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Sustainable Business Model Design

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Abstract:

This article introduces the "Sustainable Business Model Design" (SBMD) framework, an integrative methodology that synthesises sustainable business model theory with Alexandrian pattern theory. Emphasising a pragmatic interpretation of design as transformative action, the framework's foundations are explored, seeking to consolidate the theoretical underpinnings guiding SBMD and elucidate its principal conceptual components. The article further delves into the practical application of the framework as a tool for problem-solving and idea generation. It concludes with a discussion of analogical reasoning and conceptual combination, shedding light on the creativity-enhancing efficacy of SBMD patterns. Additionally, the article is a succinct primer for business designers interested in the practical utilisation of SBMD, particularly within contexts such as sustainability innovation and ESG strategy workshops.

Introduction

This short paper introduces an approach to developing business models for sustainability called *Sustainable Business Model Design* (SBMD). It is rooted in the fusion of sustainable business model theory and Alexandrian pattern theory, underpinned by a pragmatic interpretation of design as "action aimed at changing existing situations into preferred ones"

Keywords: sustainability, business model design, pattern theory

Acknowledgements: This article was written in response to an invitation by the journal's editors. It has undergone an editorial review process. In this article, we distil and extend the theoretical assumptions and concepts that guided some of our earlier works, including our monograph "Sustainable Business Model Design – 45 Patterns" (2022). While the monograph was written for teachers, business developers, and consultants, this article offers a theoretical view on sustainable business model design and is meant to contribute to the academic debate. Our readers are invited to critically review and reflect on the theoretical approach we present in this paper. It also serves as a quick introduction for those interested in practical applications of sustainable business model design, for example in ideation and strategy workshops.

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(Simon, 1996). The SBMD framework builds on insights from scientific research as well as practical experience. It has been presented in full for the first time in a recent practice-oriented monograph titled "Sustainable Business Model Design – 45 Patterns" (Lüdeke-Freund et al., 2022). The wide dissemination of SBMD among business and product developers, corporate social responsibility managers, innovators, founders, incubators, accelerators, and consultants has proven its practical value.

Against this background, the primary objectives of this article are twofold. First, it seeks to provide a consolidated synthesis of the foundational theoretical propositions that guide the original SBMD framework. Second, it aims to present its main conceptual components to offer business model researchers the opportunity to critique and build upon the framework, as well as to extend it and contribute to cumulative progress.

In the following, we introduce the main constructs informing the SBMD framework, namely sustainable business model and pattern, followed by an overview of the full framework and its application as a problem-solving and idea-generating tool. Finally, we apply a cognitive perspective and briefly reflect on analogical reasoning and conceptual combination to explain why SBMD patterns are effective sources of creativity.

Sustainable Business Models and Patterns

The foundations of the proposed framework rest upon two fundamental theoretical constructs: first, the sustainable business model concept (e.g., Schaltegger et al., 2016), and second, the notion of patterns (Alexander et al., 1977, 1979). In general terms, a *sustainable business model* (SBM) is a business model, i.e., a logic for value creation, delivery, and capture (Teece, 2010), which aims at solving ecological and social challenges *through* the value-creating activities of an organisation. An organisation operating a 'perfectly sustainable' business model would regenerate the natural environment, create value for stakeholders and society, and make a profit with every product or service it sells (Schaltegger et al., 2016). This is of course a theoretical ideal. But understood as a 'North Star', this way of looking at business models provides orientation and stimulates creative thinking.

A fundamental question motivating research on SBMs since the inception of the field (Lüdeke-Freund and Dembek, 2017) is about the ideal-types (Stubbs and Cocklin, 2008) or archetypes that may exist (Bocken et al., 2014). In its most fundamental version, this question is asking for the recurring *patterns* found in the designs of SBMs.

The notion of pattern originates from fields such as architecture and design research. According to Alexander and colleagues, a *pattern* "describes a problem which occurs over and over again in our environment and then describes the core of the solution to that problem in such a way that you can use this solution a million times over without ever doing it the same way twice" (Alexander et al., 1977, p. 17). Patterns build on practical experience and can be seen as proven problem-solution combinations. They codify knowledge and transform it from tacit into explicit, and they are generalised and to a certain degree standardised. These properties of patterns allow applying them in different situations, contexts, and domains. Furthermore, different patterns can be combined to solve multi-faceted problems.

Business model patterns have long been part of business model research. As knowledge in this field grows and becomes more specialised, patterns are commonly used to bring structure to this knowledge (e.g., Abdelkafi et al., 2013; Amshoff et al., 2015; Gassmann et al., 2020; Remane et al., 2017). This is useful for both business model research and business model design in practice.

The SBMD framework adopts the following definition of *sustainable business model design pattern*: A pattern for sustainable business model design describes an ecological, social, and/or economic problem that arises when an organisation aims to propose, deliver, create, or capture value, and it describes the core of a solution to this problem which

can be repeatedly applied in various ways, situations, contexts, and domains (cf. Lüdeke-Freund et al., 2018).

