

## Sustainability Orientation in Business Models of Swiss Start-ups

Uta Milow

Fachhochschule Nordwestschweiz, Peter Merian-Strasse 86, 4002 Basel, Schweiz  
uta.milow@fhnw.ch

**Abstract.** Research on Sustainable Business Models of start-ups currently focuses on those which pursue a sustainability goal as a main aspect and at least also follow an ethical motivation, possibly in addition to the profit motive. This paper aims to firstly identify useful criteria for describing sustainability in business models and secondly does an investigation on the sustainability orientation and implementation in business models of participating start-ups in the Swiss Innovation Challenge, a business plan competition. As sustainability was no criterion in the application process, many of the start-ups didn't have a strong sustainability orientation. It will be examined to what extent these start-ups take sustainability aspects into account, and which ones in detail. Secondly, it is examined which business model types are used here in order to identify prevailing types and patterns for start-ups that are not selected for their sustainability orientation. The 25 start-up teams were interviewed with a semi-structured interview guide, including an evaluation of sustainability criteria. Almost all start-ups have a strong profit orientation and many also consider sustainability in their business model, though mostly with only one field of action. The linear business model is dominant and only few start-ups contribute to the circular economy. Another outcome of the survey is that the sustainable business model patterns should be adapted for this target group of start-ups not geared towards sustainability for future research.

**Keywords:** Sustainable Business Model, Circular Economy, Sustainable Entrepreneurship.

### 1 Introduction

As the impact of human activity on our planet becomes ever more threatening, it is becoming more necessary to incorporate sustainability not just incidentally, but comprehensively into our actions. Businesses play a major role here as they are important players in economic activity, both in terms of resource consumption and in terms of how we interact with each other. Thus, companies have a direct influence on the way humans live today and in the future. The traditionally dominant way of using resources to produce products and services and throwing them away after use is being challenged with new approaches such as the circular economy approach (PwC & WWF, 2021). Sustainable business is essential to keep our planet livable for future generations. The definition of sustainability published by the so called Brundtland Commission as early

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as 1987, although general, is still catchy and accurate: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987, p. 6). In this same Brundtland Report, companies are also held accountable, along with individuals, governments and other institutions (World Commission on Environment and Development, 1987).

Start-ups can make a contribution here - they have the opportunity to incorporate sustainability aspects into the business model from the very beginning. According to a study by the European Commission, 80% of the environmental impact is already determined in the design phase of a new product (European Commission, 2014). On the other hand, start-ups also face the challenge that they cannot yet foresee and manage the entire production cycle in the start-up process. This paper will address the contribution of start-ups that do not have a focus on sustainability. By numbers, this is the vast majority of start-ups. For an overview on the worldwide entrepreneurial activity see the yearly publication of the Global Entrepreneurship Monitor (Bosma et al., 2020).

In 2013, Boons and Lüdeke-Freund (Boons & Lüdeke-Freund, 2013, S. 17) did a systematization of sustainability characteristics and identified a need for further research on the consideration of normative and sustainable aspects in the innovation process of companies. In the publications on sustainability and entrepreneurship of the last twenty years, the focus has generally been on start-ups or innovations in which a sustainability aspect (such as the development of renewable energy or a sharing platform) was the core of or explicitly the business idea, for example in (Schaltegger et al., 2016; Schaltegger & Wagner, 2011). In Boons and Lüdeke-Freund, social and environmental values should also be considered in the value proposition and the supply chain, the consumption and financial model should also be sustainable (Boons & Lüdeke-Freund, 2013). In reality, often only one of the sustainability aspects is considered, and improving sustainability is not always a declared goal of the start-ups (Schaltegger et al., 2018), but one aspect among several. In Stubbs and Cocklin, Sustainable Business Models take into account the benefits for all stakeholders and do not only focus on shareholder value, i.e. ultimately profit (Stubbs & Cocklin, 2008). However, there are strictly profit-oriented companies that (nevertheless?) contribute greatly to sustainability. Where to draw the line between sustainable and non-sustainable startups? A common understanding of a Sustainable Business Model is missing so far (Breuer et al., 2018).

Furthermore, several articles describing possible sustainable business models have been published in recent years. Here, too, authors assume that business models have a clear normative orientation and are generally primarily sustainability-oriented (H Breuer et al., 2018). Even though it is noted that sustainable innovations emerge in different ways and also develop randomly and with little guidance (Ahrend, 2019), the typology of sustainable business models in Ahrend and others assume that business ideas that are sustainability oriented at their core, e.g. in (Lüdeke-Freund et al., 2018). Research on the sustainability orientation and respective business models of start-ups that do not mainly or only randomly selected pursue a sustainability goal is still missing. This article aims to help close these gaps. Start-ups are considered that participated in the business plan competition "Swiss Innovation Challenge" (*Swiss Innovation Challenge*, 2021) and were not selected in this context on the basis of sustainability

orientation. Thus, these are start-ups that might happen to also pursue a sustainability aspect at the core of their business idea. For most participants, however, this is not the case, and sustainability aspects can be found as a secondary aspect, or not at all. The range of consideration of sustainability was wide, and this range will be mapped and examined here.

In this conference paper, the question is, on the one hand, to what extent these start-ups take sustainability aspects into account, and which ones in detail. On the other hand, it examines which business model types are used here in order to identify prevailing types and patterns. The results can help to understand the nature and approach of sustainability considerations for further research and to be able to promote sustainability overall with better support of the entrepreneurs.

