by B-Lab. Companies achieving a B Impact Score greater than or equal to 80/200 can obtain B corporation certification.	B Impact Assessment is applied for certification purposes when companies want to voluntarily report their environmental, social performance, and impact on their stakeholders.	Businesses of all sizes	High	Exclusive; mixed	(Moroz, Branzei, Parker, & Gamble, 2018; Villela, Bulgacov, & Morgan, 2021)

(Continued)

Table 3. (*Continued.*)

	(1) Sponsoring organizations	(2) Key characteristics	(3) Scope of application	(4) Unit of analysis	(5) SDG focus	(6) Metrics description	(7) References
SDG Compass – Business Indicators (SDG BIs)	Global Reporting Initiative (GRI), United Nations Global Compact (UNGC), and World Business Council for Sustainable Development (WBCSD)	SDG Compass provides a guide for companies that describe the five steps to maximize SDG contribution: (1) understanding the SDGs, (2) defining priorities, (3) setting goals, (4) integrating, (5) reporting and communicating. SDG Compass also includes an inventory of business tools useful in assessing the companies impact on SDGs, which can be filtered by keyword, individual SDG, or tool developer entity. SDG BIs provide an inventory of business indicators useful for assessing a company's contribution to SDGs. SDG BIs are collected from existing standards and can be filtered by keywords, single SDG or target SDG, business theme and source.	SDG BIs are applied for monitoring purpose when companies intend to find suitable tools to monitor their contributions to the achievement of the SDGs.	Organizations of all sizes, both public and private	High	Collection; mixed	(García-Sánchez, Aibar-Guzmán, Aibar-Guzmán, & Rodríguez-Ariza, 2020; Pizzi et al., 2021)
Sustainability Accounting Standards Board (SASB) Standards	SASB Foundation	SASB Standards provide 77 industry-specific standards that establish the (1) financially relevant, (2) decision-useful, and (3) cost-effective information on ESG issues that companies must provide to investors through disclosure activities. SASB Standards include the five ESG dimensions of environment, social capital, human capital, business model innovation, and leadership/governance. For each industry (11 total), the most relevant sustainability topics are provided.	SASB Standards are applied for ESG disclosure when companies have data on sustainability issues that are financially relevant to investors.	Businesses of medium to large sizes	Medium	Exclusive; mixed	(Busco et al., 2020; Grewal, Hauptmann, & Serafeim, 2021)
Future-Fit Business Benchmark	Future-Fit Foundation	Future-Fit Business Benchmark provides a guide for businesses to evaluate their contribution to sustainable principles, and it is aligned with SDGs. In particular, it includes 24 break-even goals that must be reached to have a minimum performance and 24 positive pursuits that can be reached to accelerate the transition toward future-fit society. The break-even goals are accompanied by a set of progress indicators, each expressed as a percentage. Future-Fit Business Benchmark provides a guide to help businesses in reaching bot break-even goals and positive pursuits.	Future-Fit Business Benchmark is applied for monitoring purposes when companies want to assess their contribution for a future-fit society.	Organizations of all sizes, both public and private	High	Exclusive; quantitative	(Broman & Robèrt, 2017; Future Fit Foundation, 2021)

in their social impact endeavors (Horne & Fichter, 2022). Due to limited resources, startups cannot afford to allocate them indiscriminately. Consequently, traditional frameworks used to assess social impact, which often presuppose ample resources and a low-risk setting, may not align with the actual challenges encountered by startups. Furthermore, startups frequently encounter unique challenges related to scalability and growth (Burnell, Stevenson, & Fisher, 2023). The swift evolution of startups necessitates flexible and adaptable approaches to assess social impact that can keep pace with the venture's evolving objectives and strategies (Horne & Fichter, 2022; Sommer, Loch, & Dong, 2009). Conventional SIA standards, with their relatively inflexible structures, often struggle to accommodate the dynamic nature of startups' operations and goals.

Second, we also confirm that only a few SDG-specific accounting frameworks have been fully tested, innovated, and validated for startups, thus failing to be recognized, accepted, and ultimately adopted by startups (Bebbington & Unerman, 2018, 2020). Goals and targets proposed by the United Nations Agenda 2030 are not 'digestible' as such by startups but need to be downsized and contextualized for that specific business sector. For instance, Fiandrino, Scarpa, and Torelli (2022) recently proposed two different pathways based on the concepts of interconnectedness and inclusiveness that can enhance firms' social impact through SDG-driven corporate actions, even though they did not provide a standard with metrics and scales to assess the results in terms of impact. Our review confirms the need to embed SDGs from the design phase of an SIA framework for startups.

Third, we noted that SIA methods are very different in nature, and aim and methodological steps suggested to monitor social impact. Although it is important to study and design the monitoring process before implementing SDG-driven corporate actions, the complexity and great diversity of existing SIA methods lead us to opt for the design of an SIA framework with conceptual pillars and categories. We thus focused on the assessment phase, defining social impact categories, criteria, and scales. The emerging need for startups is to have an 'actionable' framework to assess their generation of social impact qualitatively or quantitatively.

