



— Sustainable Entrepreneurship Project —

How do startups and scale-ups that benefited from sustainability innovation funds perceive and describe their contributions to societal and environmental sustainability?

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Abstract

Startups and scale-ups have a significant impact on promoting social and environmental sustainability. This study explores how startups and scale-ups benefiting from the Circular and Energy Transition Innovation Fund in Leeuwarden, the Netherlands, perceive and describe their contributions to societal and environmental sustainability. It examines the direct (level 1), indirect (level 2), and long-term (level 3) impacts of the fund on recipient enterprises. Key findings reveal that the fund's support extends beyond financial aid, encompassing financial support, resource support, network, and investment in R&D. Indirect impacts align with part of the measurement framework in economic (sustainable patent and citation), environmental (waste, emission, pollution, material usage, quality and durability), and societal (ergonomic) dimensions, while long-term effects highlight potential leadership and pioneer roles, and scale-up for broad sustainability from these beneficial companies. These empirical results, derived from interviews and analysis, offer valuable guidance for policymakers, funders, and stakeholders, and suggest directions for future research and action.

Keywords: sustainable innovation, startups, scale-ups, sustainability, innovation fund, performance, sustainable entrepreneurship

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INTRODUCTION

In recent years, the urgency of climate change, resource scarcity, and social injustice continue to intensify, sustainability has been a growing concern for governments, corporations, and society worldwide (Caiado et al., 2017). Sustainability, in a broad context, is defined as meeting the demands of the present generation while not risking future generations' ability to meet their own (Burton, 1987). The introduction of the "Triple Bottom Line" idea, as conceptualized by John Elkington, has caused a shift in how corporate performance is evaluated, moving away from a primary emphasis on economic factors and taking the consideration of environmental and social responsibilities (Bell, 2002). Governments increasingly acknowledge the necessity of engaging all sectors of society in sustainable development efforts. Meanwhile, the recognition goes beyond governmental initiatives, emphasizing the critical role that companies must play in contributing to sustainable solutions (Bell, 2002). Notably, small and medium-sized enterprises (SMEs) in Europe, constitute over 80% of all enterprises, make up 66% of private sector employment, and account for over 50% of the overall value created by businesses, which makes them substantial contributors to the resolution of sustainable issues (Biondi, Iraldo & Meredith, 2002; Busco et al., 2023). Entrepreneurs are essential in promoting social progress and enhancing prosperity through job creation, strengthening the monetary resources, and facilitating the economic advancement of a certain area. Sustainable enterprise (SE) is a unique method that combines the principles of environmental, social, and economic values, with a focus on the well-being of future generations. It aims to meet the needs of stakeholders on a broader scale (Anderson, 1998; Venkataraman, 2019).

Against this backdrop, sustainable innovation is considered a pivotal strategy to incentivize businesses to achieve sustainability for the whole society (Luqmani et al., 2017). Sustainable innovation involves “the development of new products, processes, services, and technologies that contribute to the development and well-being of human needs and institutions while respecting the world’s natural resources and regenerative capacity” (Tello & Yoon, 2008, P. 88). Sustainable entrepreneurs who are committed to sustainability are disrupting traditional production methods, products, market structures, and consumption patterns, by introducing superior environmental and social products and services, thereby shaping market dynamics that drive both environmental and societal progress. SMEs, recognized as catalysts for sustainable innovation and contributions to sustainability, these companies often rely on various innovation funds to support their projects (Schaltegger & Wagner, 2011; European Commission, 2020; Vanderhoven et al., 2020).

This study aims to explore how startups and scale-ups, benefiting from sustainability innovation funds, perceive and describe their contributions to societal and environmental sustainability. Startups is defined as “new businesses which are started from scratch” (Kolvereid & Isaksen, 2006, P. 868), while scale-ups are a category of high-growth companies characterized by a distinctive growth pattern that necessitates the rapid expansion of production for a new product or service (Coad et al., 2024). Understanding the perspectives of these companies that are successful in sustainable development is imperative for steering the industry towards a more sustainable future. In a broader sense, the logic of a business case serves as a guiding framework for managerial thought processes and the rationale behind management decisions and actions (Schaltegger & Burritt, 2018). Therefore, understanding their strategies,

challenges, and achievements can provide valuable insights and inspiration for other businesses and policymakers. However, adaptively measuring the contributions of these companies to social and environmental sustainability remains a complex and pivotal challenge in identifying indicators applicable across broad industries.

While existing literature has focused on developing frameworks through scale and scope level to assess the impact of sustainability innovation or through legitimate mainstream tools to evaluate companies' performance for disclosure, within the context that there are existing challenges for startups and scale-ups to collect sustainability information (Molecke & Pinkse, 2017). There is a notable gap in understanding the subjective views of companies receiving sustainable innovation funds regarding their contributions to social and environmental sustainability. Additionally, there is a lack of empirical company cases reflecting these perceptions, highlighting the necessity for further exploration in this underexplored area.

To bridge this gap, this research focuses on investigating the impact of the Circular and Energy Transition Innovation Fund of the city of Leeuwarden, the Netherlands, on the sustainability practices of recipient enterprises. By conducting interviews with these enterprises and analyzing their self-described contributions to sustainability, this research aims to identify suitable metrics for assessing the sustainability performance of these ventures. By uncovering insights into strategies, challenges, and achievements, this research seeks to offer valuable guidance to businesses and policymakers navigating the complexities of sustainable entrepreneurship and innovation.

The structure of this study is structured into the following sections: The second section digs deeper into the literature analysis, analyzing the appropriateness of existing performance

assessment frameworks for startups and scale-ups. A conceptual model of sustainable innovation performance derived from Calik & Bardudeen (2016) is applied. Subsequently, the third section provides an overview of the methodologies and procedures for data collection. It also provides an explanation of the reasoning for the selection of these organizations and the fact that qualitative research methods were utilized. Thereafter, the fourth section offers a comprehensive elucidation of the data analysis methodology and presents the obtained results. Furthermore, the results include three levels of impact: direct, indirect, and long-term impact. This section indirectly discusses the need to modify the conceptual measurement framework. It also reveals additional findings that are classified into both direct and long-term effects. The final section delves into the discussion, its implications, and potential future consequences arising from the study.