**Structure of the paper.** First, a literature review will be used to conceptualize what criteria can be used to describe sustainability, how categories for business models can be developed, and how these can be assigned to startups. Subsequently, the 25 participants in the competition who were available for an interview on the topic of sustainability will be assessed on the basis of the criteria developed. Finally, the results of the study are evaluated and commented on.

**Method.** Personal interviews were conducted under the assumptions that firstly participants do not know a lot about sustainability criteria and often did not think about the implementation, and therefore explanations during the interviews are necessary. Secondly, the interviewees will not spend much time to do an assessment. The personal interviews took about one hour. The research procedure was explorative with the knowledge about sustainability contributions still growing. Interviews give the opportunity to flexibly include additional questions.

The interview transcripts were qualitatively analyzed. It is assumed that start-ups fit in categories of sustainability criteria. Business models were categorized by the interviewer (SDG, sectors, degree of sustainability orientation, business model types, ...). Besides the descriptive quality for a single start-up, a simple statistical analysis facilitated the qualitative analysis as further information about the group of start-ups could be gathered and the single start-up could be positioned against the group.

Data collection took place with the registration for the Swiss Innovation Challenge 2020 and with a survey of the participants after the 2nd pitch. Data on sustainability orientation and intensity were collected. The interviewer made a rating on different sustainability topics with an ordinal scale ("does not apply at all" to "fully applies"). In addition, characteristics of the competition participants were collected that describe the business model. (See sections 2 and 3)

The semi-structured interview guide is aimed at the participants of the Swiss Innovation Challenge who were selected by the jury for the 2nd pitch. Both innovations that lead to the founding of a company (start-ups) and innovations in existing companies are incorporated. In the 2020 cohort, all participants who agreed to have the sustainability interviews were start-ups, though. The participants come from all over Switzerland and occasionally from neighboring countries. They are randomly distributed across different industries and business models.

The participants did not know anything about this research project on sustainability aspects prior to registration, which is why the selection at this application level is random. Participation in the interview is voluntary. Participation or refusal seemed to mostly depend on time availability, rather than interest in sustainability issues. A bias towards participants with greater interest cannot be ruled out, though, which is why conclusions for the population cannot be drawn. However, statements can be made about the group of interview participants. The interviewer was thoroughly introduced to the topic and the questions and possible answers were discussed. Since one colleague conducted all 25 interviews, the evaluation is consistent. The evaluation was additionally and independently reviewed by the project management.

## 2 Sustainable Entrepreneurship

For a later evaluation of the competition participants in terms of sustainability, possible forms of sustainability are first systematically described. It is not the aim to draw a sharp line between sustainable and non-sustainable business models. Because of the many forms of sustainability, this is also not readily possible. Rather, there are various sustainability criteria and these in different forms, so that it is better to create a kind of sustainability profile for each company under consideration. We start with the more general sustainability criteria and then become more specific.

There are numerous definitions of sustainable entrepreneurship. Like all entrepreneurs, sustainable entrepreneurs seek to identify, develop, and market a future business with a product or service - as in any startup or innovation project. In doing so, they take risks that they must manage for long-term success (York & Venkataraman, 2010). The terms entrepreneur and entrepreneurship are used broadly in this article. These are startups directly before, in the process of founding, or in the initial period after founding. Generally, we also include so-called intrapreneurship, i.e., the implementation of new, innovative business ideas in existing companies (Schaltegger & Wagner, 2011) even if we happen to have only start-ups among the interview participants in 2020. Sustainable entrepreneurship is defined in this way:

"We view sustainable entrepreneurship as the discovery, creation, evaluation, and exploitation of opportunities to create future goods and services that is consistent with sustainable development goals." (Pacheco et al., 2010), or:

"An innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations". (Young & Tilley, 2006)

The first definition is quite general and refers to all corporate activities that are compatible with the Sustainable Development Goals (United Nations, 2016). Incompatibility with any of them is treated as an exclusion criterion. The second definition is on the one hand broad in terms of a general value creation, but on the other hand requires innovations that at least achieve a breakthrough in the environmental or social field and is thus stricter, as sustainability must be recognizable in the core of the business idea.

## 2.1 Motivation and profit orientation

Following this strong sustainability orientation, one characteristic mentioned in the literature is the motivation of the entrepreneurs. Sustainably oriented start-ups are often assumed to act at least also with ethical motives and with a sustainably oriented or values-based mission (Breuer & Lüdeke-Freund, 2018).

Looking at a whole range of sustainability-oriented startups, several motives are conceivable side by side in various forms. Ethical-sustainable motives stand alongside the satisfaction of realizing a self-developed business idea or bringing an innovation to market and the desire to generate income from the company's profits. Combinations are thus conceivable that include the motivation of profit orientation and the desire to create added value for the society (Alberti & Varon Garrido, 2017; Breuer & Lüdeke-Freund, 2018). There may or may not be a trade-off between the two motives. The social contribution may incur costs and reduce profits, for example by paying suppliers fairly. In the case of a technical innovation for example to reduce CO<sub>2</sub> emissions, there is not necessarily a trade-off; the sustainability orientation is core to the business idea and at the same time does not reduce profit. In recent years the line between profit orientation and sustainability has become increasingly blurred, "hybrid firms" developed that combine characteristics from both (Alberti & Varon Garrido, 2017).

