
Sustainability-oriented business model development: principles, criteria and tools

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Abstract: A shared understanding of the basic requirements for modelling sustainability-oriented business is currently missing. This is hindering collaboration, exchange and learning about sustainability-oriented business models as well as the development of suitable and widely-accepted modelling tools. We contribute toward such a shared understanding based on a theoretical

discussion of boundary-spanning and interactive business model development for sustainable value creation. The theoretical discussion feeds into a comparative analysis of the six currently available practitioner tools supporting the exploration and elaboration of sustainability-oriented business models. By synthesising findings from theory and available tools, we define four guiding principles (sustainability-orientation, extended value creation, systemic thinking and stakeholder integration) and four process-related criteria (reframing business model components, context-sensitive modelling, collaborative modelling, managing impacts and outcomes) for the development of sustainability-oriented business models.

Keywords: corporate sustainability; business model; business model development; business model tool; value creation; innovation; innovation management; sustainable entrepreneurship; activity system; interaction economics; stakeholder; stakeholder integration; start-up; corporate venturing; impact management.

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1 Introduction

Within the last decade, the innovation management discourse has moved its attention from products and services, corporate resources and capabilities and revenue models as focal issues toward a more strategic and comprehensive view on business models, which, from a conceptual perspective, comprise several of these components (e.g., Baden-Fuller and Morgan, 2010; Wirtz et al., 2016). In parallel, the limits of purely profit-oriented business models have been revealed and the potentials and promises of sustainability-oriented business models (SBMs) are increasingly being identified and discussed (e.g., Kiron et al., 2013; Schaltegger et al., 2016a; Seelos, 2014). The development of SBMs requires not only substantial shifts in our understanding of business models, but also in their design requirements. While most business model concepts take a single-actor or 'egocentric' perspective of one focal firm, some scholars point to the importance of multi-actor concepts and extended value definitions in the context of sustainability (e.g., Bocken et al., 2013; Jones and Upward, 2016; Stubbs and Cocklin, 2008; Weber and Kratzer, 2013; Wells, 2016). In order to account for ecological, social and financial bottom lines and the diverse stakeholders who are affected by highly interconnected business activities, we need to consider the interactions among different actors within open activity systems (Zott and Amit, 2010).

'Business models as models' (Baden-Fuller and Morgan, 2010) play a crucial role in designing these activity systems. Baden-Fuller and Morgan (2010, p.156) argue that business models can be used "to describe and classify businesses; to operate as sites for scientific investigation; and to act as recipes for creative managers." It is the latter function of business models to provide principles, ingredients and their composition that we focus on in this article. We seek to understand the requirements needed for the development of SBMs.

However, a shared understanding of the basic requirements for SBMs is still missing (Kurucz et al., 2017; Schaltegger et al., 2016a; Upward and Jones, 2016). This is needed to empower sustainability-oriented entrepreneurs, to support experimentation with business model design patterns and to facilitate comparative research. Therefore, based on theoretical discussions and a comparative review of existing tools, this paper asks: What are the minimum requirements to constitute SBMs and how can their development be supported in practice? Our goal is to foster the exploration and elaboration of SBMs

based on a shared understanding of these requirements. This should help to avoid an inflationary branding of business models and development processes as being considered “sustainable” if they do not even fulfil these minimal requirements, as well as to reframe and redirect business efforts toward sustainability.

Until now, no comparative and integrative study exists that systematically looks at the distinct principles and process characteristics needed for the development of SBMs. To fill this gap, we review contributions from the literature regarding such principles and criteria, develop a theoretical framework for analysing different approaches of business model development. We propose minimal requirements for sustainable business modelling based on a synthesis of academic insights and on a comparative analysis of six available tools.

2 Current research on requirements for SBMs

Academics and practitioners are increasingly discussing the relationship between business models, innovation and sustainability (e.g., Bocken et al., 2014; Boons et al., 2013; Pedersen et al., 2016; Wells, 2016). However, SBMs need to diffuse and scale up in order to be effective (Schaltegger et al., 2016b). A shared understanding of not only what constitutes a SBM, but also of frameworks as well as of tools to design and implement SBMs is required to facilitate a widespread diffusion of social, technological and organisational sustainability innovations (Kurucz et al., 2017; Upward and Jones, 2016). Nonetheless, both research and practice are missing such a shared understanding in regard to SBMs [Schaltegger et al., (2016a); the notions of ‘SBM’ and ‘business model for sustainability’ are abbreviated in the following as ‘sustainable business model’, or ‘SBM’]. Consequently, most of the currently available theoretical and empirical work deals with examples from specific fields such as mobility (e.g., Abdelkafi et al., 2013; Bohnsack et al., 2014; Cohen and Kietzmann, 2014), renewable energies (e.g., Looock, 2012; Richter, 2012), or social entrepreneurship (e.g., Grassl, 2012; Seelos, 2014; Seelos and Mair, 2005; Yunus et al., 2010), but it hardly offers any type of general design principles or practical guidance for the development of SBMs. In a similar vein, though with an organisational rather than a business model focus, Parrish (2010, p.513) describes principles for sustainability-oriented organisations. Hence, there is no consensus yet on what constitutes SBMs nor on how they can be developed. We found only three articles that explicitly define SBM requirements (Table 1).