LITERATURE REVIEW

Innovation, as articulated in the Oslo Manual, encompasses the introduction of novel or substantially enhanced “products, services, processes, marketing strategies, or organizational methods within business operations, workplace dynamics, or external interactions” (OECD/Eurostat, p. 46). This notion, extensively emphasized by Schumpeter (1934), serves as a fundamental principle for initiating revolutionary changes in many sectors and businesses (Croitoru, 2012). Boons et al. (2013, P. 4) defined sustainable innovation as “innovation that improves sustainability performance, where such performance includes ecological, economic, and social criteria.” Nevertheless, in a capitalist society, discussing sustainable innovation is pointless unless the market is utilized as a medium. This implies that these innovations are

eventually achieved by gaining a portion of the market through the marketing of new and groundbreaking product or service (Boons & Lüdeke-Freund, 2013).

Performance measurement refers to “organizational excellence is outstanding practice in managing organizations and delivering value for customers and other stakeholders” (Moullin, 2002, p. 96). Social performance assessment involves assessing the effects or results obtained, which may be roughly classified as “impact evaluation” and “outcome measurement.” These assessments usually take place after the program has been implemented and are mostly initiated by financial organizations such as foundations and government agencies (Ebrahim & Rangan, 2014). Sustainability performance encompasses the holistic economic, environmental, and social effects of a business, relative to a specified benchmark. Sustainable Performance Evaluation (SPE), including three main aspects: accounting, assessment, and reporting, aims to evaluate this performance, aiding companies in understanding their footprint on stakeholders, ecosystems, and communities, and guiding them in adopting measures to mitigate or augment these effects (Büyüközkan & Karabulut, 2018).

To assess the impact of transition innovation funds beyond the profit dimension, sustainability is characterized as the aspiration to enhance the social and environmental performance of the current generation, ensuring it does not compromise the capacity of future generations to fulfil their social and environmental needs (Alhaddi, 2015). Existing literature has made significant progress in formulating measurement and evaluation methods (Ebrahim & Rangan, 2014). Various studies focus on investigating the scale and scope level for measuring sustainability innovation. For instance, in the social sustainability field, von Geibler et al. (2006, P. 339) enhance the social dimension of sustainability by incorporating eight

indicators such as “health and safety, quality of working conditions, education and training, employment, knowledge management, product acceptance and societal benefit, innovation potential, and social dialogue.” The scale for environmental dimension consists of an assessment matrix that considers carbon footprint, pollution, and the life cycle of materials (Baxter & Chipulu, 2023). Ebrahim & Rangan (2014) establish a performance evaluation framework based on an organization's operational mission, scale, and scope, illustrating how social organizations transition from measuring outputs to outcomes based on their scope of activities and control capabilities. A more comprehensive measurement framework developed by Calik and Bardudeen (2016) identifies key indicators for sustainable innovation performance covering economic, environmental, and societal dimensions based on decision points.

Meanwhile, there are notable frameworks and certifications aimed at assessing and promoting sustainability and responsible business practices among organizations. For instance, CSRD/ESRS and GRI, under the trend that the EU moves towards mandatory sustainability reporting requirements (European Commission, n.d.; Yosifova & Petrova-Kirova, 2022). However, numerous methodologies for measuring social impact are available, each possessing unique strengths, limitations, and objectives (McLoughlin et al., 2009). Measurement and reporting systems are customized uniquely for each company, with the purpose of aligning with and coordinating the organization's mission, structure, stakeholders, and the intermediate and ultimate goals it sets (Russell & Friend, 2018). Collecting sustainability information from non-disclosure corporations, such as SMEs, to apply mainstream evaluation standards can be costly and time-consuming (Bossut et al., 2021). Startups and regular firms meet challenges in eco-

efficiency and sustainability metrics, they encounter both internal and external challenges, internal hurdles such as “limited resources,” “inadequate skills,” and “difficulty in measurement of results”; outside the company, they meet challenges including “communication barriers,” “competitive pressure”, “lack of customer awareness”, extra crucial factors such as “lack of data,” “growth pressures,” and “existing regulations” that make these enterprises more tough to measure their sustainable initiatives (Gurrieri, 2024, P. 22). Enterprises under societal measurement pressure tend to adopt a mix of practical and conceptual approaches while attempting to discredit formal methodologies, aiming to enhance the legitimacy of their chosen measurement methods (Molecke & Pinkse, 2017). Previous studies provide a fundamental framework as a guideline for this paper to identify practical and accountable metrics and indicators. However, the existing literature lies in the lack of understanding of the subjective views of companies benefiting from sustainable innovation funds.

Conceptual Model

To evaluate the impact of the innovation fund and explore how the interviewees from these companies who have benefited from the innovation fund, describe their contributions to sustainability. Calik & Bardudeen’s (2016) study provided the present study with a conceptual framework as a backbone. Their model categorizes sustainable innovation performance into three dimensions: economic, environmental, and social, focusing on the innovation type of product and process. These dimensions are further divided into “sub clusters,” including “Material Usage, End-of-Life Management, Health and Safety, Waste & Emission & Pollution,”

among others, totaling 15 sub clusters (Calik & Bardudeen, 2016, P. 452), as the scale for measuring innovation performance. However, Calik & Bardudeen claimed that the model requested data from practical companies. Also, due to the fact that the innovation type based on the research object of this paper is product and service, similar to Calik & Bardudeen's measurement scape, this study merged the original model to make it more suitable for our research. Given these considerations, this study opted to adjust the framework by incorporating the aforementioned measurement metrics (Fig. 1).