If several motives can stand side by side, the question arises as to the significance of sustainability orientation in the start-up process, as this motivation can possibly lead to a different approach and different business models. There are entrepreneurs who do not implement their business idea primarily out of an ethical drive or a sustainability-oriented mission, but who do consider sustainable aspects later when implementing their innovation (Boons & Lüdeke-Freund, 2013). In other words, they primarily want to be successful with an innovative business idea and generate profit, but do so while taking into account social and environmental needs (Thompson & MacMillan, 2010). For example, they consider ecological aspects in the energy supply for production and avoid CO<sub>2</sub> emissions, or they design products that can be easily disassembled into individual parts and recycled. These entrepreneurs are thus aware of the sustainable challenges facing our society and explicitly incorporate sustainability aspects into their business model.

Following Breuer and Lüdeke-Freund (2018), we distinguish the following categories: Sustainability is firstly integrated as a single component, e.g. by replacing a conventional pre-product with a sustainable one. The company is externally motivated by regulations or competition or demands of the clientele. The organization as a whole is not involved or integrated in sustainability aspects.

Second, sustainability is systematically integrated with several components and at one point in the business operation, e.g. with replacement of an entire product line, other distribution channels or similar. There is no comprehensive integration in several business areas.

Third, in a basically conventional business idea, sustainability is strategically integrated with a comprehensive sustainability process and management, e.g., with coordinated Corporate Social Responsibilities activities or the consideration of the sustainability impacts of the entire company.

Finally, in the fourth category sustainable value creation is at the core of the business idea, e.g. with a product-as-a-service system to reduce environmental impact, or a social initiative to include disadvantaged people. The founders' own motivation is present and finds expression in a comprehensive consideration of further sustainability aspects in business operations.

While categories one to three can be thought of as a process in which a company increasingly integrates sustainability aspects, level four is not necessarily reached as a further step. For these characteristics, such extensive changes to the business model are necessary that companies would basically have to start over. However, this category is well suited for describing companies that consider sustainability orientation as the core of their business idea from the beginning.

All manifestations are basically compatible with profit orientation, even if this will not always have the same priority. The sustainable entrepreneurs thus have several motivations, which can be pronounced to different degrees: the ethical convictions, profit orientation and possibly others, in order to be able to run their company without subsidies in the long term. Profit orientation usually leads to growth and thus to a spread of ethically desired action. As mentioned above, a strong profit orientation can get in the way of strictly sustainability oriented business models (Thompson & MacMillan, 2010). In principle, however, both sides can be reconciled (Boons & Lüdeke-Freund, 2013) and influence each other. In the case of non-profit enterprises, the profit orientation is not present at all, while the ethical motivation for it is usually particularly pronounced. NPOs primarily pursue social and environmental goals (Sarango-Lalangui et al., 2018). Looking at start-ups, these can be social organizations, for example, whose operation is not intended from the outset as the main source of income for the people involved or founding the organization.

## **2.2 The Triple Bottom Line of sustainability**

Sustainable or, better, sustainability-oriented entrepreneurship as this implies an intention or attitude, differs from entrepreneurship in general in several respects. Entrepreneurs who act sustainably pursue not only economic but also ecological and/or social goals. These are also grouped under non-economic goals, e.g. in (Shepherd & Patzelt, 2011). Today, this so-called triple bottom line approach has become generally accepted, whereas initially sustainability was only understood as a consideration of ecological aspects (Sarango-Lalangui et al., 2018).

The three aspects of economic, ecological and social sustainability are often not covered to the same extent. For example, something could be produced conventionally and be ecologically questionable, but make a good social contribution. A contribution to sustainability is then recognizable, and it should not be definitively decided at this point in the evaluations whether a company can basically be described as sustainable or not. All three sustainability aspects for positioning a business idea should not stand side by side, but be understood as interwoven and integrated components of society (DIN, 2020, pp. 17, 18). In terms of environmental sustainability, the product, technology or service should improve the achievement of environmental goals. Examples are the preservation of biodiversity, reduction of pollution, reduction of CO<sub>2</sub> emissions,

efficient use of resources. Correspondingly, in terms of social sustainability, the product, technology, service should improve the achievement of social goals, like the consideration of the needs of the socially disadvantaged, poverty prevention, inclusion, development cooperation, fair treatment of employees and fair, non-discriminatory remuneration. Finally, in terms of economic sustainability, the product, technology or service should contribute to the economic strength of the country through entrepreneurial success. Through business activity, the production factors are remunerated (workforce, capital, other resources), and thus jobs and income are created for the population. This means that the contribution to the society is also considered in the economic sustainability aspect, and not just the profit orientation on the company level.

### **3 Sustainable business models**

#### **3.1 Sustainability in business models**

In the last twenty years, the term "business model" has been shaped. The core feature is the description of a value creation, which is mentioned in many definitions. Osterwalder and Pigneur introduced the term Value Propositions. The business idea of a start-up or company should solve a problem for customers or satisfy their needs, respectively (Osterwalder & Pigneur, 2010). Based on this, they identified nine aspects, such as Customer Segments, Distribution Channels and others, which were clearly presented in the well-known Business Model Canvas.