Fourth, our review reveals a significant challenge in traditional SIA standards: the failure to acknowledge the intrinsic and mutual influence between environmental and social impacts. These standards often maintain separate assessment categories for environmental and social aspects, thus promoting a compliance-based approach that addresses specific requirements without fostering a comprehensive and mature sustainability behavior. By perpetuating this separation, companies may miss out on the opportunity to fully assess the impacts of their business activities from an integrated perspective and embrace a holistic approach to sustainability. Moreover, in the context of startups, separating the assessment and management of environmental and social impact into distinct categories can create unnecessary complexity and burden for the evaluation processes. To overcome this limitation, it is essential to develop SIA standards that recognize and encourage the interdependence of environmental and social impacts, especially when considering startups.

Fifth, the existing literature highlights the complementary nature of different standards in terms of materiality, such as the SASB and GRI Standards. While SASB primarily caters to investors, focusing on the financial materiality of sustainability issues, GRI narrows its reach to a different spectrum of stakeholders. This fundamental difference in audience and materiality definition underscores the distinct purposes served by these two reporting standards. Although they are not in competition but rather designed for distinct yet mutually supportive objectives, within the context of startups, there is a clear need to harmonize the existing plethora of SIA frameworks and materiality interpretation, recognizing the unique challenges and financial priorities faced by early-stage ventures.

These needs, which correspond to the research gap we aim to fill, are also confirmed in the extant literature on startups contribution to SDGs. For instance, Mio, Panfilo, and Blundo (2020, p. 3242) advised that a 'deeper investigation of SDG outcomes and their impact measurement is crucial in the area of performance measurement and management', while the systematic review on SDG management research conducted by Pizzi, Caputo, Corvino, and Venturelli (2020) revealed that 'even the frameworks traditionally used in business studies do not appear adequate to represent a complex topic, such as the SDGs'. Business-tailored SIA frameworks are crucial to incentivize startups at

contributing for SDGs and improving the related performance. Otherwise, startups would lack the adequate tools both to pursue measurable SDG targets and to monitor their achievement, thus being disincentivized from pursuing strategies based on SDGs fulfillment.

The aim of our research is to contribute to addressing these gaps by designing a new framework for assessing social impact, which draws inspiration from previous SIA standards but is specifically tailored for startups and strongly aligned with achieving the SDGs. In particular, the scope of the framework is to assist startups in identifying and understanding the various dimensions of impact they can achieve. The intent is to design an SIA framework that functions as a mapping tool for both impact dimensions and their corresponding assessment methods. While offering qualitative criteria and quantitative scales, the tool should not impose specific requirements for collecting quantitative data or indicators. In short, the research question we aim to address is the following: '*How can startups account for their social impact through an SDG-driven framework of social impact assessment?*'

Research methodology

To answer the research question, we used a methodology based on action research, which aims 'to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities' (Reason & Bradbury, 2008, p. 1).

In particular, we collaborated with Energizer, a startup accelerator owned by the Italian energy company ENI. The accelerator has been established to provide incubation and acceleration programs, including mentoring, logistical, and financial support, for startups active in the fight against climate change. All of the startups accelerated by ENI's incubator operate in the green economy sector, with products and services that aim to reduce the environmental footprint of human activities. The 'pressing concern' for ENI was to dispose of an SIA framework for startups, to be applied both in the phase of startup selection for Energizer and in subsequent phases, such as startup incubation, acceleration, or co-innovation.

The collaboration with ENI started in March 2021 and ended in October 2021. During this period, we worked closely with three ENI managers, co-developing the SIA framework. Moreover, we also collaborated with five startups related to ENI's innovation ecosystem, validating and co-refining the framework through interviews with the startups founding teams.

In addition to direct collaboration with ENI's team interested in the practical solution, action researchers aim to bring about social change through the production of new knowledge that is already actionable in practice (Brydon-Miller, Greenwood, & Maguire, 2003; Eden & Huxham, 1996).

In our research design, we sought to develop an SDG-driven framework for SIA that startups could use as a guiding tool to identify and understand the various dimensions of impact they can generate. We also aimed for an SIA framework that does not necessitate any specific pre-processing of data gathering, data processing, or prior knowledge acquisition, in order to ensure immediate applicability and to foster social change among startups interested in enhancing their social impact. While we aimed to maintain simplicity and clarity in the SIA framework without compromising scientific reliability and comprehensiveness, we propose a tool which is not capable of quantitatively measuring the considered dimensions. Rather, we present our SIA framework as a mapping tool for impact dimensions, offering qualitative criteria to indicate relevant areas where impact assessment can take place and qualitative assessment scales that do not require the collection of specific quantitative data.

Methodology for the framework design

We proceeded with two methodological phases: (1) drafting the foundations of the SDG-driven framework of SIA for startups on the basis of our review and (2) refining the framework on the basis of an empirical validation on five startups.