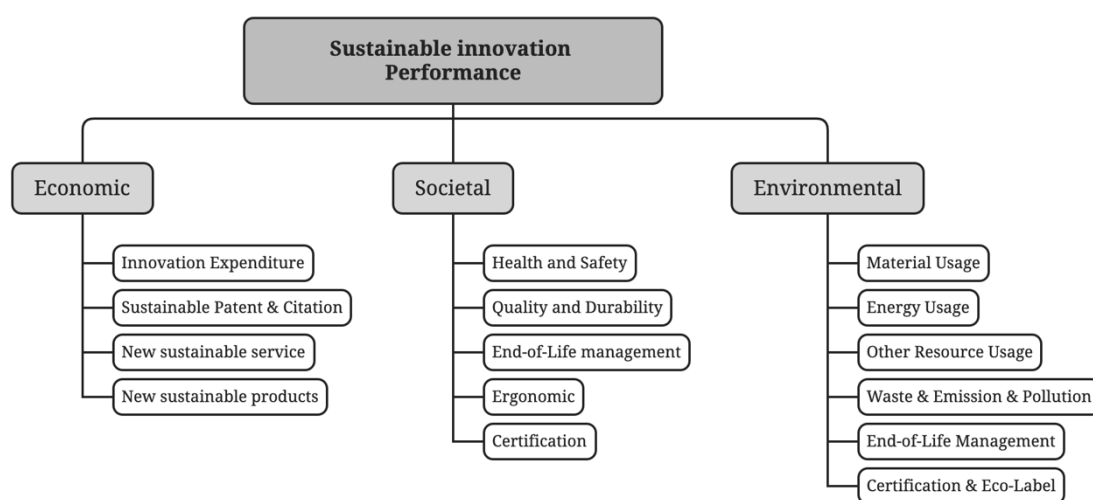


Fig. 1. Integrated innovation type of product and process measurement framework.

Fig. 1 divides the sustainable innovation impact into economic, societal, and environmental categories, with relevant sub cluster performance, respectively. This framework will inspire the subsequent data analysis and explore the results.

METHODS

To address this gap, the paper focuses on investigating the Circular and Energy Transition Innovation Fund of the city of Leeuwarden in the Netherlands. The goal is to make the

sustainability aspects of the innovation fund measurable in order to effectively communicate its impact. This research is inductive, so it proposes a qualitative methodology to investigate the contributions made by companies. The qualitative approach is utilized to facilitate an understanding of individuals' perspectives, experiences, attitudes, behaviors, and interactions (Pathak et al., 2013). The methodology includes engaging in semi-structured interviews with startups and scale-ups benefiting from the transition innovation fund to collect diverse narratives and perspectives, enabling them to articulate their views, share experiences, and highlight the facets of sustainability dimensions.

Innovation Fund Circular and Energy Transition

According to the Dutch government. (n.d.), the Netherlands aims to achieve a fully circular economy by 2050, emphasizing reduced raw material usage, substitution with sustainable materials, extended product lifespans, and high-grade processing. Starting in 2018, the Municipality of Leeuwarden in Friesland has been operating a Circular and Energy Transition Innovation Fund, which plays an important role in supporting companies that integrate sustainability into their business models. It has an annual budget of approximately €250,000 and offers a maximum grant of €25,000 per application. The innovation fund application matters encompass company profile, project details, innovativeness, sustainability, and more. Compared to traditionally focusing on creating economic spin-offs, the fund is now shifting its focus more towards adding value for society and environmental development (Leeuwarden Municipality, n.d.).

Data Collection

This research selected six beneficiary companies from various industries (Table 1). Data comes from interviews and companies' application reports for funds. The selected firms, covering the circular economy, agriculture, automotive, supply chain, logistics, and technology sectors, all integrate sustainability into their business models by providing either product or service. Five of the six companies, both startups and scale-ups, established their operations after 2020, indicating a short turnaround time from the initial stage of establishment to operation. The number of employees in the company is generally between 2 and 10, and the sustainable innovation type is mainly focused on products and services, with a specific aim to achieve sustainability. Additionally, four of them are tech-based companies. This study primarily collaborates with the municipal staff responsible for this fund. The focus and selection of companies are guided by these personnel from the pool of beneficiary companies. Initially, the fund primarily emphasized energy and circular transition, but now it aims to encompass a broader range of industries and sectors. Therefore, to enhance the fund's scope, diverse industries with the engagement of sustainability were selected for research.

Brief introduction of company										
No.	Company	Founded	Scale	Employees	Project name	Product/Service	Tech-based	Sector	Phase	Aim
1	A	2021	start-up	10	Software Further Development and Setup of the BOXO Production Line	product	Yes	Supply chain, packaging	Focuses on writing software links (APIs) for the shipping-return chain and setting up a production line. The main challenge is ensuring the technical integration among different stakeholders. The project is in the development phase.	Offer an alternative to single-use packaging by providing reusable circular shipping packaging. It seeks to make reusable shipping packaging the standard in the e-commerce industry. Create meaningful employment opportunities, particularly for individuals distanced from the labor market, by setting up labor-intensive production and maintenance lines.
2	B	2021	start-up	2	Cloning human behaviour for autonomous vehicle	product	Yes	Autonomous vehicle/Transportation and logistics	Development phase.	To create autonomous vehicles capable of competing with traditional express delivery services in terms of speed, cost, and customer experience, with a focus on using cycle paths.
3	C	2020	start-up	9	TrackSense	product	Yes	Logistics & supply chain, recycled paper tracker	Orientation - design - prototype - development - validation	Develop new chip without battery, no human action required.
4	D	2020	start-up	2	New applications within Orderli against food waste	service	Yes	Technology	Preliminary research into different inventory management systems -Building a dynamic map	To combat food waste in the catering industry by integrating inventory management systems with its digital ordering platform, thereby optimizing menu offerings and reducing unnecessary food waste.
5	E	2018	start-up	<10	Optimization and automation of processing coffee grounds into oyster mushrooms and mushroom compost	product	No	Agriculture /circular economy	Development phase, with certain aspects still requiring research and optimization before moving towards commercialization.	Develop a financially viable and scalable solution for processing coffee grounds into oyster mushrooms and compost. This involves optimizing cultivation processes, exploring revenue models, and improving logistics efficiency. Ultimately, the project aims to create a marketable modular nursery for oyster mushroom cultivation, contributing to circular economy initiatives and creating social employment opportunities.
6	F	2020	scale-up	15	Circular pot	product	No	Upcycling, waste management	B-corp assessment, scale-up phase, seeking marketing demands.	Upcycle empty wine bottles into an alternative to disposable plastic packaging in the shape of a jar.