Having defined the main theoretical notions underlying the SBMD framework, namely *sustainable business models* and *sustainable business model design patterns*, the next section introduces the framework's main elements. This is followed by two main ways in which SBMD patterns can be used for better business model designs to illustrate the usefulness of the proposed approach.

Sustainable Business Model Design Framework

The SBMD framework builds on a robust and expert-validated *classification of patterns* for sustainable business model innovation. It consists of 45 patterns organised in 11 thematic groups (Lüdeke-Freund et al, 2018). The framework distinguishes three *pattern types,* namely overarching, prototypical, and modular patterns, and it also includes a *navigation system* derived from a so-called 'sustainability triangle' (Kleine and von Hauff, 2009).

To effectively navigate the information associated with each pattern and make their respective insights actionable, the SBMD framework uses a structured pattern description approach. This approach follows the pattern template introduced by Alexander and colleagues, who propose a comprehensive yet accessible way of describing problem-solution combinations (Alexander et al., 1977, 1979; Leitner, 2015). Finally, the framework also includes considerations of using patterns as inherently design-oriented tools, which requires outlining those framework properties that support the development of a so-called *pattern language,* i.e., a system that supports the identification of meaningful pattern combinations.

Pattern classification

Forty-five patterns were identified in a literature review and Delphi study process involving a group of ten experts from academia and business. The experts helped in developing the pattern groups and evaluating the patterns' potential to contribute to ecological, social, and economic value creation. The resulting taxonomy was built following the principles of classification theory in combination with a card-sorting procedure, which is an established approach often used to sort large of amounts of items into meaningful groups (a detailed description of the research methodology can be found in Lüdeke-Freund et al., 2018).

The SBMD pattern classification includes a wide range of design ideas to support organisations in creating ecological, social, and economic value. Table 1 offers an overview of all 45 patterns contained in the 11 groups. It is a revised and updated version of the original taxonomy proposed in Lüdeke-Freund et al., 2018. The associated forms of value creation indicated here are also found in the pattern triangle (Figure 1). This value creation potential provides an initial orientation for the selection of patterns for specific design tasks (e.g., tasks related to supporting greener products with a new business model design or making procurement more inclusive to local and small-scale suppliers).

The Cooperative and Community Platform groups each contain only one pattern. In fact, these two are not (yet) real groups. However, the classification is not carved in stone, but is an open system that can change and grow. The underlying taxonomy has been developed in a way that it explicitly allows for changes and additions. New patterns can be added to existing groups (extending the scope of groups) and new groups can be added to the current list (extending the scope of the classification).

Pattern navigation

The triangle shown in Figure 1 is a stylised sustainability triangle (Kleine and von Hauff, 2009). Each corner represents one of the main dimensions of sustainability, here redefined as representing major orientations of organisational value creation in terms of ecological value, social value, and economic value creation.

The positions of the patterns on the triangle express their association with economic, ecological, and social value creation. The association of each individual pattern with ecological value, social value, and

Table 1.

Pattern groups	Included patterns	Associated forms of value creation (primary and secondary)
(1) Pricing & Revenue Patterns that primarily address the revenue model of a business model, i.e., how offerings are priced and revenues generated.	(1) Differential Pricing (2) Social Freemium (3) Customer Financing (4) Subscription	Mainly economic Social-economic
(2) Financing Patterns that address the financing model within a business model, i.e., how equity, debt, and operating capital are acquired.	(5) Crowdfunding (6) Microfinance (7) Profit Reinvestment	Social-economic Mainly economic
(3) Ecodesign Patterns that integrate ecological aspects into key activities and value propositions, i.e., how processes and offerings are designed to improve their ecological performance.	(8) Green Razor and Blade (9) Resource Efficiency and Productivity (10) Sustainable Product Design (11) Renewable Resources and Natural Processes	Mainly ecological Ecologic-economic
(4) Closing-the-Loop Patterns that help integrate the idea of circular material and energy flows into partnerships, key.	(12) Co-Product Synergy (13) Industrial Symbiosis (14) Online Waste Exchange Platform (15) Product Recycling (16) Remanufacturing (17) Repairing (18) Reusing (19) Take-Back Management (20) Upgrading	Mainly ecological Ecologic-economic
(5) Supply Chain Patterns that modify the upstream or downstream parts of a business model, i.e., how inputs are sourced and target groups are reached.	(21) Green Supply Chain Management (22) Inclusive Sourcing (23) Micro Distribution and Retail (24) Virtual Sales and Distribution (25) Produce on Demand (26) Shorter Supply Chain	Integrative

Table. 1: Sustainable business model design patterns.