Table 4. Interviews details for validating and refining Prosper

	Description of startup products or services	Date and duration of the interview
Alpha	Air purifier that improves air quality in indoor spaces through a bio-filtering system consisting of modular 'active' green walls.	June 14, 2021 – 1 hr
Beta	Smart bin that automatically performs recycling collection through the use of machine learning algorithms in the field of image recognition.	June 16, 2021 – 1 hr
Gamma	Platform that enables companies to reduce their environmental footprint, offering services such as carbon credit offsets, green point missions, and CSR projects.	June 16, 2021 – 1 hr
Delta	Redox flow battery that enables long-term energy storage in medium-to-large scale sites by sulfur waste valorization process.	June 21, 2021 – 1 hr
Epsilon	Treatment service by advanced fluorination of lithium batteries that ensures better performance, oxidation resistance, and stability during battery duty cycles.	June 23, 2021 – 1 hr

In the first phase, we devised the cornerstone elements of the SIA framework. First, we examined the reviewed SIA standards to provide a working definition of social impact. Second, we designed two main pillars of social impact. The design of these two pillars originated directly from the beneficiaries mentioned in the working definition of social impact, thus ensuring that our framework captures the comprehensive nature of positive social change created by startups. Third, we designed four social impact categories based on our review of the SIA standards and ongoing dialogue with the ENI team. To ensure the design of a comprehensive framework, we analyzed the existing indicators and dimensions of the six SIA standards reviewed, with the aim of extrapolating valid conceptual categories. This process involved a careful examination of the dimensions through which social impact is commonly assessed in these standards, with the aim of including conceptual elements that were actionable for startups. For instance, we did not include SIA categories that require highly granular and quantitative data because startups may lack accounting systems, available data, and adequate structuring to be able to make complex SIAs. Moreover, following an action research approach (Reason & Bradbury, 2008), we listened to the needs and practical suggestions of ENI's people interested in applying the SIA framework for assessing social impact of startups accelerated in Energizer. To ensure the SDG focus of the framework, we made use of the Inventory of Business Indicators provided by the SDG Compass (https://sdgcompass.org/business-indicators/), which catalogues and associates each SDG to the indicators and metrics of some of the most acknowledged SIA standards. To design Prosper, we included, for each category, those SDGs associated by the SDG Compass to the metrics we reviewed and mentioned. This ensured rigor in selecting and including the SDGs to which startups contribute through the social impact generation activities assessed by Prosper.

In the second phase, we refined Prosper through an empirical validation with five startups. First, we empirically tested the pillars and categories of our SIA framework through interviews with team founders of five startups (Table 4), and we refined the framework coherently.

The semi-structured interviews with startup founders were divided in three parts: first, we asked them to describe their entrepreneurial activities (about 15 min); second, we asked them to provide qualitative evidence of the social impact generated by their startups according to the categorization of the pillars and categories of our SIA framework (about 30 min); and third, we asked them whether the proposed framework succeeded to assess the social impact generated by their startups or if they had suggestions to modify and improve it (about 20 min). We recorded and transcribed all the interviews. Through conducting interviews and collaborating closely with ENI's team, we iteratively refined the framework by carefully incorporating their specific requirements, whether it involved adding, removing, or modifying categories. This process ensured that the framework effectively catered to their needs in promoting social change among the startups accelerated in their program. Coherently with

action research, we tried to combine the '(i) the central principle of "participatory" or "collaborative" research – the notion that some members of the organization being studied should actively participate in the research process rather than just be the subjects of it – with (ii) the central principle of action research – that there should be an intent to take action' (Eden & Huxham, 1996, p. 77).

Second, for each category, we also elaborated specific qualitative criteria to assess social impact, as well as quantitative scales associated with them in order to provide a quantitative result of the social impact generated. Both qualitative criteria and quantitative scales have been defined with the aim to be 'actionable' by an external evaluator, without the need to acquire prior or hard-to-find data for a startup. Along with the quantitative scales, we also provided a weighting method to adjust the quantitative results derived from the application of the scales to take into account our specific unit of analysis, i.e., startups, and our SDG focus.

Results

Definition of social impact

Scholars argue that social impact is characterized by the generation of positive change (Latane, 1981; Stephan, Patterson, Kelly, & Mair, 2016), which affects people, both individuals and groups (Freudenburg, 1986; Vanclay, 2003), and enables them to benefit social value (Santos, 2012) in the form of improved living conditions (Burdge & Vanclay, 1996; Santos, 2012). Based on the full review about the assessment and definition of social impact conducted by Rawhouser, Cummings, and Newbert (2019) and our own review of SIA methods and standards, we provided a working definition of social impact that has informed the design of our SDG-oriented SIA framework for startups. We define social impact as *the value generated by positive changes that increase the economic, cultural, relational, physical, and mental wellbeing of individuals and communities.*

In line with this definition, we recognize the inseparable link between environmental and social considerations. By adopting this perspective, we aim to shift the focus from merely mitigating negative environmental impacts to actively promoting positive social change. Our SDG-oriented SIA framework for startups emphasizes the identification, assessment, and amplification of positive social outcomes while simultaneously considering the ecological footprint and resource consumption associated with business activities.

Thus, our intention is to promote a paradigm shift that considers environmental consequences as part of social ones, thus intrinsically aligning economic prosperity, social well-being, and ecological sustainability. By embracing this approach, startups can play a pivotal role in driving social positive change, contributing to the achievement of the SDGs, and ensuring a more sustainable and equitable future for all.