Table 1: Summary of beneficiary and interviewed companies.

These companies remain anonymous in the report to ensure confidentiality. Data collection will involve both primary data, obtained through semi-structured interviews with funders or cofounders from the beneficiary companies, and secondary data, including official reports and publication documents, the funder's or company's LinkedIn, and the company's official website.

Semi-structured interviews were conducted either face-to-face or through online meetings, based on the participants' preferences. Using a pre-set question (Appendix A). In order to address this study's question, interviewers were asked how they viewed their contribution to sustainability by the following key questions scope: the company's sustainability approach, the influence of innovation funds, measuring impact, stakeholder engagement, challenges and opportunities, and future directions. Each scope following two main questions aim to explore interviewers' nuanced opinions based on their experience. Before starting the interview,

participants were briefed on the research purpose and objectives, to establish a conducive atmosphere for openly articulating their narratives without reservation. In addition, relevant documents, such as annual reports, sustainability reports, and official documents related to the Innovation Fund, will be analyzed to supplement the interview data, and provide additional context.

In the subsequent phase, the interviews were transcribed through *TurboScribe*, then the transcription used *ATLAS.ti* to code the results, and document excerpts will be subjected to thematic analysis to identify recurring patterns, themes, and categories in the data. These codes will then be organized into categories, culminating in the formulation of ultimate themes that encapsulate the research's conclusions (Islam et al., 2021).

EMPIRICAL RESULTS

The analysis of the data collected from semi-structured interviews with six beneficiary companies provides valuable insights into their perceived contributions to societal and environmental sustainability. The findings are structured around the measurement framework model developed by Calik & Bardudeen (2016), with a focus on economic, societal, and environmental dimensions. However, it was observed that only a fraction of the results generated from the coding process corresponded with the conceptual model, while additional classifications yielded by the coding process extended into other subsets (Appendix B). The impact of this fund was then categorized into three levels, each accompanied by corresponding descriptions of their effects: level 1 (direct impact), level 2 (indirect impact), and level 3 (long-term impact). The themes of indirect impact were found to be in line with the conceptual model,

whereas levels 1 and 3 revealed new findings that went beyond the scope of the model (Fig. 2).

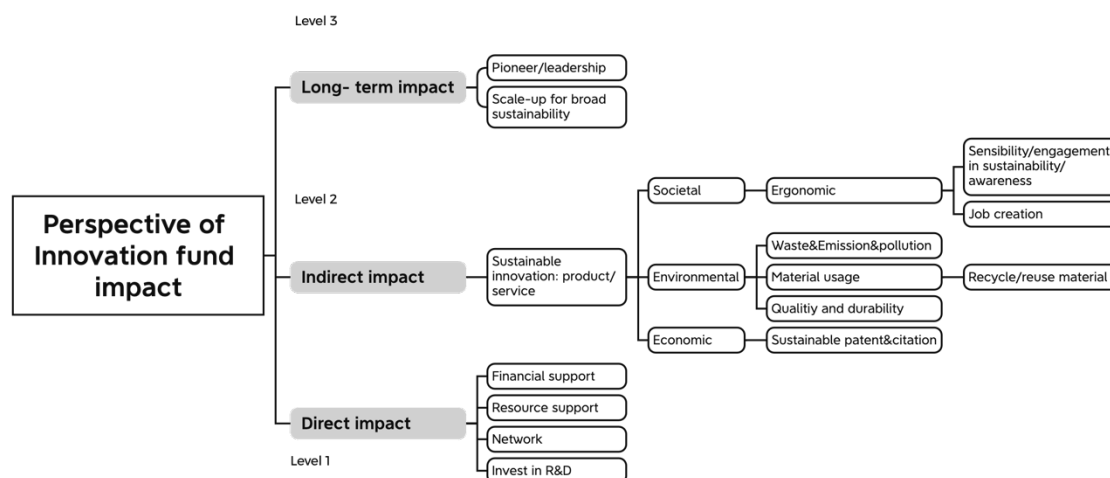


Fig. 2. Perspective of innovation fund impact.

There are convincing reasons for categorizing into three levels of impact. First, these companies have not been in operation for a long time. These firms are relatively new to the market, with the earliest laying groundwork in 2018 and typically launching operations post-2020. However, their funding remains constrained, posing challenges to securing additional financial backing until investors witness tangible results. Hence, the innovation fund from the government could be their best option, yet data tracking and indicators to measure the contribution to sustainability require more investment. Therefore, in the phase of these startups, the most straightforward impact generated from the fund is easy to investigate at an early stage of the development of these companies, they believed that tracking the sustainability outcomes would be expensive and time-consuming, or that they would be unable to collect all of the information from their stakeholders. One of the interview questions was: *Do you track the outcomes of your sustainability initiatives?*

Not at all, no. There is something on our wish list... We don't have it and it's too costly. You know, it costs a lot of money to have an LCA... in order to really measure

it, we need an LCA. And again, we need money for that.

Second, these businesses' commitment to sustainability manifests through the products and services they offer. To this extent, some data are indeed provided for extra corresponding metrics in line with the previous model in economic, environmental, and societal dimensions. For instance, the following questions were asked: *Can you provide an overview of your company's commitment to sustainability and why it's important for your operations?*

Our whole company's business model revolves around sustainability..., but also the way in which we produce it, which is made from old big bags. So, it's also a material that we are reusing during our production process..., each product that we ship with our packaging reduces CO2. So, the more packaging we offer to the market, the better it is for the environment.

Lastly, due to the backing of this fund, it effectively catalyzes and promotes the growth of these enterprises. To some extent, the advancement of these companies contributes to long-term sustainability through their willingness to scale-up. For instance, *are there any new sustainability initiatives or projects you plan to pursue?*

If we are able to do that, we have a connected version of our product with a recyclable battery. And that would be something groundbreaking for the industry. So, if we are able to create it, that might be a game changer for a lot of companies. So, we're working towards that as well. But that would be very, very interesting. Have a real-time connected product that is still 100% recyclable.