Table 1.		
Pattern groups	**Included patterns**	**Associated forms of value creation (primary and secondary)**
(6) Giving Patterns that help donate products or services to target groups in need, i.e., how costs are covered and social target groups are reached.	(27) Buy One, Give One (28) Data for Social Good	Social
(7) Access Provision Patterns that create markets for otherwise neglected target groups, involving new value propositions, channels, revenue, pricing, and cost models.	(29) Market Maker (30) e-Transaction Platforms (31) Experience-Based Customer Credit (32) Last-Mile Grid Service (33) Value-for-Money Education (34) Value-for Money Housing	Social-economic
(8) Social Mission Patterns that integrate social target groups in need, including otherwise neglected groups, either as customers or productive partners.	(35) Expertise Broker (36) Employing Minority Talent (37) Soup Kitchen (38) Socio-Economic Empowerment (39) Two-Sided Social Business	Social Social-economic
(9) Service & Performance Patterns that emphasise the functional and service value of products and offer performance management.	(40) Pay for Success (41) Product-Oriented Service (42) Use-Oriented Service (43) Result-Oriented Service	Mainly economic Ecologic-economic
(10) Cooperative Patterns that integrate a broad range of stakeholders as co-owners and co-managers.	(44) Cooperative Ownership	Social-economic
(11) Community Platform Patterns that substitute resource or product ownership with community-based access to resources and products.	(45) Sharing	Integrative
Sources: Lüdeke-Freund et al., 2018, 2022		

Table. 1: Sustainable business model design patterns *(Continued)*

economic value creation was determined with the help of the aforementioned Delphi study (Lüdeke-Freund et al., 2018). Thus, a pattern's position should be interpreted in the following way: The closer a pattern is located to one of the corners, e.g., close to the ecological corner, the stronger is its expected contribution to the respective form of value creation, e.g., ecological value creation. Patterns located between two corners are expected to create a mix of these two types of value. And those in the middle of the triangle are assumed to contribute to all dimensions of sustainable value creation. This way of reading the pattern positions allows users to search for different patterns based on the expected contribution in terms of economic, ecological and social value creation.

For example, pattern group 4 can be found on the left side of the triangle, positioned between the ecological and economic corner. This is the Closing-the-Loop group shown in Table 1 above. It consists of nine patterns that help in closing material and energy loops. Their position on the triangle indicates that these circular economy patterns mainly contribute to ecological and ecologic-economic forms of value creation. This group includes patterns such as *Take Back Management*, *Reuse*, or *Product Recycling*. Business model designers trying to make their organisations ready for the circular economy can look into this group and find some inspiration and practical examples.

As another example, the social part of the triangle also contains various patterns. Social sustainability challenges are often caused by a lack of access to basic supplies and services, such as food, health care, or education. These social challenges are often