Foundations of the framework

Following the methodology described, we designed an original SIA framework – *Prosper* – illustrated in Table 5.

We designed two main pillars of social impact, i.e., *People* and *Communities*. These two pillars descend directly from our definition of social impact, which refers to the value generated by positive changes for individuals and communities. Thus, the first pillar – People – refers to individuals, while the second one – Communities – refers to organized groups of individuals.

By reviewing the SIA standards and dialoguing with ENI's team, we then designed four categories of social impact, two for each pillar: *Creating New Opportunities* and *Fostering Integral Human Development* for the pillar 'People' and *Building Resilient Communities* and *Including Stakeholder* for the pillar 'Communities'. For each category, definitions are available in Table 5. The collaborative process with ENI's managers involved discussing the relevance, applicability, and significance of each category within the context of startups and their contribution to SDGs.

Table 5. Description of Prosper

Pillar	Category	Definition	SDGs	References to SIA standards
People	**Creating new opportunities**	Implementing fair and quality training activities that aim to promote skills for the future, lifelong learning, and new competences to be spent in emerging sectors (such as digital, Industry 4.0, environment, creative services, etc.). Fostering employment opportunities for youth, women, and vulnerable groups, including people with disabilities, disabling diseases, migrants, and people marginalized in society (ex-prisoners, drug addicts, etc.).		GRI 404: Training and Education 2016 GRI 405: Diversity and Equal Opportunity 2016 Employee Training and Transition Programs Offered (OI3368) Social and Environmental Performance Incentives (OI4953) Equity (OI2362) B-Impact Assessment: Diversity, Equity & Inclusion; Education; Workforce Development
	Fostering Integral Human Development	Promoting integral development of people in terms of cultural, social, **economic, physical,** and mental well-being, with the aim of enhancing relational capacity, sense of belonging, and active participation in society, in contexts of diversity, fraternity, **and economic prosperity.** Ensuring access to health services, to **food (canteen services or meal vouchers),** and other important services (e.g., daycare, remote work), parental, sick and overtime leave, social and **financial aids.**		**GRI 202: Market Presence 2016** GRI 403: Occupational Health and Safety 2018 GRI 406: Non-discrimination 2016 Anti-Discrimination Policy (OI9331) Employees Earning a Living Wage or Higher (OI4724) Employment Benefits Uptake (OI8865) Occupational Injuries (OI3757) B-Impact Assessment. Career Development, Engagement & Satisfaction, Health & Wellness Improvement

(Continued)

Table 5. (*Continued.*)

Pillar	Category	Definition	SDGs	References to SIA standards
Communities	**Building resilient communities**	Investing in infrastructures, territories and communities, understood as mutually close groups of people living in cities, small towns, or inland areas. Transmitting values and principles that promote social prosperity of communities by fostering dialogue, inclusion and acceptance of diversity within the community. Fostering the socioeconomic development of communities with the goal of making them self-reliant and resilient, that is, capable of providing ready and appropriate responses to social change.	(9 Industry, Innovation and Infrastructure; 11 Sustainable Cities and Communities)	GRI 413: Local Communities 2016 Community Engagement Strategy (OI2319) Community Service Hours Contributed (OI8429) Local Compliance (OI9379) B-Impact Assessment: Community Impact Areas, Infrastructure/Market Access Building, Local Economic Development
	Including stakeholders	Promoting social, economic and decision-making inclusion of various stakeholders in the company's business activities and implementing value co-creation processes with them through partnerships aimed at sustainable and inclusive development. Devoting specific attention to frail, disadvantaged people and peripheral contexts in the inclusion of internal stakeholders (employees, shareholders, managers) and external stakeholders (suppliers, business partners, institutions, local communities), with the aim of networking for the creation of shared value.	(9 Industry, Innovation and Infrastructure; 16 Peace, Justice and Strong Institutions; 17 Partnerships for the Goals)	GRI 414: Supplier Social Assessment 2016 GRI 416: Customer Health and Safety 2016 Target Stakeholder Fatalities (PI8145) Target Stakeholder Injuries (PI7161) Governance Policies (OI2330) B-Impact Assessment: Civic Engagement & Giving, Customers Impact Areas, Supply Chain Management

Empirical validation and refinement of the framework

All of the five startups contributed to the validation and refinement phase of the framework. During the interviews, the founders of the startups were satisfied with the effectiveness of *Prosper* in qualitatively capturing, categorizing, and representing the social impact generated through the proposed Pillars and Categories (see Table 6).

More specifically, with regard to the pillar People, the creation of new opportunities occurs through employees' training and new skills generation to be spent in occupations related to the green economy, such as air purification processes (Alpha), maintenance of smart bins (Beta), or the production of environmentally friendly batteries (Delta and Epsilon). Some startups even created new jobs that did not exist in traditional markets (Beta and Gamma) or slowed down the exploitation of people in underdeveloped countries where raw materials are extracted (Delta). The promotion of Integral Human Development mostly occurs by improving customers' health (Alpha, Gamma, and Epsilon) or customers' quality of life with green products (Alpha, Beta, and Delta). Also, some startups positively impact employees' quality of life with internal sustainable projects (Gamma) or with promotion of gender equality (Delta).