The branches of each level of impact will be analyzed in the following section.

Level 1: Direct Impact of the Innovation Fund

The analysis of interview data revealed several key themes pertaining to the direct impact of the Circular and Energy Transition Innovation Fund on the sustainability initiatives of startups and scale-ups. These themes are straightforward and obvious, including financial support, resource support, network, and investment in R&D.

All interviews revealed that the Innovation Fund played a pivotal role in providing financial support to companies. Participants emphasized how the funding enabled them to invest in critical aspects of their sustainability projects, such as R&D, and implementation. This financial backing was instrumental in overcoming initial barriers and catalyzing progress towards sustainability goals.

One social entrepreneur commented:

So, developing a product from scratch, as we did, takes a gigantic amount of time and therefore money... So, in order to achieve all those recyclability goals, you need money from external funds. These funds, specifically this one, are very helpful.

In terms of resource support, in addition to financial assistance, companies highlighted the valuable resource support offered by the Innovation Fund. This support encompassed access to expertise, networks, and infrastructure necessary for the successful execution of sustainability projects. Participants underscored the importance of this resource support in supplementing their internal capabilities and enhancing project outcomes. One funder stated:

They are really helping you further with their network, which could be inside the government of Leeuwarden, but also outside...but sometimes the knowledge.

The next is network. An emergent theme from the interviews was the significance of the

networks facilitated by the Innovation Fund. Participants noted that these networks provided opportunities for collaboration, knowledge sharing, and access to potential partners, customers, and investors. The connections forged through these networks were instrumental in expanding market reach, fostering innovation, and driving sustainability impact. As they stated:

-Actually, we had our first investment round closed last week, so that's the first investor that is joining us. This kind of funding also brings some, let's say, a reliable reputation.

-Connecting us to other entrepreneurs with a similar mindset...participates in meetings and is invited as a speaker in various event.

The last one stated that tech-based firms invest most in R&D. Another notable finding was the role of the Innovation Fund in catalyzing investment in R&D. These tech-based companies highlighted how the funding enabled them to explore new technologies, refine existing products and processes, and drive innovation in their respective industries. This investment in R&D was crucial for staying competitive, addressing sustainability challenges, and driving company growth. Some funders claimed:

-And it is necessary for us to develop the product. If we didn't get the fund, it wouldn't work.

-This allowed us to hire some expertise on the AI side to help us predict what we can push and what restaurants can buy.

-We were able to discover all these possibilities with the fund in the first place. So, they already helped. And they help us more. It allows us to accelerate more.

Level 2: Indirect Impact

Building upon the direct impact of the Innovation Fund, the analysis revealed several indirect impacts on sustainability performance. These impacts encompassed sustainable innovation (product or service), including societal impact (ergonomic), environmental impact (waste & emission & pollution, material usage, energy usage, quality and durability, and economic impact (sustainable patent & citation). Which align with part of the previous measurement framework, the alignment highlighted with blue color (Fig. 3)

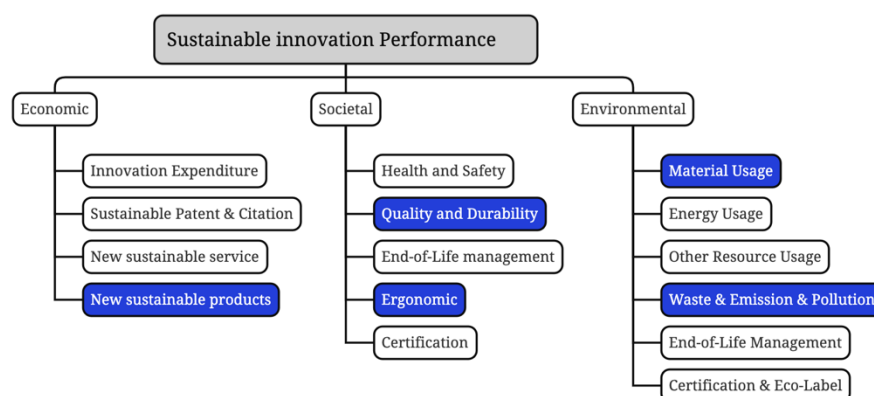


Fig. 3. Impact in line with the sustainable innovation performance framework (with blue-colored ones).

Achieving sustainability via sustainable innovation - product/service

Companies described how the support received from the Innovation Fund enabled them to develop and commercialize sustainable products and services. These innovations ranged from eco-friendly consumer goods to waste management solutions and circular economy initiatives, and so on. By investing in sustainable innovation, companies aim to address pressing environmental and societal challenges while capitalizing on emerging market opportunities. This aligns with marketing as a means of making sustainable innovation

achievable. (Boons & Lüdeke-Freund, 2013)

Societal impact – ergonomic

Specific in sensibility, engagement in sustainability and awareness, and job creation. Participants expressed a strong commitment to sustainability and highlighted initiatives aimed at promoting environmental awareness, fostering community engagement, and creating employment opportunities. These efforts contributed to societal well-being and economic development, aligning with broader sustainability goals. By engaging stakeholders and empowering communities, companies sought to create lasting positive change and build social capital.

-It's relatively easy to convince people to work with us. Whether it's an employee or a stakeholder, a supplier, for instance, or customers, they all notice what we do and they acknowledge it. Therefore, they are enthusiastic about it.

-So, the number of people that we could hire during our production of the packaging.

- Makes entrepreneurs aware of food waste and motivates them to take action.

Environmental impact - waste & emission & pollution, material usage, quality and durability

Sustainability initiatives undertaken by companies led to reductions in waste generation, CO2 emissions, and pollution. Relatedly, it created themes that corresponded to metrics from the previous measurement framework, such as CO2 reduction, waste reduction and recycle and reuse material. Companies reduced environmental effects and improved resource consumption by implementing creative product and process design. Furthermore, by focusing on quality and durability, businesses may lengthen product lifecycles, reduce material consumption, and

lessen their environmental impact.

-Our product is reducing CO2 when you are using it, so the more packaging (reusable material) we can use, the more CO2 we reduce, the better the business case is. So, the more we do it, the more products we get into the market, the better it is for the environment.