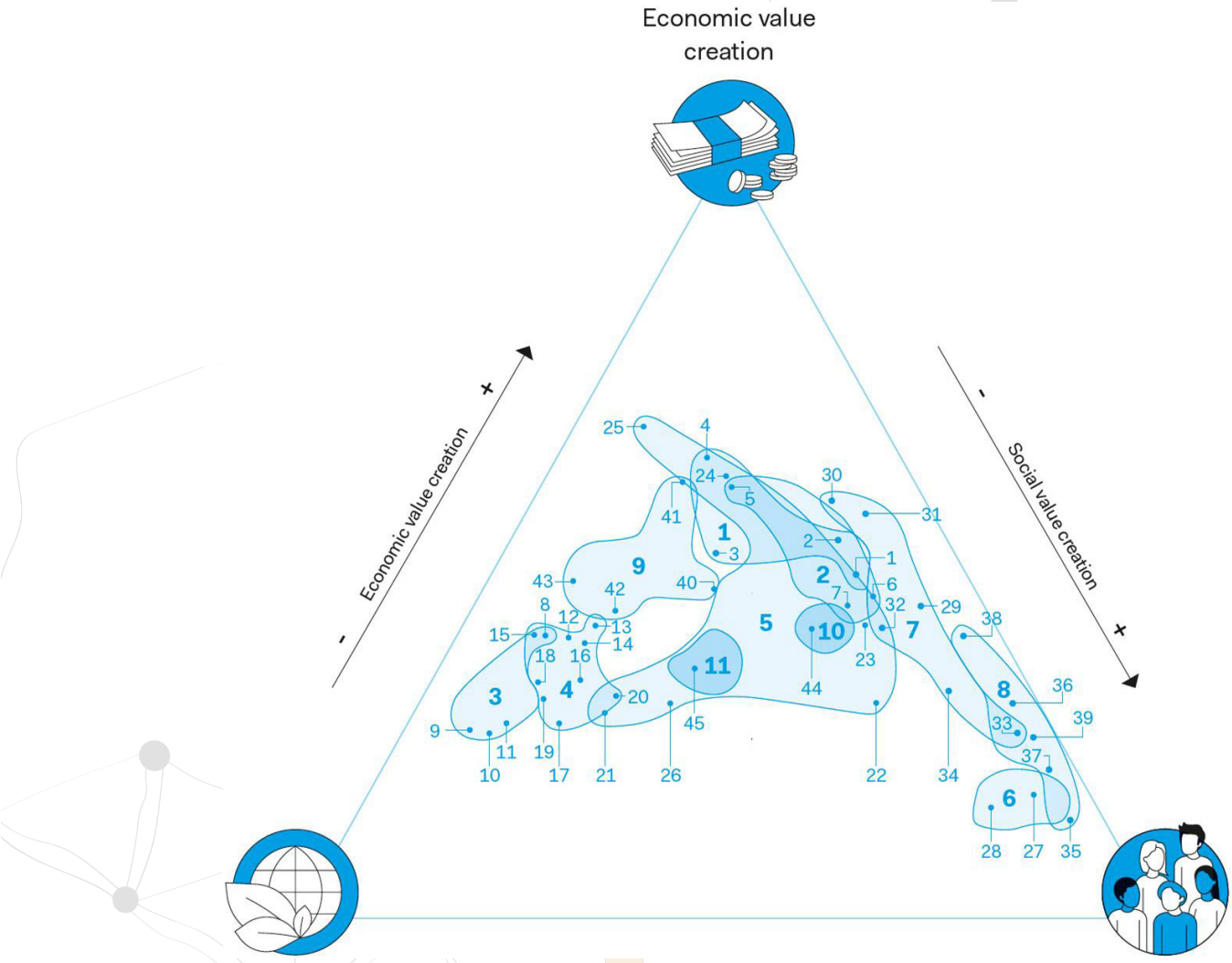


Figure 1: The sustainability pattern triangle.

coupled with economic and financial challenges. Families without money cannot afford to send their children to school or pay for medical services. Several groups, such as Access Provision, Giving, and Social Mission, include patterns that help organisations to design business models that are inclusive towards often neglected stakeholders and that make much needed supplies easier accessible for those in need.

Pattern types

Further analysis of the 45 patterns and more than 100 case examples revealed that the patterns differ in how they contribute to sustainable business model design (Lüdeke-Freund et al., 2022). In fact, this holds for other pattern classifications as well, but is often not made explicit. Only few authors point to this important feature of business model patterns (e.g., Abdelkafi et al., 2013; Remane et al., 2017). SBMD distinguishes between three pattern types: overarching, prototypical, and modular patterns (Figure 2).

Overarching patterns

Overarching patterns describe *major innovation orientations*. It is less about a specific business model design, but more about major design principles. These can be used to guide the development of complete business models or parts thereof. As an example, the pattern *Substitute with Renewables and Natural Processes* (Ecodesign group) proposes general principles of using renewable instead of finite resources and making use of nature-inspired production processes (this pattern was found, for example, in Bocken et al., 2014). These principles are not explicit about particular business models or their components, but they provide an overarching orientation for their design.

Prototypical pattern

This pattern type describes complete business models in the sense that a *consistent logic of value creation* is defined (cf. Remane et al., 2017). This does not require that every business model component is defined, which actually depends on the business model tool used, but that designers understand the implications for how to propose, deliver, create, and capture value with a complete and consistent business model design. As an example, the pattern *Data for Social Good* (Giving group) distinguishes different offerings for social and commercial target groups and how these offerings and target groups