As for the pillar Communities, the building of resilient communities benefits from the sale of products that directly contribute to better livability of municipalities and cities (Alpha, Beta, and Epsilon), their energy and economic independence (Gamma and Delta), and their capacity to respond to external shocks (Alpha, Gamma, and Delta). Finally, with regard to the inclusion of stakeholders, the majority of the startups directly collaborated with larger companies of the same sector to co-develop their products (Alpha, Gamma, and Epsilon), with universities to find talents and test their products (Alpha and Delta) and with not-for-profit and public organizations to conduct sustainability or business-related projects (Beta, Gamma, and Epsilon).

Discussing the results with the ENI team and members of the startups, we soon realized that *Prosper* failed to map some important startups' activities of social impact generation which are strongly related to SDGs. There was a need to consider the startup's commitment to raise awareness on sustainable development, promote sustainable behaviors, and convey SDG-related values and principles to external actors such as public institutions, municipalities, partners, suppliers, and local communities. While the other social impact categories do include operations and activities directly implemented by startups, these activities are related to communication and advocacy that inspire others in pursuing a sustainable development path.

To take into account this type of social impact, we, therefore, included an additional social impact category – 'Raising awareness on sustainability' – within the pillar communities, specifying its definition, SDG linkage, and references to other SIA standards (Table 7).

Finally, we also designed qualitative criteria in order to facilitate the process of social impact evaluation, as well as to design quantitative scales associated with them in order to provide a quantitative result of the social impact generated by startups. We identified 10 qualitative criteria (2 for each category) and 10 associated quantitative scales to assess the social impact generated by a startup, which are described in Table 8.

The quantitative scales have been designed with the aim to be 'actionable' by an external evaluator, without the need to acquire prior or hard-to-find data for a startup. Each scale is orderable on a scale, ranking from zero to three points. We tried to refer to acknowledged definitions and constructs when designing different options for a single scale, such as in the case of the emerging sectors, the investment classes, the interventions for community resilience, and the alternative ways to create shared value. Throughout all the design phase of the SIA framework, we had active feedback both from ENI's team and from the startups which were being accelerated.

Weighting method of the framework

In the discussion of the scales, the need to elaborate a weighting method to adjust the quantitative results also emerged. In particular, we adjusted them for the factors of *startups applicability*, i.e., the

Table 6. Empirical validation of Prosper

Pillar	Category		Startups			
		Alpha	Beta	Gamma	Delta	Epsilon
People	**Creating new opportunities**	- Creating new jobs and skills in the green economy due to the air purifier paving the way for emerging markets	- Training employees on green skills for maintenance and operation of smart bins.	- Creating new jobs and skills in the green economy - Conveying environmental values to employees through direct involvement in sustainability projects	- Reducing exploitation of people for extraction of rare metals needed for lithium battery production	- Creating new jobs thanks to growing battery market contributing to green economy - Training of undergraduates in laboratories who are subsequently hired
	Fostering Integral Human Development	- Improving people's health through a reduction in diseases related to sick building syndrome (SBS) - Increasing psychic well-being related to the human–nature relationship through plants inside buildings	- Improving life quality by reducing waste and suggesting sustainable purchasing choices through data analysis - Strengthening the human–nature relationship through protection of natural resources	- Improving people's health by lowering greenhouse gas emissions - Rediscovering the social value of nature through sustainability projects	- Supporting the empowerment of women in science and business through Delta CEO testimonial - Increasing the quality of human life through the storage of energy from renewable sources provided by the battery	- Improving people's health through abatement of harmful waste and pollution through Lift treatment to batteries - Simplifying people's lives by providing battery power to several devices simultaneously
Communities	**Building resilient communities**	- Building green city neighborhoods that improve local livability for the community (e.g., Milan neighborhood)	- Contributing to making municipalities and neighborhoods more environmentally virtuous with Zero Waste goal and with waste valorization - Educating communities and people through waste data processing and subsequent communication	- Increasing economic self-sufficiency of local communities through tree planting (project in Madagascar, Australia) - Enhancing local areas and culture through protection of special plant species - Complying with regulations related to the promotion of carbon neutrality	- Promoting community energy independence through off-grid battery application - Promoting raw material sourcing from different territories (benefits for geopolitical issues) - Raising awareness of sustainable and human rights-friendly supply chains	- Promoting electric mobility through battery technology that contributes to the construction of sustainable smart cities - Raising awareness of local governments, municipalities, and schools on the issues of green technologies and sustainable smart cities
	Including stakeholders	- Collaborating with universities to place purifiers in study rooms - Collaborating with public/private entities to raise awareness of the importance of switching from mechanical to biological purifiers	- Collaborating with a social cooperative involving ex-convicts or frail people to have support team in basket maintenance phase - Collaborating with a startup for CO_2 offsetting project through carbon credits	- Communicating sustainability projects that act as a sounding board to raise awareness and attract new stakeholders - Collaborating with various startups and companies for sector-specific projects (e.g., tourism)	- Enhancing at economic and environmental level the sulfur waste that enables value generation for the entire supply chain (petrochemical companies) - Collaborating with universities (open days) and European contests to popularize Delta's redox battery technology	- Involving suppliers in the product development process executed in symbiosis - Revaluating brownfield sites by creating new markets to enhance underdeveloped territories