-Our company is really based on sustainability because we use coffee grounds, so our company is really based on sustainability because we use coffee grounds, so using waste to grow food.

-Well, long. Around, if you... It's difficult to explain, but if you have it in a normal use case, it will last for over a year...But we also have done tests where the battery lasts for two and a half years, so it depends. But it's very long, very long.

Economic impact - sustainable patent & citation

Companies highlighted the economic benefits of sustainability innovation, including increased market competitiveness, enhanced brand reputation, and access to new revenue streams. Sustainable patents and citations served as indicators of the economic value generated by their innovation efforts. By securing intellectual property rights and driving innovation, companies position themselves for long-term growth and success in sustainable markets. However, only one participant mentioned this process among four tech-based companies.

We will have some patents this year.

Level 3: Long-term Impact

Finally, the analysis identified long-term impacts stemming from companies'

sustainability initiatives. These impacts included pioneer and leadership, and scale-up for broad sustainability.

Pioneer/Leadership

Companies recognized the importance of their role as pioneers and leaders in driving sustainable innovation and fostering industry-wide change. By demonstrating the feasibility and benefits of sustainability initiatives, companies inspired others to follow suit and accelerated the transition towards a more sustainable future. Through leadership, advocacy, and collaboration, companies aimed to shape industry norms and promote sustainable practices across sectors.

-You can't get help from anybody, as it is new. We're building something that doesn't exist in the world.

-Like I said, our mission is to make reusable packaging the norm for e-commerce. And it is normal when we have like the market in control of 51%.

- I think we try to invite them to come see what we are doing and to try to inspire them. And those are the main things. Of course, we try to also stimulate other companies to work like us.

Scale-up for broad sustainability

Participants emphasized the scalability of their sustainability initiatives and their potential to catalyze broader systemic changes, almost everyone in the interview expressed their ambitions. By scaling up their impact, companies aim to address pressing environmental and societal challenges on a larger scale and contribute to the achievement of global sustainability

goals. By leveraging their networks, resources, and expertise, companies sought to amplify their sustainability impact and drive positive change at the global level.

-Definitely. Bigger, bigger.

-The more we do it, the more products we get into the market, the better it is for the environment, but also the better it is for our company...So we are trying to work to become like the 51% who have reusable packaging for e-commerce. So that is a target to have like 51% of the e-commerce market shipped in reusable packaging.

- We will stay the same, I guess, and grow and do what we already do, but on a bigger scale...we try to always make a new product to sell it. That's basically what we do and create more jobs.

Alternative Reflection of the Impact

Besides the above direct, indirect, and long-term impact, there are alternative concerns from participants (Fig. 4). For example, it can be challenging to secure a second subsidy once they've already received one. The fund is mostly focused on energy transition and the circular economy. In addition to financial support, other resources or incentives are expected to be obtained or implemented. As the company scales up, it requires different types of funding, or targeted funding, for instance, from angel investors.

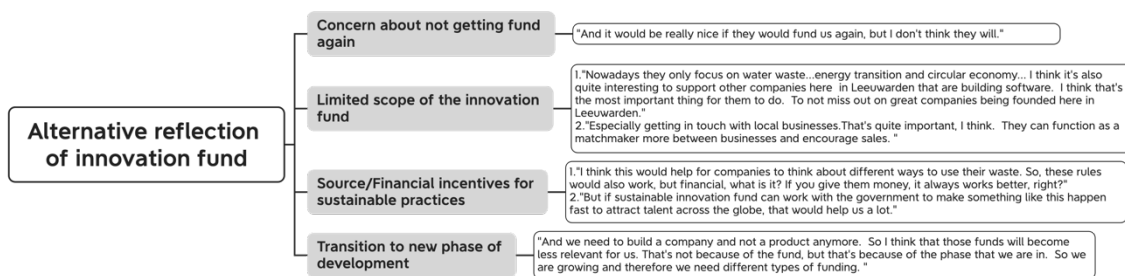


Fig. 4. Alternative reflection of the innovation fund

To sum up, the study's findings offer valuable insight into the multiple contributions of startups and scale-ups to social and environmental sustainability. These contributions are made achievable by the assistance provided by innovation funds such as the Circular and Energy Transition Innovation Fund. Through the allocation of resources towards R&D, the acquisition of essential resources, and the promotion of collaboration, firms successfully stimulated creativity and created practical solutions to pressing issues, and integrated sustainability into their business models. Moving forward, policymakers and funders should continue to prioritize initiatives that support sustainable entrepreneurship and innovation, considering different phases of a company's development, thereby accelerating progress towards a more sustainable future.

DISCUSSION, IMPLICATIONS AND FURTHER RESEARCH, AND CONCLUSION

Discussion

This study's findings illuminate the diverse contributions of startups and scale-ups that receive sustainability innovation financing for social and environmental sustainability. Although the results of narrative representations have a strong sense of subjectivity, it evaluates the direct and indirect impacts of the innovation fund on startups and scale-ups, the indirect impact analyzes the alignment with existing sustainable innovation performance frameworks. It also highlights that sustainable entrepreneurship plays a crucial role in achieving sustainable development by fostering business practices that not only address immediate environmental and social issues but also create long-term value for society, fostering systemic transformation

within the sector.

The Circular and Energy Transition Innovation Fund's immediate effects on recipient firms are evident in several domains. The fund's financial support empowers startups and scale-ups to overcome initial obstacles and allocate resources towards vital sustainability initiatives, including R&D, and implementation. Furthermore, the provision of resources, such as experience, networks, and knowledge, not only complements internal skills, but also improves project's results. The fund enables networking opportunities that promote cooperation and information exchange, and provide access to prospective partners, consumers, and investors. This, in turn, expands the market reach and stimulates innovation. Moreover, allocating resources to R&D stimulates the creation of new ideas and methods, empowering organizations to investigate novel technologies, enhance current goods and procedures, and promote long-lasting solutions.