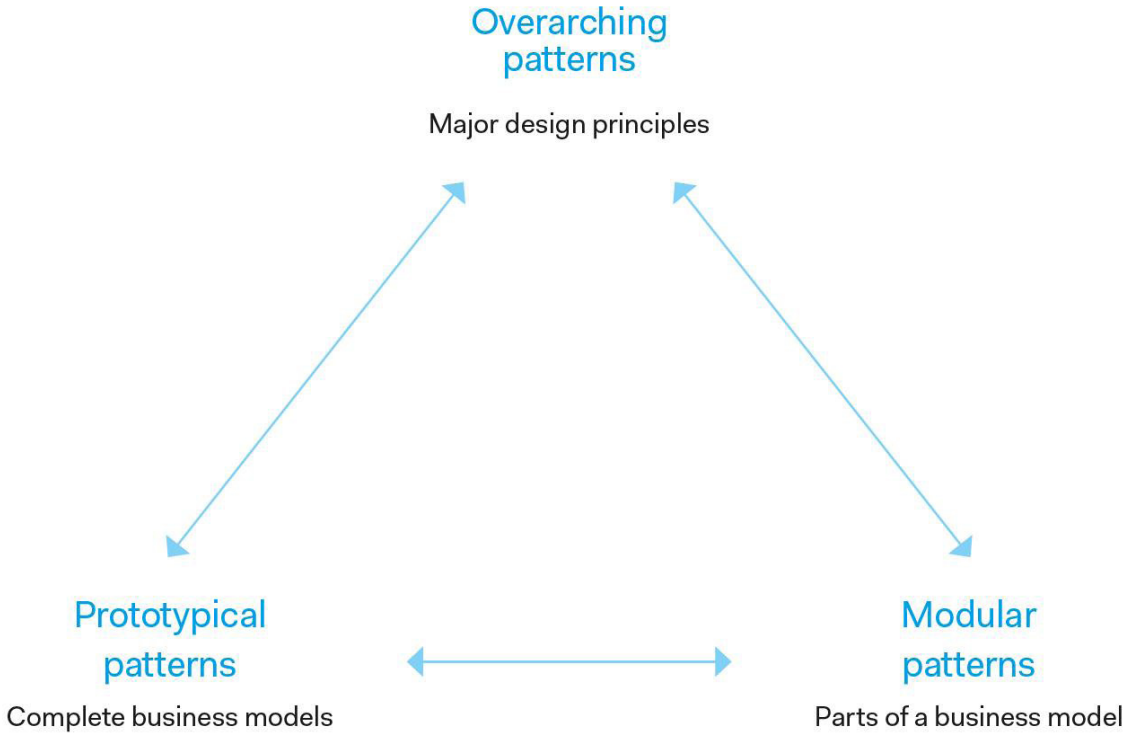


Figure 2: Three different pattern types.

interrelate (this pattern was found, for example, in Dohrmann et al., 2015). It also describes the role of the company applying this pattern and how, in general terms, serving social and commercial target groups can create a business opportunity.

Modular patterns

Modular patterns describe *selected parts of a business model*. Depending on the framework and level of detail, these parts are sometimes called sub-models, pillars, building blocks, elements, components, or something else. In SBMD they are referred to as 'modules.' A module can refer to any part, or several parts, of a business model, such as resources, processes, products, communication channels, revenue sources, and many more. As an example, the *Subscription* pattern (Pricing & Revenue group) describes how charging customers a recurring fee helps businesses generate reliable revenue streams with new and sustainability-oriented offerings (this pattern was found, for example, in Clinton and Whisnant, 2014). This modular pattern also allows for more effective investment and risk management for green and purpose-driven founders and business developers.

These three pattern types can be combined in various ways. Modular patterns can be combined to form complete business models, which in turn can resemble certain prototypical patterns. And these can in turn follow certain overarching patterns.

Pattern description

The framework elements introduced so far point to several important features of SBMD patterns: every pattern belongs to a certain pattern group (classification), helps in dealing with certain sustainability challenges (navigation), and contributes in a certain way to processes of business model design, from modules to principles and whole business models (types). In addition to these features, a pattern is typically described by referring to the contexts in which it can be useful, the specific problem-solution combination it proposes, and the relationships it has to other patterns (cf. Alexander et al., 1977, 1979).

Dealing with this significant amount of information and making the relative knowledge practical and readily comprehensible for application requires an efficient way of describing patterns. The SBMD framework makes use of the following elements to offer efficient descriptions of the 45 patterns: first, a *pattern title*, a *summary*, *hashtags*, and an *illustration* (a visual representation of the main idea behind the pattern) to provide an overview; second a description of the *challenge*, the *solution*, *case examples* related to the pattern and its application in practice; and, third, a description of *related patterns*, and an *outlook* for the full pattern description and further insights (e.g., boundary conditions). Table 2 shows the example of the *Green Razor and Blade* pattern (abbreviated).

Pattern language

The qualities of patterns, i.e., experience-based, generalised, and combinable, turn the SBMD framework into a (still rudimentary) *pattern language*. Just as a language consists of words and rules defining how to use and combine these words, a pattern language consists of patterns that can be used and combined to tell 'business model stories.' As Alexander and colleagues put it (Alexander et al., 1977, p. xiii): "... no pattern is an isolated entity. Each pattern can exist in the world, only to the extent that is supported by other patterns: the larger patterns in which it is embedded, the patterns of the same size that surround it, and the smaller patterns which are embedded in it."

For example, the *Use-Oriented Service* pattern can be supported by the *Subscription* and *Repairing* patterns to come up with a service business model that offers access to coffee machines and maintenance, based on regular payments by the customer and repair services provided by the supplier. This combination can furthermore be complemented by patterns such as *Take-Back Management* and *Remanufacturing* to create a complete business model that may resemble the *Green Razor and Blade* or another prototypical business model.

Using the SBMD patterns in such a way, also in combination with other pattern classifications (e.g., Gassmann et al., 2020; Remane et al., 2017), is like using a pattern language. This approach is particularly useful in the context of SBMD as sustainability challenges are per se multi-dimensional and often 'wicked.' However, combining different patterns will

Table 2.