Sustainability-oriented business models do not differ generally from the main criteria. However, sustainability aspects are integrated and presented. In summary, sustainability can thus be integrated into the definition of a business model (Schaltegger et al., 2016, p. 6):

"A business model for sustainability helps describing, analyzing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries. "

The view on the society outside the company becomes clear and ecological and social aspects are explicitly integrated as well as other stakeholders are mentioned. Boons and Lüdeke-Freund emphasize that the topic of sustainability should be represented throughout the entire business process (Boons & Lüdeke-Freund, 2013). The value proposition should create a balance between the three aspects of economy, ecology and social issues. These aspects should also be recognizable in the supply chain and infrastructure. Customers and other stakeholders should be motivated to behave responsibly. And finally, the financial model should also take into account ecological and social framework conditions. Breuer, Fichter, Lüdeke-Freund, and Tiemann define four principles as minimum requirements for a Sustainable Business Model (SBM): sustainability orientation, value creation in a broader sense with a view to society, systemic thinking with, for example, an understanding of the circular economy, and stakeholder integration (H Breuer et al., 2018). They derive more concrete requirements for the

development of SBM, such as consideration of the context, possible collaboration, and taking into account the impacts and outcomes of the business activity.

### 3.2 The linear economic model and circular economy

For an analysis of the material flow, the question of the business model can be further differentiated from an ecological point of view: are resources returned to the economic cycle in the sense of the circular economy, or does the business model promote resource efficiency in the linear model, or possibly neither? This distinction and a differentiated view is useful to be able to identify typical business models that contribute to a more circular economy and thus promote sustainability. The circular economy is therefore a goal under the umbrella concept of sustainability. The focus of circular economy concepts is mainly on economy and ecology, less on social aspects (Murray et al., 2017). Social aspects can, of course, be additionally considered.

The linear economic model "Take - Make - Waste" is predominant today. Resources are used to make products that are thrown in the trash after use. In contrast, in the "cradle-to-cradle" approach, resources are used longer or are reused or reintroduced into the material cycle after the end of use – the circle economy (McDonough & Braungart, 2002). Further variations are possible if sustainable business ideas enable a more efficient use of resources in the linear economic model. For example, new technology can reduce material consumption or energy consumption in a production process. The linear economic model thus becomes more sustainable, but still leads to the discarding of goods that are no longer used. The linear model is increasingly reaching its limits, due to the scarcity of natural raw materials or the disposal of large amounts of waste containing valuable resources (Walcher & Leube, 2017). According to current estimates, only 8.6% of resources worldwide are regenerated in the sense of the circular economy, while more than 90%, accordingly, are not fed back into the material cycle (PwC-WWF, 2021).

### 3.3 The concept of circular economy in business models

The problem has now been recognized, and the transition of current global production patterns to a circular economy is being pursued by political actors. Approaches can be found, for example, in the European Commission, which presented an action plan for the circular economy in 2015 (European Commission, 2015). In addition to closing material cycles, it is also intended to enable improved innovation capacity, new jobs and sustained economic growth in general.

The term circular economy is used in different ways, and a general definition has yet to be developed. One well-known definition of the circular economy comes from the Ellen MacArthur Foundation, which defines it as "an industrial economy that is restorative or regenerative by intention and design" (Ellen MacArthur Foundation, 2013, p. 14). This understanding of the circular economy aims to maintain products, components, and materials at their highest utility and value. The circular economy concept emerged from industrial ecology, the blue economy, the product-service system



(Camilleri, 2019; Tukker, 2015) and the cradle-to-cradle approach (Ellen MacArthur Foundation, 2013; McDonough & Braungart, 2002; SATW, 2014).

In the current discussion, the circular economy is understood as a closed system of resource use that decouples economic growth from problems such as environmental pollution and limited resources (Geissdoerfer et al., 2017). Reuse or remanufacturing and recycling are mentioned as methods (see Fig. 1). According to the Ellen MacArthur Foundation, circular economy is defined as an economic system that is regenerative and aims to keep resources and (partial) products at the highest possible use for society. Consequently, burning the waste to recover energy should only be the last choice as the material is lost forever. In the literature, the term circular economy is often generally understood to mean a sustainability contribution to improving the use of resources, with the designs then distinguishing whether the material cycle is actually closed or slowed down in one way or another (Antikainen & Valkokari, 2016; Bocken, 2020; Henry et al., 2020). The different design forms will now be described in order to be able to assign business model patterns to them further below.

Nancy Bocken (2020) distinguishes between 'narrowing', 'slowing' and closing resource loops under the umbrella term circular economy. Narrowing refers to the reduction of resource consumption through more efficient use of energy and materials. One can also speak of efficiency improvements. This is not circular economy in the strict sense, since less is consumed, but nothing is said about reuse of resources. So we are still in the linear model here, with an improvement in sustainability through more efficient use.

Slowing down the resource cycle means using products for a longer period of time, whether through repair, second-hand sale to a new owner, or multiple use through a sharing model (like car sharing). Here, resources are put back into the economic cycle (Bocken, 2020).

Closing the loop means putting materials back into the economic cycle. The best-known example is recycling. Products are dismantled or made available in another form as raw materials (Bocken, 2020). This can also be related to the biological cycle as a regeneration when organic material is composted.

The "5 R" (Henry et al., 2020) Reduce, Reuse, Regenerate, Recycle, Recover can thus be assigned to these categories:

**Table 1.** own compilation with (Bocken, 2020; Henry et al., 2020)

| <b>Sustainable business model strategies</b> | <b>Definition</b>  | <b>narrowing, slowing, closing</b> | <b>Type circular or linear</b>                 |
|--|--|------------------------------------|--|
| Reduce                                       | Reduce use of resources, efficient design and production           | narrowing                          | linear   |
| Reuse  | Bring products back after initial use, repair, second-hand markets | slowing                            | circular in a broader sense/<br>finally linear |

|            |  |         |          |
|------------|--|---------|----------|
| Regenerate | Benefits for and through the biological ecosystem, composting, green roofs, ..       | closing | circular |
| Recycle    | Process materials for using them again, upcycling, downcycling                       | closing | circular |
| Recover    | Incinerate residuals and recover embodied energy, last option if others do not apply | closing | circular |

The linear value chain and the circular economy can be mapped as follows.