Table 7. Revising Prosper: description of the new category 'Raising awareness on sustainability'

Pillar	Category	Definition	SDGs	References to SIA standards
Communities	**Raising awareness on sustainability**	Inspiring business stakeholders (suppliers, partners, competitors, etc.) and external actors (public institutions, municipalities, partners, suppliers, and local communities) to adopt an inclusive and sustainable vision and business models, through communication activities (seminars, conferences, and joint programs) and a leadership with example. Conveying values, principles, cultural models of sustainable development to local communities, public bodies, educational institutions, and institutional stakeholders, through outreach activities such as open days, programs, or granting of patronage.		GRI G4: Event Organizer Sector Disclosures (EO11) GRI 102–16: Ethical and Lawful Behavior B-Impact Assessment: Civic Engagement & Giving; Ethics & Transparency; Information Dissemination

extent of scales applicability to startups, and *SDG contribution*, i.e., the extent of scales contribution to SDGs. Considering a basic weight equal to one, we increased or decreased the weights for some criteria (and associated scales). Concerning *startups applicability*, we noted that criteria 1, 2, and 3 are mainly concerned with startups employees, but startups are often composed of only a few people, thus having a limited potential for a social impact on those criteria. Thus, we applied a negative correction factor of 0.2 due to the reduced *startups applicability*. Criterion 5 is weighted with a decrease of 0.2 on *startups applicability* because many startups are specialized in a single sector, and thus, they are less likely to invest for territories and communities in the four different investment classes proposed. As far as regards *SDG contribution*, we noted that criteria 4, 7, 9, and 10 aim to assess the positive changes induced by startups activities that directly or indirectly contribute to sustainable development. Given the close link between the SDGs and the type of social impact generated, we weighted these criteria with a 0.2 increase on *SDG contribution.* In summary, criteria 1, 2, 3, and 5 have a weight of 0.8, while criteria 4, 7, 9, and 10 have a weight of 1.2.

These weights are useful for a quantitative assessment of startups' social impact through the application of *Prosper*. In particular, the steps of the weighting method to quantitively assess the social impact of startups are the followings: (1) obtain the social impact scores, which range for each scale from zero to three; (2) multiply the obtained 10 scores by the abovementioned weights; (3) sum the weighted scores to obtain the aggregated score of social impact, which ranges from zero to thirty.

Discussion and conclusion

This paper explored how startups can assess the social impact generated by their business activities through an SDG-based framework, i.e., Prosper. Using an action research approach, after a review of the scientific and gray literature on existing frameworks for assessing social impact, we designed pillars, categories, qualitative criteria, and quantitative scales of Prosper.

With our research, we try to contribute to the intersection of the sustainability and startups literature in two ways.

First, we contribute to overcome existing sustainability barriers for startups by providing a practical tool to assess sustainable development performance (Álvarez Jaramillo, Zartha Sossa, & Orozco Mendoza, 2019). One important barrier is the lack of scientifically robust standard of SIA (rigor) that can be easily adopted by startups (relevance) (Dalton, 2020; Heidrich & Tiwary, 2013). We sought to ensure rigor by grounding Presper's design on a review of the scientific and gray literature of existing methods and standards for assessing social impact. Moreover, we sought to ensure relevance by using an action-research approach throughout the design process, which was based on a continuous and intense dialogue with entrepreneurs and startup founders that allowed us to design, test, and revise the framework according to the startups needs and suggestions (Eden & Huxham, 1996). In short, our