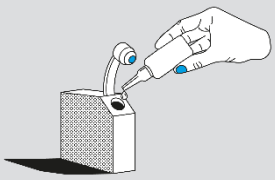
Pattern description element	Example
Title	Green Razor and Blade
Summary	Most companies depend on growing sales volumes and revenues – but how can they avoid increasing negative environmental impacts? While products that last can be an answer to this question, companies are still challenged to develop new revenue channels. The Green Razor and Blade pattern unbundles durable products and short-lived consumables to mitigate the negative effects of growing business.
Hashtags	#prototypicalpattern, #resourceefficiency, #productdesign, #unbundling, #modularoffering
Illustration	
Challenge	Traditional business models often build on the idea of constant sales growth, and thus increasing resource consumption. How can you open up new and growing revenue streams to run a successful business selling long-lasting products?
Solution	The solution is a modular offering that combines a durable product (the 'razor') with shorter-lived consumables (the 'blade'). Unbundling an offering can help you save resources and reduce negative environmental impacts.
Case example	'Sustainable bubbles' and SodaStream. The amount of plastic bottles used for sparkling water and lemonade, and related logistics, can be significantly reduced if consumers prepare beverages at home. SodaStream, founded in 1903 and based in Tel Aviv, is mainstreaming home-made sparkling water and lemonade.4 The company sells sparkling water makers for home use, gas cylinders, flavours, and other accessories like design bottles ...

Table 2: Exemplary pattern description – the Green Razor and Blade pattern.

Related patterns	This pattern can be combined with patterns from the Ecodesign and Service & Performance groups, notably *Product-Oriented Service* and *Use-Oriented Service*, *Resource Efficiency and Productivity*, or *Sustainable Product Design*. As well as patterns from the closing-the-loop group ...
Outlook	The *Green Razor and Blade* pattern is about unlocking a firm's ability to reduce resource consumption by creating the conditions for profitably marketing products that are built to last coupled with highly reusable or recyclable disposables or components, as in the case of SodaStream. The main limitations of this model mostly come from the initial purchasing price of the main product, which may be more expensive than less durable ones ...
Source: Lüdeke-Freund et al., 2022	

Table 2: Exemplary pattern description – the Green Razor and Blade pattern *(Continued)*

also create knock-on effects such as tensions and trade-offs, and sometimes maybe even paradoxical situations presenting new challenges to designers, innovators, entrepreneurs, and managers in search for better business models.

Designing Sustainable Business Models with SBMD Patterns

The SBMD framework offers two complementary approaches to support the design of sustainable business models. The first is to serve as a reservoir of possible solutions for tackling already identified challenges – the *problem-solving approach.* The second is to function as a practical means of discovering untapped value creation opportunities that have not been explored before – the *generative approach.*

The problem-solving approach

The problem-solving approach presumes an existing and profound comprehension of the sustainability challenge faced by an organization (e.g., to reduce production waste and emissions). This approach is typically used by business model designers motivated by ethical values and entrepreneurial ventures driven by ecological or social objectives. Moreover, it proves highly conducive in the context of coaching and teaching sustainability entrepreneurship, management, and innovation.

The initial phase of the problem-solving approach involves an in-depth scrutiny of the targeted challenge. This is followed by identifying patterns that can effectively address the different facets of the problem at hand. Subsequently, these identified patterns can serve as reference points or even comprehensive templates for the development of solutions. While prototypical patterns with their complete business model ideas suffice for this purpose, overarching and modular patterns are also equally effective in achieving the goal of finding solutions to a given problem. In its generic form, the problem-solving approach includes the five main steps outlined in Table 3. These steps can be integrated into any kind of business ideation and modelling process and can be combined with various other tools (e.g., Santa-Maria et al., 2022).

Proven practical applications include teaching in sustainability entrepreneurship, management, and innovation programmes for undergraduate and graduate students, as well as specialised executive

Table 3.

Steps	Main activities
1. Understand	Develop a deeper understanding of the sustainability challenge in its context; consider the stakeholders involved. Look into the root causes of the environmental, social, or economic problem to be addresses. Follow the guiding question: Why are things the way they are?
2. Set the course	Find patterns that seem to have the greatest potential for the task at hand. Use the pattern groups, the triangle, and the patterns' cross references. Is the challenge primarily of an environmental, social, or economic one?
3. Review and select	Study the identified patterns more closely, as well their related patterns. Review their challenges sections and then the full pattern description, until the one pattern is found that offers the most promising starting for the business model design task.
4. Adapt and combine	Get inspiration from the short cases and their real-world examples. The pattern's outlook section and the recommended readings offer further information about the conditions under which a pattern works more or less effective. Often, it will be helpful or even needed to combine different patterns to design a new business model.
5. Model	Use the identified pattern(s) and information from the research and the case examples to develop a new business model. Larger and mixed groups, in terms of disciplines, types of expertise, and stakeholder groups, are recommended. Combining the patterns with modelling tools such as the 'Business Innovation Kit' (Breuer and Lüdeke-Freund, 2018), the 'Triple-Layered Business Model Canvas' (Joyce and Pacquin, 2016), or the 'Flourishing Business Canvas' (Upward and Jones, 2016) helps structure the modelling process. (For an overview of tools see Breuer et al., 2018).
Source: Lüdeke-Freund et al., 2022	

Table 3: Five steps of the problem-solving approach.

education courses, for example, on sustainable energy management, environmental, social, and governance (ESG) issues, and sustainable business design. In addition, a growing number of practicing business developers, innovation managers, and consultants are making use of this approach, working on their own or their clients' sustainability challenges.