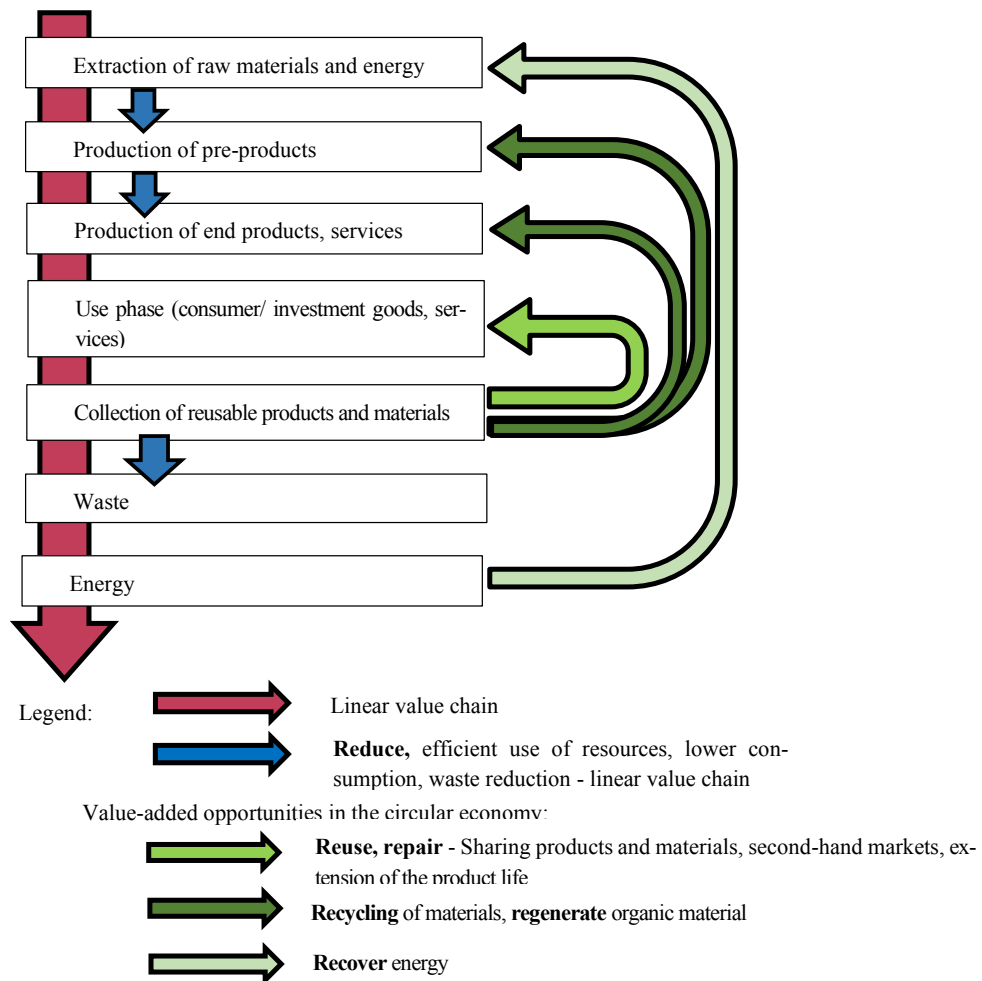


Fig. 1: Value creation opportunities in the circular economy, own illustration developed from (von Kutzschenbach & Milow, 2019).

To get a better overview of typical sustainability-oriented business models, companies can be further categorized according to their activity. These five types were identified: design-based, waste-based, platform-based, service-based and nature-based start-ups (Henry et al., 2020). However, the authors mainly have in mind start-ups with sustainability at their core. In another analysis, the categories were chosen more broadly so that many different sustainable business models could be represented. In an analysis 11 pattern groups with altogether 45 patterns were identified (Lüdeke-Freund et al., 2018). The idea was to have a rather complete picture of possible sustainability patterns in business models. The pattern groups will be used in this evaluation, with the detailed patterns providing further information about the categories.

**Table 2.** Sustainability patterns (pattern groups) in business models, following (Lüdeke-Freund et al., 2018)

| <b>Pattern</b>                           | <b>Description</b>  |
|--|---|
| <b>G1 Pricing &amp; Revenue Patterns</b> | Addressing the revenue model of a business model, i.e., how offerings are priced and revenues generated. E.g. Differential pricing, freemium.   |
| <b>G2 Financing Patterns</b>             | Addressing the financing model within a business model, i.e., how equity, debt and operating capital are acquired. E.g. Microfinance, Crowd Funding.  |
| <b>G3 Ecodesign Patterns</b>             | Integration of ecological aspects into key activities and value propositions, i.e., how processes and offerings are designed to improve their ecological performance over their entire life cycle. Including reduction of resource use, higher efficiency.  |
| <b>G4 Closing-the-Loop Patterns</b>      | Integrating the idea of circular material and energy flows into partnerships, key activities, and customer channels, i.e., how materials and energy flow into, out of, and return to a company. E.g. Recycling, reuse, repair, take-back-management.  |
| <b>G5 Supply Chain Patterns</b>          | Modifying the upstream (partners, resources, capabilities) and/or downstream (customers, relationships, channels) components of a business model, i.e., how inputs are sourced and target groups are reached. E.g. shorter supply chains, produce on demand.  |
| <b>G6 Giving Patterns</b>                | Helping donate products or services to target groups in need, i.e., how costs are covered and social target groups are reached. E.g. buy-one-give-one.  |
| <b>G7 Access Provision Patterns</b>      | Creation of markets for otherwise neglected target groups, involving modified value propositions, channels, revenue, pricing and cost models, i.e., how value propositions are designed, delivered, and to whom. E.g. affordable housing, degrees.  |
| <b>G8 Social Mission Patterns</b>        | Integrating social target groups in need, including otherwise neglected groups, either as customers or productive partners, i.e., how customers, partners, and employees are defined and integrated.<br>Including "high-tech for health" health improvement through innovative medical or pharmaceutical products |