Table 8. Qualitative criteria and quantitative scales of Prosper

Category (Pillar)	Qualitative criteria	Quantitative scales
Creating new opportunities (People)	**1) Providing training to employees on emerging sectors**	Does the startup implement training activities for the following emerging sectors[a]: (1) care economy, (2) green economy, and (3) people and culture? - 0, if the startup does not implement training activities that promote skills for any of the emerging sectors listed above. - 1, if the startup implements training activities that promote skills for any of the emerging sectors listed above. - 2, if the startup implements training activities that promote competencies for two of the emerging sectors listed above. - 3, if the startup implements training activities that promote competencies for three of the emerging sectors listed above.
	2) Generating fair and inclusive work	Does the startup offer employment opportunities to (1) youth (under 30), (2) women, (3) migrants, (4) vulnerable (disabled, terminally ill), and (5) marginalized subjects (former prisoners, former drug addicts)? - 0, if the startup does not offer jobs for any of the above categories. - 1, if the startup offers jobs for one of the above categories. - 2, if the startup offers jobs for two or three of the above categories. - 3, if the startup offers jobs for four or five of the above categories.
Fostering Integral Human Development (People)	**3) Promoting corporate welfare**	Does the startup promote corporate welfare for its employees, divided into (1) physical well-being (health care services, **company canteen or meal vouchers**, company sports, and sustainable transportation), (2) mental well-being (flexible work as time and place, common breaks, and group work), and (3) social well-being (cultural initiatives, company outings, **financial services**, and parental or extraordinary leave)? - 0, if the startup does not promote any type of corporate welfare for its employees. - 1, if the startup promotes one type of corporate welfare for its employees, among physical, mental, and social wellness. - 2, if the startup promotes two types of corporate welfare for its employees, among physical, mental, and social wellness. - 3, if the startup promotes all three types of corporate welfare for its employees, among physical, mental, and social well-being.
	4) Promoting sustainable human development	Does the startup promote the sustainable development of the person, through (1) indirect benefits brought by cultural awareness, (2) direct benefits brought by its products and services, or (3) simultaneously direct and indirect impact? - 0, if the startup negatively impacts or does not impact the sustainable development of the person. - 1, if the startup indirectly impacts sustainable development of the person with cultural awareness raising activities and promotion of sustainable behaviors. - 2, if the startup directly impacts the sustainable development of the person with the benefits brought by its products and services. - 3, if the startup impacts both directly and indirectly on the sustainable development of the person.
Building resilient communities (Communities)	**5) Investing for territories and communities**	Does the startup invest for territories and communities,[b] with specific focus on (1) green transition (energy upgrading, seismic safety, hydrogeological safety, and sustainable mobility), (2) digital transformation (digital infrastructure and services, schools, and universities), (3) health, and (4) poverty alleviation? - 0, if the startup does not invest in any of the investment classes listed above. - 1, if the startup invests in one of the investment classes listed above. - 2, if the startup invests in two of the investment classes listed above. - 3, if the startup invests in three or four of the investment classes listed above.

(Continued)

Table 8. (*Continued.*)

Category (Pillar)	Qualitative criteria	Quantitative scales
Building resilient communities (Communities)	**6) Enhancing the resilience of communities[c]**	Does the startup increase community resilience through interventions[d] that (1) reduce the community's environmental impact, (2) provide welfare and protection services, (3) provide economic stability and access to resources, (4) reduce the risks of environmental and social disasters, and (5) ensure a high quality of life? - 0, if the startup does not increase community resilience. - 1, if the startup increases community resilience with one of the interventions listed above. - 2, if the startup enhances community resilience with two or three of the interventions listed above. - 3, if the startup enhances community resilience with four or five of the interventions listed above.
Including stakeholders (Communities)	**7) Creating shared value[e]**	Does the startup create shared value through (1) ideation of products and markets that address a social need, (2) productivity improvements in the value chain that reduces negative externalities on the environment and society, and (3) participation in business clusters that promote co-creation of products and services? - 0, if the startup does not create any kind of shared value. - 1, if the startup creates shared value in one of the ways listed above. - 2, if the startup creates shared value in two of the modes listed above. - 3, if the startup creates shared value in all three of the modes listed above.
	8) Taking action to support the fragility of stakeholders	Does the startup act to support fragile stakeholders through collaborations with marginalized, disadvantaged, or peripheral stakeholders? - 0, if the startup has no collaborations with marginalized, disadvantaged, or peripheral stakeholders and is not currently engaged in activating any partnerships. - 1, if the startup has no collaborations with marginalized, disadvantaged, or peripheral stakeholders but is currently working to activate them. - 2, if the startup has engaged in dialogue/established contacts with marginalized, disadvantaged, or peripheral stakeholders. - 3, if the startup has formalized collaborations (i.e., a signed contract, NDA, written agreement) with marginalized, disadvantaged, or peripheral stakeholders.
Raising awareness on sustainability (Communities)	**9) Promoting sustainable change**	Does the startup inspire sustainable change through (1) offering a product and service that influences the vision and strategy of other organizations for sustainability, (2) adopting a sustainable business model that can be imitated or inspiring for its stakeholders in some of its elements (sales channels, cost structure, and value proposition), and (3) inducing sustainable behaviors in consumers of the products and services offered? - 0, if the startup does not inspire sustainable change. - 1, if the startup inspires sustainable change in one of the ways listed above. - 2, if the startup inspires sustainable change in two of the ways listed above. - 3, if the startup inspires sustainable change in three of the ways listed above.

(Continued)

Table 8. (*Continued.*)

Category (Pillar)	Qualitative criteria	Quantitative scales
	10) Disseminating sustainability	Does the startup carry out activities to raise awareness, disseminate, and convey values and principles on sustainable development through information initiatives such as seminars, open days, fairs, and workshops aimed at its stakeholders (internal and external), the communities in which it operates, and society at large? - 0, if the startup has not implemented activities to raise awareness, disseminate, and transmit principles and values on sustainable development - 1, if the startup has not implemented activities to raise awareness, disseminate, and transmit principles and values on sustainable development but is currently working to activate them. - 2, if the startup has implemented activities to raise awareness, dissemination, and transmission of principles and values on sustainable development. - 3, if the startup has implemented activities to raise awareness, disseminate, and transmit principles and values on sustainable development and is currently working to activate new ones.

[a]World Economic Forum (2020).

[b]Alleanza Italiana per lo Sviluppo Sostenibile (2020).