Illustrative example (patterns in italics)

A team of business developers is working on the challenge of integrating recycling into their existing business model. Nowadays, manufacturing companies are experiencing increasing pressure to respond to regulation related to the reduction of production waste and emissions. For example, such companies are expected to take back electronic waste and hence to find ways to turn it into something useful which, in the best case, improves their economic models. This can be achieved with approaches such as remanufacturing or recycling.

In such a case, the Closing-the-Loop patterns group can look promising. The team can start by designing different *Take-Back Management* channels and *Product Recycling* activities. They may even realise that *Product Recycling* could become a lucrative business model itself, for example by developing a fully integrated model that combines taking back, sorting, and purifying of base materials and selling these via additional channels, such as *Online Waste Exchange Platforms*. Instead of seeing recycling as a burden and just a new activity within an existing business model in response to legal requirements, the team can work on creating an entirely new business segment around *Take-Back Management* and *Product Recycling*. Using the SBMD patterns in this way turns solving a problem into an inspiration for new business model designs.

The generative approach

In the generative approach patterns are used to develop new opportunities for sustainable value creation that may not have been considered before (e.g., because of cognitive distance between the user and the idea presented by the pattern). This approach is generally characterized by an opportunity-seeking stance. It is more flexible and less structured compared to the problem-solving approach and resembles an open and discovery-driven ideation process. There are two main ways to apply the SBMD patterns within the generative approach as shown in Table 4. The first way applies when developing a completely new business idea with sustainability in mind when

Table 4.

Context of using the generative approach	Characteristic of the context
Business model is lacking, but business idea is given	A basic business idea does exist, e.g., based on a new kind of product or service, but a clear idea for a business model and hence logic that would allow bringing this idea to the market is missing. E.g., a new and already tested product design does exist, but customer channels, pricing models, etc. are still missing.
Business model exists, but needs to be changed	An organisation has an already established business model and uses the SBMD patterns to adapt, expand, or revise their business model as they perceive new value creation opportunities. For example, a company producing electronic devices finds out that there is growing demand for repair and upgrade services. The patterns can provide ideas for how to make use of this new value creation opportunity.

Source: Lüdeke-Freund et al., 2022

Table 4: Main contexts of using the generative approach.

still needing to design the corresponding business model. For example, when a new line of environmentally friendly products made from recycled materials has been developed, the foundation for sustainable value creation is given through *Sustainable Product Design*. However, a suitable business model is still needed to bring these products to the market and help the company propose, deliver, and capture value. The second way involves using the SBMD patterns to adapt or even completely rethink existing business models. If a business is already up and running, the patterns can provide guidance towards new opportunities for sustainable value creation. In both cases, with or without existing business model, the process starts by taking a high-level look at the patterns and drawing inspiration from the examples and pioneers they present.

Illustrative example (patterns in italics)

The fictitious example of designing a new business model for an innovative mobility service can be used to illustrate the generative approach. In this case, the opportunity lies in developing a business model for a new mobility service that provides real-time journey information and includes guidance on environmentally friendly travel options. This involves helping users determine when to leave home, where to board a bus, how to locate their train at the station, and how to handle unexpected challenges like delays or a lack of wheelchair accessibility.

The *Resource Efficiency and Productivity* pattern can serve as a heuristic to generate initial ideas and explore ways to maximise the efficiency and productivity of resources, particularly in the context of reducing mobility-induced emissions. Key considerations may include formulating new value propositions for travellers with pro-environmental values and identifying additional stakeholders to enhance the entire mobility system. Additionally, exploring opportunities to introduce new revenue streams through supplementary services is essential. Delving into the available patterns, *Data for Social Good* stands out as it offers the potential to provide a free product to one group (e.g., eco-conscious travellers) while generating revenue from another (e.g., mobility providers using the data to optimise their offerings). Adapting this approach leads to the concept of offering free energy consumption tracking tools to better calculate the environmental impact of intermodal mobility. These tools also empower all users and customer groups to reduce their energy consumption, costs, and carbon emissions. In addition, a *Social Freemium* model can be consideration to achieve a critical user mass. Here, the idea could be to extend the freemium model to encompass social groups that may be unable or unwilling to pay for mobility services, while other segments are maybe willing to pay for more eco-friendly premium offerings. Overall, using various SBMD patterns in combination allows turning an initially vague opportunity – offering real-time and environmental information to travellers – into a comprehensive business model design – an eco-efficiency-promoting *Social Freemium* and *Data for Social Good* model.