In addition to the direct implications, the study also identifies several indirect impacts on sustainability performance. Sustainable innovation in products and services tackles urgent environmental and part of societal issues while taking advantage of rising commercial prospects. The promotion of environmental awareness and the creation of job possibilities have positive effects on social well-being and economic growth. Companies strive to minimize their environmental footprint by focusing on waste reduction, CO₂ emissions reduction, and resource conservation, which are all key aspects of environmental effects. Economic repercussions, such as sustainable patents and citations, underscore the economic value of sustainability innovation activities. In this context, the study's indirect findings demonstrate alignment with existing sustainable innovation performance frameworks, particularly in

economic, environmental, and societal dimensions. The empirical indirect impacts are not able to test all the sub cluster of the innovation performance framework. However, companies' sustainability initiatives align with metrics, reflecting their commitment to sustainable innovation and performance. The fund's support enables companies to achieve measurable impacts across these dimensions, contributing to broader sustainability goals and industry standards.

Furthermore, the long-term effects of sustainability efforts implemented by recipient companies are essential for promoting systemic transformation and cultivating sustainability throughout the whole sector. Companies that take on the role of pioneers and leaders in sustainable innovation have the potential to shape industry norms and serve as a source of inspiration for others, encouraging them to adopt similar practices and speed up the process of transitioning towards a more sustainable future. Moreover, corporations may effectively tackle global sustainability difficulties and make a significant contribution to the attainment of global sustainability goals by expanding their impact on a broader scale.

Implications and Further Research

The implications section explores the practical implications of the study findings for policymakers, funders, and stakeholders involved in promoting sustainable entrepreneurship and innovation, as well as identifies potential avenues for future research to advance understanding in this field.

For policymakers, the fund can directly assist startups and scale-ups by offering targeted grants and subsidies, which can be used for specified purposes such as R&D, product testing,

and market growth. In addition, the government can invest in incubator and accelerator programs that provide startups and scale-ups with not only financial resources but also mentorship, networking opportunities, and business development support. Additionally, the government should provide complementary investments alongside private venture capital to mitigate risk for private investors and encourage more investment in startups and scale-ups. This strategy has the potential to attract substantial private investment, amplifying the impact of the government's innovation initiatives (Link & Siegel, 2007; Lerner, 2009; Grilli & Murtinu, 2014).

For funders, in addition to providing financial assistance, it is important to provide them access to mentoring and professional networks. This can assist emerging businesses and rapidly expanding companies in overcoming obstacles and expediting their progress. Structure financing in tranches based on the completion of particular objectives, which might reduce risk and help entrepreneurs stay focused on critical deliverables (Chesbrough, 2006; Freeman, 2010).

For stakeholders' strategy, start by identifying all the relevant stakeholders, including staff, customers, suppliers, investors, and regulatory authorities. Understanding their interests and the impact they have on the innovation process becomes the most important priority. Using a stakeholder map to map out the power, influence, and interest of every stakeholder (Freeman, 2010). Engage stakeholders in pilot programs to get initial input and implement incremental enhancements. Active participation in this process can enhance acceptance and endorsement of the innovation (O'Sullivan & Dooley, 2008).

While the study provides valuable insights into the impact of the Circular and Energy

Transition Innovation Fund on startups and scale-ups, it's essential to acknowledge its limitations. One notable limitation is the relatively small sample size of beneficiary companies. Although the sample covers various sectors, the limited number of companies restricts the generalizability of the findings. Additionally, the outcomes generated from the qualitative analysis may not comprehensively examine the measurement framework's applicability, for the reason that startups and scale-ups encounter numerous obstacles to tracking sustainability outcomes, either cost-bearing, time-consuming, insufficient data collection, or the lack of labor dedicated to it. Besides that, the lack of efficient tools and short time operation make these companies hard to measure outcomes of sustainability. This study was initially intended to analyze the perspectives of startup companies through interviews to identify innovation fund impact metrics applicable to a broader range of industries. However, during the interviews, it turns out that there is limited validation of the outcomes predicted by Calik & Bardudeen's (2016) innovation performance framework. Instead, this study identified various other impacts, which it has categorized as direct and indirect effects, and potential long-term impacts, leaving space for further exploration.

Therefore, future research efforts should address these limitations and expand on the study's findings. One direction could involve conducting a larger-scale study with a more extensive sample of beneficiary companies, encompassing a broader range of industries and sectors. Meanwhile, startups and scale-ups operate in a short time. Therefore, tracking the long-term impact of sustainability initiatives supported by innovation funds, assessing their sustainability performance over time could be a solution. This would enable researchers to gain a more comprehensive understanding of the Innovation Fund's impact and its alignment with

sustainable innovation performance frameworks. Moreover, in line with the municipality's goal of identifying indicators applicable to a wider range of industries, future research could focus on collecting data to refine existing measurement frameworks or develop an adaptive general metrics framework. This could involve collaborating with diverse stakeholders to identify relevant indicators and metrics that capture the multifaceted nature of sustainability performance, shaping sustainability outcomes. This, in turn, the efficiency and accountability of for-profit organizations can be emulated to improve funding operations and funding decisions based on sustainable practices (Molecke & Pinkse, 2017). It is imperative to enhance cooperation and the exchange of information among relevant parties in order to foster sustainable innovation across many sectors.

Conclusion

To summarize, this study emphasizes the importance of startups and scale-ups as sustainable enterprises in promoting social and environmental sustainability, which are backed by sustainability innovation funds. Sustainable entrepreneurship is critical for generating a long-term systemic transition and creating a more sustainable future. Understanding and enhancing the contributions of these sustainable enterprises allows policymakers and stakeholders to successfully support innovation that tackles pressing environmental concerns, boosts economic growth, and assures long-term social benefit.

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APPENDICES

Appendix A: Interview guide

Introduction to the topic

- Context project

In collaboration with the municipality of Leeuwarden, our project aims to assess the impact of the Circular and Energy Transition Innovation Fund on societal and environmental sustainability. Comparing to traditionally focusing on creating economic spin-offs, the fund is now shifting its focus more towards the added value for society. This fund supports startups and scale-ups engaged in sustainable innovation initiatives. We seek to understand how companies benefiting from the fund perceive and describe their contributions to societal and environmental sustainability, such as healthcare, carbon emissions reduction etc. Through this research, we aim to provide insights that can guide municipalities in effectively measuring and communicating the sustainable outcomes of innovation initiatives.