[c]The ability of a community to effectively prevent, respond to, and recover from negative shocks and changes – economic, social, and environmental – from outside the community, fostering long-term community development.

[d]https://www.build-resilience.org/community-resilience-framework.php

[e]'Policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates' (Porter & Kramer, 2011, p. 6).

SDG-driven framework has been designed for startups and together with startups, i.e., the innovative startups incubated in the ENI's accelerator Energizer. Various scholars claim that business performance should be increasingly assessed including sustainability performance indicators, such as ESG metrics (Widyawati, 2020), social impact metrics (Rawhouser, Cummings, & Newbert, 2019), corporate purpose metrics (Gartenberg, Prat, & Serafeim, 2019), and SDG-related metrics (Pizzi, Rosati, & Venturelli, 2021). Our framework goes in this direction, providing a qualitative and quantitative way to assess social impact of startups, thus contributing to give emphasis on sustainability performance assessment.

Second, we respond to the call for assisting startups in reporting against SDGs (Dalton, 2020; Smith, Discetti, Bellucci, & Acuti, 2022). Most of the studies on business contribution to sustainable development concern large and multinational corporations (Park, 2018; Pizzi, Del Baldo, Caputo, & Venturelli, 2022; van der Waal, Thijssens, & Maas, 2021; van Zanten & van Tulder, 2018), while research on startups and SDGs is still scarce and fragmented (Mio, Panfilo, & Blundo, 2020; Silva, Gomes, Carvalho, & Geraldes, 2021; Smith et al., 2022). We contribute to filling this gap by bringing the assessment of the SDGs to a startup level, with an effort to make them less 'distant' and 'big' than typically perceived (Smith et al., 2022). In particular, we respond to the call for an independent framework to assess the business contribution to SDGs (Mio, Panfilo, & Blundo, 2020; Pizzi, Rosati, & Venturelli, 2021). Most standards are sponsored by private networks or organizations that also provide the companies' assessment or audit (see Table 3). There is a direct interest in the diffusion and wide adoption of these standards by sponsoring organizations, and this may be conflicting with the need of an independent and fair evaluation. Social impact generated by startups can be evaluated with Prosper without the need to collect startups external data or to benchmark with other organizations.

Thirdly, our study also emphasizes the importance of establishing robust SIA frameworks, incorporating categories and metrics of significant financial relevance for their material issues (Schiehll & Kolahgar, 2021). This holds especially true for early-stage startups seeking investments. Such frameworks should serve to align startups' purpose with the values held by discerning investors (Busco et al., 2020). Crucially, a focus on financial materiality within SIA frameworks demonstrates a cognizant awareness of long-term sustainability, acting as a linchpin in risk mitigation and fortifying startups' resilience in the face of unforeseen challenges. Furthermore, this emphasis grants startups a competitive edge, particularly in industries where social responsibility is esteemed, attracting a diverse array of investors ranging from impact funds to foundations (Bocken, 2015). For early-stage startups, the access to a comprehensive SIA framework that places due emphasis on financial materiality emerges as a strategic imperative that not only garners investors' favor but also establishes a sturdy foundation for sustained success in an era increasingly attuned to the dual imperatives of profit and societal progress (Battilana, Obloj, Pache, & Sengul, 2022).

Limitations and future research avenues

Our study exhibits certain limitations that pave the way for future research. First, our SIA framework is intentionally designed as a mapping tool with qualitative criteria and scales. This design choice inherently restricts its capacity to provide quantitative measurements on the considered dimensions. To address this limitation, subsequent studies could explore methodologies to complement our qualitative approach with quantitative assessments. This might involve developing specific metrics or incorporating data-driven techniques to enhance the quantitative measurement aspects of the SIA framework, thereby providing a more comprehensive standard for evaluating social impact.

Secondly, our study intentionally narrows its focus to startups, which entails specific limitations in terms of generalizability to other types of organizations or industries. This choice is primarily rooted in the distinct business modeling of startups compared to well-established enterprises (Burnell, Stevenson, & Fisher, 2023; Sommer, Loch, & Dong, 2009). For instance, startups' agility can be advantageous for quickly responding to emerging social issues and adjusting impact strategies, but

this may lead to more flexible approaches to impact assessment compared to established enterprises. Moreover, startups' emphasis on rapid growth may lead to a shorter-term focus on SIA, as they prioritize scaling and market penetration. Established enterprises, with a more stable foundation, may take a longer-term view toward impact assessment. Future research should consider these nuances and explore frameworks that are tailored to the specific business models and contexts of startups.

Thirdly, we did not assess how the social impact generated by startups is assessed in different sectors. The outcomes of social impact can be contingent on the operations and activities carried out by startups, which, in turn, also influence the SDGs involved. While our social impact categories, criteria, and scales encompass 9 out of the 17 SDGs, distinguishing by sector could potentially encompass more SDGs.

Fourthly, we did not conduct empirical testing of Prosper on a substantial number of startups. Future research endeavors should focus on testing and comparing emerging standards for assessing social impact, with the aim of evaluating their strengths and weaknesses, as well as their validity and applicability.

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