Patterns and the Power of Analogical Reasoning and Conceptual Combination

Although the SBMD framework builds on years of research and the expertise of various experts from academia and business, and although the uptake of this approach in teaching and practice is huge, one may ask whether and why this approach to designing better business models is effective. As argued above, patterns are experience-based problem-solution combinations that have proven their practical usefulness. The SBMD patterns were identified in a wide range of publications, including a large amount of case studies. In addition, first-hand experience of the authors as teachers, coaches, and advisors suggests that the patterns are not just effective tools for simulated and real business design projects, but also invite users to explore use cases that were not anticipated.

For example, in the case of a German SME specialised in food packaging technology, the SBMD patterns were used to structure and prioritise the company's sustainability activities. This company was in the process of creating an overview of ongoing ESG initiatives and was searching for a more structured and strategic approach to dealing with

them.[1] While the initial idea was to assist the company in developing new approaches to implementing and executing their initiatives more effectively, they also utilised the SBMD framework as a tool to structure and prioritise their ESG initiatives. In other words, these users found value in the patterns as tools for ESG strategy development.

So, why are the SBMD patterns an effective source of creativity? A reasonable hypothesis (to be tested as suggested in Massa and Hacklin, 2020) is that they support what Martins and colleagues call 'analogical reasoning' and 'conceptual combination' (Martins et al., 2015). Building on the idea of business models as mental models (e.g., see Massa et al., 2017), they theorise on the "processes through which schemas [i.e., mental and linguistic models] can be changed to ideate and design new business models in the absence of exogenous change" (Martins et al., 2015, p. 100). Which is, they theorise on how new ideas for business model design emerge, particularly when taking a proactive – as opposed to reactive – approach to business model design, stemming from the idea of designing a desirable future. Their theory suggests that analogical reasoning and conceptual combination can be used to explain the emergence of new business model ideas.

Analogical reasoning "refers to use of the knowledge contained in the schema about one domain (termed 'source') to interpret information in another domain (termed 'target')". *Conceptual combination* "is a cognitive process through which a focal/target concept is combined with a modifier/source concept in order to create a new concept. It preserves core similarities with the target concept, but it generates essentially a new concept through the integration of attributes derived from the modifier/source concept" (Martins et al., 2015, p. 104). We can use an anecdote from our executive education experience to illustrate how the SBMD patterns can trigger these cognitive processes.

We taught a one-day SBMD course to executives from diverse branches of the energy industry. Their challenge was to extend the existing business model of an already quite successful company that operates a successful multisided platform that matches demand for and supply of solar photovoltaic installations in Germany. One of the key challenges faced by this company is finding enough solar installers, such as electricians and other experts, to be able to scale and sustain the strong growth of their business. The participants in the SBMD executive education course followed the problem-solving approach outlined above, and after investigating the challenge and its roots causes in more detail they found inspiration in the *Socio-Economic Empowerment*, *Expertise Broker,* and *Sharing* patterns. They developed the idea of an industry-wide 'Solar Power Academy' that brings together various actors from the industry, some of which are typically competitors, to join forces in the education of solar installers and other much needed solar technology experts.

Looking at this case from the perspective of the cognitive business model innovation theory by Martins and colleagues, we see that the participants engaged in analogical reasoning as they transferred the notions of empowerment (typically applied in developing country contexts), expertise brokerage (typically a social or non-profit business activity), and sharing (typically applied by scalable businesses in the access economy) to the case of solar installations. The main analogies they found in these patterns referred to empowering a specific target group (solar installers), bundling the expertise of different actors (solar companies and educators), and then sharing access to the pool of newly emerging experts (the educated specialists in solar installations and technologies). At the same time, the participants engaged in conceptual combination as they worked with the three patterns, because their 'Solar Power Academy' model had "new attributes that were not present in either constituent concept" (Martins et al., 2015, p. 104), such as empowering a target group in an industry nation context through brokering the expertise of commercial actors, and then interpreting sharing not as an access economy model for a single commercial sharing company, but from the perspective of competitors who share the 'assets' they co-develop as collaborators.

[1] ESG stands for corporate activities related to environmental, social, and governance issues. Companies frequently refer to ESG initiatives as a way of addressing sustainability concerns.

So far, there is plenty of anecdotal evidence like this to illustrate the effectiveness and explain the uptake of the SBMD approach. However, future research should investigate the cognitive processes and characteristics of the associated business ideation and modelling processes in a more systematic manner. The goal would be to identify those cognitive mechanisms and design methods that enable students, industry experts, and all sorts of business model designers to develop sustainable business models more effectively.

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