|  |  |
|--|--|
| <b>G9 Service &amp; Performance Patterns</b> | Emphasizing the functional and service value of products and that offer performance management, i.e., how value propositions are defined and delivered.                                |
| <b>G10 Cooperative Patterns</b>              | Integrating a broad range of stakeholders as co-owners and co-managers, how partners are defined and how the organisation is governed. E.g. cooperative ownership.                     |
| <b>G11 Community Platform Patterns</b>       | Patterns that substitute resource or product ownership with community-based access to resources and products, how value propositions are defined and delivered. E.g. sharing business. |

These patterns are used to describe the main sustainability aspect of a business idea but do not incorporate information about the intensity or other sustainability aspects. It is therefore conceivable for a company to bring a technical innovation to market without any particular sustainability features and at the same time to treat its employees in a particularly social and participatory manner (social mission pattern). The pattern is not describing the whole business model but only the main sustainability aspect.

To sum up, a start-up's sustainability profile can be described with the general sustainability orientation, the contribution to the three pillars economic, ecologic, social, the degree of profit orientation, regarding ecologic sustainability with contributions to resource efficiency and the circular economy, in more detail described with the "5 R", and finally with typical sustainability patterns in business models.

An **Interview Guideline** was derived following the criteria just described. In a first section of the guideline the personal motivation and development of the business idea were addressed. Then the business concept and the business model were evaluated with the core topics of sustainability contribution according to the triple bottom line, the linear business model versus a circular economy concept with different characteristics and finally the business model patterns.

#### **4 Evaluation of sustainability in the business models of Swiss Innovation Challenge participants**

The entrepreneurial competitions under the brand Swiss Challenge were launched by the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) in 2014 to provide practical education and training for both students and graduates. Entrepreneurial thinking and action of students and employees at university as well as beyond in business and society are promoted - participation in the competitions is open to start-ups in different entrepreneurial stages as well as too SME (FHNW, 2019b).

The Swiss Innovation Challenge lasts a total of eight months and includes three pitches of the participants with an evaluation of their business ideas and projects by a jury (FHNW, 2019a). During the competition, participants can attend free, user-oriented seminars. In addition, they have access to mentoring and coaching programs where they are supported and encouraged with practical knowledge. The data from the 2020 cohort were evaluated for this article. 25 teams in the second pitch were ready for an interview, which was conducted using a semi-structured interview guideline.

The contest participants are randomly distributed across different industries and business models. In this 2020 cohort, all participants were start-ups. The teams are planning an innovative business in the near future or they have started already within the last two calendar years. (Admission criteria, (FHNW, 2019a)).

First, the general sustainability orientation was examined. Being asked, some of the teams answered that they currently are too busy to deal with sustainability aspects, for example with interview partner 4 (I4). “At the moment, we are more focused on the economic goals, because as a young start-up, it is very important for us to be able to launch at some point and scale the business.” Others started talking about their general sustainability attitude but could not find those aspects in their start-up, like I22: “Our activity is mostly online and environmental protection is not an issue for us. This is neither positive nor negative. Basically, environmental protection is something we consider important. For example, we travel as much as possible by public transport and not by private car, but otherwise there are actually few decisions in our business or there is little in the area of environmental protection that has an influence on our decisions.”

Other interview partners instantly found some sustainability motives, some of them thought about before, others possibly recognized at the moment: “Ecological aspects are very important to us. We are a start-up that is already CO<sub>2</sub>-neutral. Which is also not a matter of course, since it also costs a certain amount. That's why it was important for us from the very beginning. We produce as much as possible in Switzerland. In addition to the ecological aspect, we also want to strengthen Switzerland as a business location with our product. A social aspect is that it is also extremely important for us to have a very good relationship within the team as well and that the employees can work very well.” (I6)

The categories below were evaluated with the ranges from 0, not applicable, to 4, the core of the business idea.