Interview guide

Thanks again for meeting with me. I am excited for our interview; your insights are invaluable for our research on sustainable innovation and its impact on societal and environmental sustainability.

- Just a couple of things in the beginning:

- Show and explain consent form, make them sign it (we will keep information anonymous).
- There is no right or wrong answer, so we appreciate your honest and genuine opinion.

- In case there is a question you do not want to answer, that is completely fine. We can also stop at any moment.

- **Main questions**

Company's Sustainability Approach:

- Can you provide an overview of your company's commitment to sustainability and why it's important for your operations?
- Can you share any specific sustainability goals or values your company aims to achieve?

Influence of Innovation Funds:

- How has receiving funding from the Circular and Energy Transition Innovation Fund impacted your company's sustainability initiatives?
- Have there been any specific projects or initiatives funded by the innovation fund that have led to notable sustainability outcomes?

Measuring Impact

- Do you track the outcomes of your sustainability initiatives? If yes, how? Are there any specific measures or indicators you use to evaluate the impact of your sustainability initiatives?
- Are there any specific metrics that you find particularly helpful or insightful?

Stakeholder Engagement:

- How does your company engage with stakeholders (e.g., employees, customers, communities) regarding its sustainability efforts?
- Do you collaborate with other organizations or stakeholders to further your

sustainability goals?

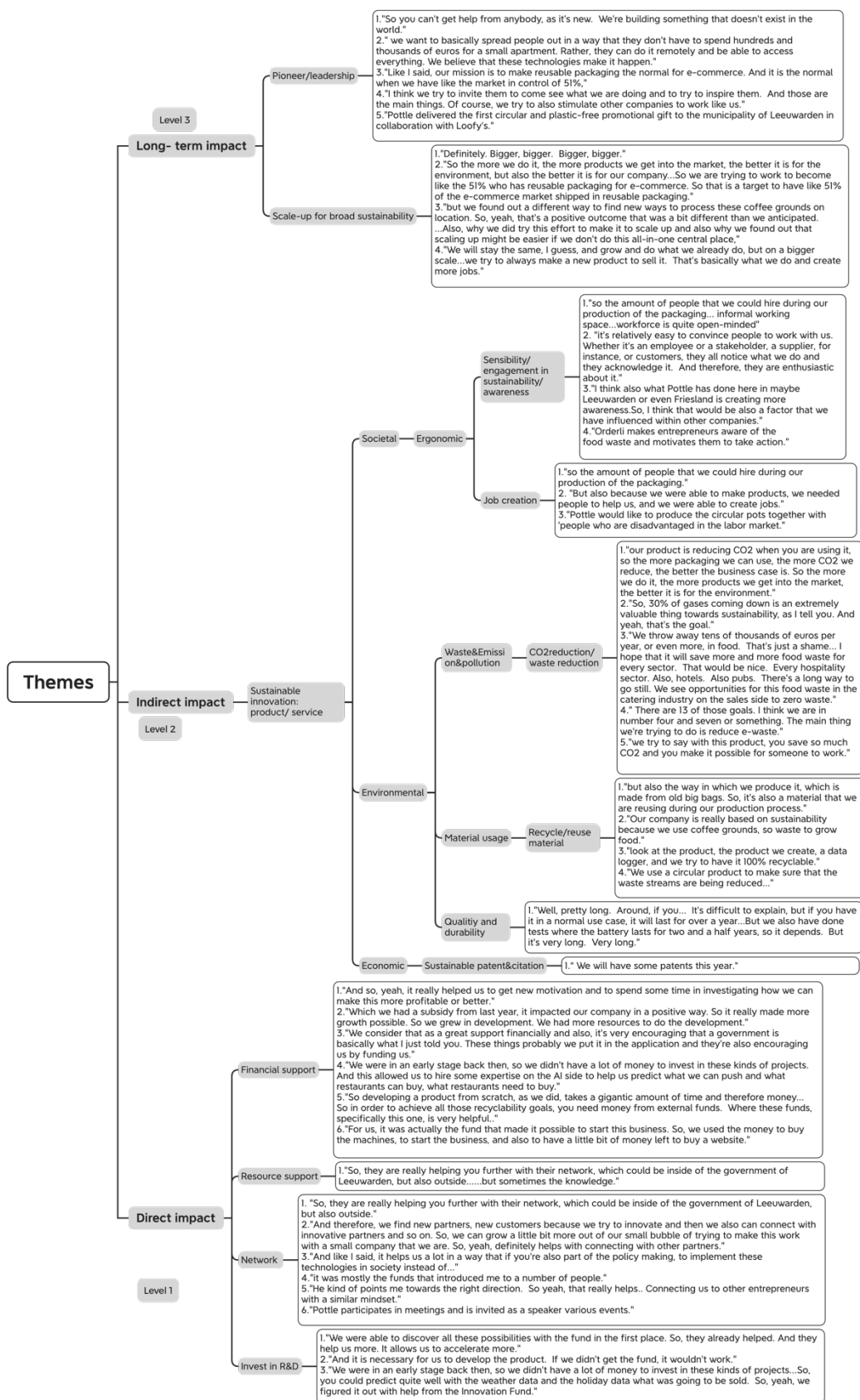
Challenges and opportunities

- What challenges have you encountered in implementing sustainability initiatives?
- Have you identified any opportunities for innovation or improvement in your sustainability efforts?

Future Directions:

- Looking ahead, how do you envision your company's sustainability journey evolving?
- Are there any new sustainability initiatives or projects you plan to pursue?
- What role do you see sustainable innovation playing in the future growth and success of your company?

Appendix B: Codes of transcription and related documents



Appendix C: Signature of consent form

<https://drive.google.com/drive/folders/1sFPXppeD37Vh2bBzBRYHSJRxOvOq22TW?usp=d>

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Appendix D: Interview audio and transcript

<https://drive.google.com/drive/folders/1LlqBw7sGy17vKDUBHVw28SKIYV923882?usp=dr>

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