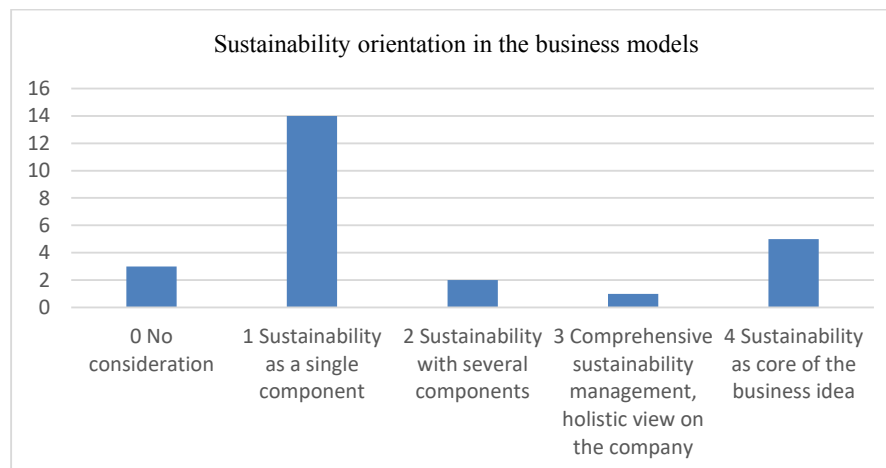


Fig. 2, sustainability orientation, own evaluation

While three of the 25 start-ups did not at all contribute to sustainability, 14 did so with a single component. For example, they use energy from renewable resources but otherwise did not implement sustainability aspects into their business operations or have a holistic sustainability approach. There were few companies in the mid-range but 20% (5) have an explicit sustainable business idea, like in I1: “The goal is petroleum substitution. There are basically two sources of carbon that could replace petroleum. That is CO<sub>2</sub> from the air and plants, and we see a lot of potential in plants because we already have a lot of agriculture and the conversion will be much faster. That's why we've developed a process that can get petroleum-like molecules from plants.”

Next, the sustainability contribution of the products or services was closer examined with respect to the three pillars of sustainability. The projects were evaluated about their contribution to the economy, the ecology and/or to the society with a range of “not at all” to “high contribution” (0 to 4).

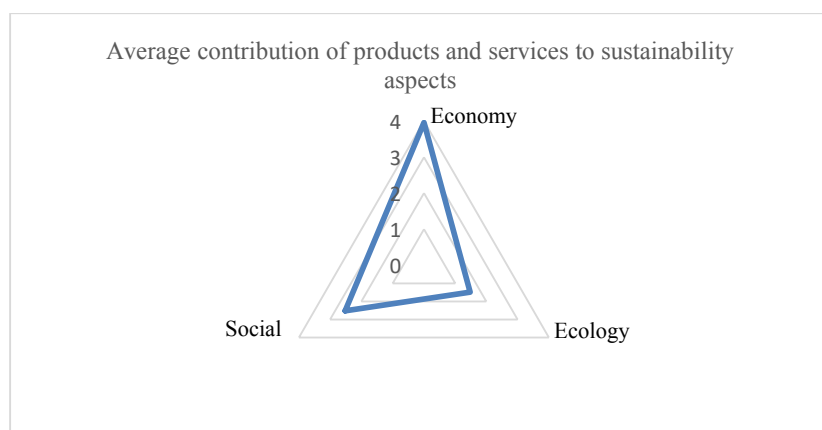


Fig. 3, contribution to three pillars of sustainability, own evaluation

While almost all start-ups have a strong economic focus, only some contribute to social sustainability and to a lesser extent, and even fewer to ecologic sustainability. This is in line with the profit orientation of the start-ups. The business models were categorized with respect to their profit orientation. We learnt above that this is not necessarily connected to sustainability orientation, and a fully profit oriented company can at the same time strongly contribute to sustainability. Still, there might be a relationship as the core sustainability oriented companies could be less profit oriented. With this evaluation a correlation could be examined in this group.

Quite a few interviewees were very clear about the profit orientation of their company. “We are purely profit driven. We believe that by building a company that tries to get an impact or the most out of these devices, we have the greatest impact this way.” (I15), or “We want to build a viable company. So simple.... At the moment, we are purely profit oriented.” (I2). One argument for a strong profit orientation can be the funding of expensive investments, “it takes so much money to build a new chemical plant (...) It would be several hundred million to build such a thing, and unfortunately

no one does that today without hoping that the thing will spit out the money again.” (I1).

The interviewer discussed the topic with the participants and then decided the best fitting category from profit to non-profit orientation.

**Table 3.** Degrees of profit orientation

| <b>Profit orientation</b>   | <b>Number</b> |
|---|---------------|
| Profit oriented   | 12            |
| Profit orientation first priority, among other goals                  | 12            |
| Mainly not profit oriented goals but want to make a profit, after all | 1             |
| Non-profit  | 0             |

We see that generally the interviewed participants were profit oriented but quite a few also follow other goals. The five start-ups that are very sustainability oriented (see above) obviously also have a strong profit orientation.

Next, the ecologic sustainability with respect to resource and energy efficiency in the linear model and contributions to the circular economy are examined. The interviews show that most of the start-ups have a linear business model. Some contribute to a very limited extent to the circular economy, like I5: “In the area of recycling, reuse, circulation (...) it is actually only the packaging that we bring back into the cycle and reuse. We also don't really have any waste from production that we could put back into the production process afterwards. That is actually all.” Others argue that with producing a software, there is no material that could be reused or recycled, like I2 “by offering Software as a Service it is a linear business model.” At the same time, I2 explains that in the linear model the company contributes to energy efficiency, “we are an enabler that our customers can plan more sustainable buildings. (...) In terms of CO2 reduction, [lower] energy consumption.” Finally, few contribute to closing the resource loops, like I1 with an idea to replace fossil products, “The circular economy is one reason for our idea. If you need biomass from wood or agricultural waste, that's already CO2 that was in the air, then in the plant and you borrow it, so to speak.”

The four categories are shown in the following table. Compared to table 1, the different types of actual circular economy business models are aggregated here in one category.

**Table 4.** Circular economy and linear economic model

| <b>Circular economy - linear economic model</b>   | <b>Number</b> |
|---|---------------|
| Linear economic model without sustainability contribution   | 15            |
| Improve resource, energy efficiency – reduce, in the linear model   | 5             |
| Slowing resource use: reuse, repair, (sharing, 2nd hand, ..., still linear model)                                   | 1             |
| Closing the Loops: recycling for new products, actual circular economy, regenerate (biological), recovery (energy). | 4             |

Then, the circular economy business models were separated according to the “5 R”, reduce, reuse, regenerate, recycle, recover. The picture was very similar to the previous table 4. All four start-ups with a circular business model were of the type “recycle”.

For a more differentiated picture, the interviewed start-ups were categorized in terms of their sustainability patterns. Some patterns did not occur among the 25 participants, but others were particularly frequent.

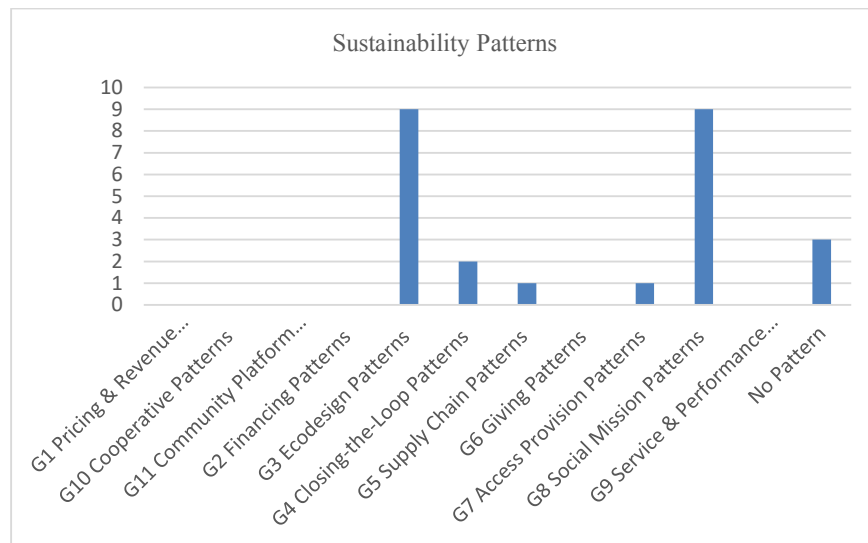


Fig. 4. Patterns of sustainable business models, own evaluation

There are two clusters in the pattern types, ecodesign and social mission patterns, with nine start-ups each. For the classification the strongest component determined the pattern category. A recyclable new waterproof membrane for outdoor clothing for example is both, an innovative ecodesign, and at the same time contributing to closing the resource loops. In this case, the ecodesign is regarded dominant. This explains that we found above four companies in the circular economy category, but here we have only two for the closing-the-loop pattern.

## 5 Discussion

The main question of this paper is to what extent the interviewed mostly conventional start-ups take sustainability aspects into account, and which ones in detail. The typical participant of the 25 teams that had been interviewed is profit oriented with some awareness of sustainability topics, but often this is only implemented in the business as a single component. There are also some few start-ups with a strong sustainability orientation. The mid-range seems to be almost missing – either they are implementing sustainability aspects to a large extent or not very much.



A social focus was more represented than an ecologic one, looking at the triple bottom line of sustainability. This is in line with the peak for social mission patterns. The social mission patterns include health improvements, here med-tech or pharmaceuticals. There were quite a few among the participants. And these typically do not contribute to a circular economy or a slowing or narrowing of the value chains. Consequently, we found a relatively high number of start-ups in the linear model with no such contribution.

Looking at the sustainability patterns in detail, we find in an analysis of ecological aspects another typical combination. Some Start-ups contribute to sustainability only with a single component, and this is often a reduction of resource, energy or carbon dioxide use, for example when using an electric car. Although this is no high level regarding overall achievable sustainability of a start-up and not a real innovation, these actions counted as ecodesign in the sub-pattern “substitute with renewable processes”, as no other matching category was available. This explains the high number of ecodesign patterns. At the same time, we see that for further research the categories (Lüdeke-Freund et al., 2018) have to be revised to be applicable also for companies that do not have a strong sustainability focus.

Examining the results for the “5 R”, the clusters of cases in the categories “reduce” and “recycle” (see table 4) is in line with results of an examination of 128 sustainability oriented business models (Henry et al., 2020) – here the accumulation of cases was in the same two categories. An interpretation could be that a reduction of resource or energy use is an easily reachable goal, and recycling seems to be the dominant way of implementing circular economy ideas. Further research could verify this.

## 6 Conclusion

The initial assumption that many of the competition participants do not follow a sustainability path as the core of their business model was confirmed. While the attitude of quite a few management teams was sustainability oriented, the implementation in the companies was mostly not advanced. Typical sustainability contributions and their intensity of the start-ups could be elaborated. Among the interview participants there were several with a social contribution in the health sector, while a group of other conventional start-ups only contribute with one energy-related aspect like carbon dioxide reduction. There was no broad range of circular economy business models. Further support and training for start-ups could encourage the implementation of these circular economy ideas that will help to make our planet livable also for future generations. The categories of this analysis turned out to be useful for describing the start-up’ sustainability orientation. The sustainability patterns have to be revised, though, to better map business models with a less strong sustainability orientation.

Further research could evaluate the contribution of the business models to the United Nations’ Sustainable Development Goals and include an analysis of the industries of the start-ups, combined with the sustainability patterns. Over the years, we will have more data in the Swiss Innovation Challenge for a more substantiated analysis. On an individual company’s level, the sustainability criteria from this article could be used to

develop a profile for positioning, communication to the stakeholders and as an incentive to improve the weaker areas.

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