In summarising the commonalities of these three approaches, we see that they share the idea of conceptual extension: from customers to stakeholders, from monetary to multiple forms of value, from a single business to a network perspective and from a purely organisational to an embedded systems view. The requirements for SBM development integrate and extend these findings (Section 6). They confirm the essence of Stubbs and Cocklin’s (2008) SBM characteristics and Boons and Lüdeke-Freund’s (2013) normative requirements. However, whereas these authors define characteristics that ought to be found in realised business model, our aim is to propose requirements for SBM development as a process. And while Upward and Jones (2016) use their formative propositions to create a new business model ontology, our aim is to offer guiding principles and process-related criteria that are independent of any particular ontology or realised business model.

Table 1 SBM requirements defined in the existing literature

<i>Stubbs and Cocklin (2008)</i>	<i>Boons and Lüdeke-Freund (2013)</i>	<i>Upward and Jones (2016)</i>
A SBM draws on economic, environmental, and social aspects of sustainability in defining an organisation's purpose.	Customer value proposition. Deliver customer value propositions in concert with balanced and measurable positive effects on environment and society.	Definition of a strongly sustainable firm: an organisation that creates positive environmental, social, and economic value throughout its value network, sustaining the possibility that human and other life can flourish on this planet forever.
A SBM considers the needs of all stakeholders rather than giving priority to shareholders' expectations.	Business infrastructure: engage in partnerships to enhance resources and capabilities for corporate sustainability and supply chain management.	Definition of value: a strongly sustainable business model must co-create value with all an organisation's stakeholders: customers, shareholders, social, and environmental constituents, any and all actors in the value constellation.
A SBM treats nature as a stakeholder and promotes environmental stewardship.	Customer interface: motivate and help customers to take care for the effects of their consumption and consider an extended product responsibility.	Definition of a business model: reformulated as a systemic model of business as a social system within its containing systems of economy, society, and environment.
Sustainability leaders, or champions, drive the cultural and structural changes necessary to implement sustainability.	Financial model: develop inclusive pricing models and align ownership models with the need for 'patient' capital; make use of triple-bottom-line accounting and reporting.	Definition of tri-profit: a tri-profit metric is calculated as the net sum of the costs (harms) and revenues (benefits) arising as a result of a firm's activities in each of the environmental, social, and economic contexts.
A SBM uses a triple bottom line approach in measuring performance.		
A SBM encompasses the systems perspective as well as the firm-level perspective.		

3 Theoretical background: business models as boundary-spanning, interactive and planned systems

Before we compare the different SBM tools and analyse the design requirements, we first create a compilation of relevant theoretical prerequisites for business model development. This serves as a frame of reference for the following analysis and discussion. Following

this review, it can be concluded that in order to consider diverse stakeholders and their interests in the development of SBMs, openness and interaction beyond the focal firm are crucial. Corresponding theories with an emphasis on openness and interaction can be found in the business model and innovation literature: first, Zott and Amit's (2010) theory of business models as *boundary-spanning activity systems* and second, an *interaction economics* perspective on innovation (Fichter, 2014). Since business model development requires a proactive approach, we will also discuss the difference between planned and realised business models, based on Mintzberg's (1998) notions of intended and realised strategies.

3.1 *The business model as a boundary-spanning activity system*

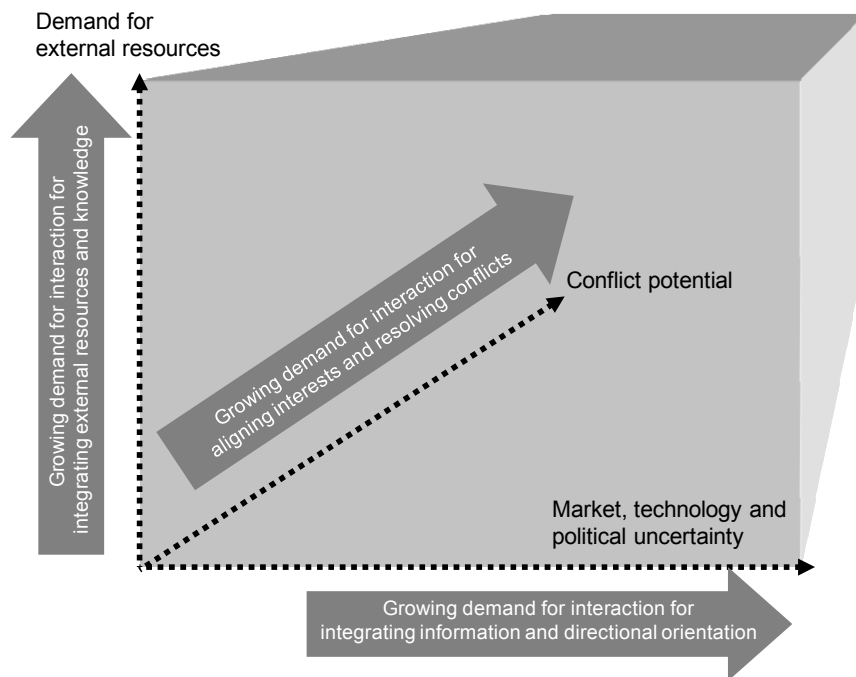
Zott and Amit (2010, p.216, italics added) define a firm's business model as "a system of interdependent activities that transcends the focal firm and spans its boundaries." The notion of 'boundary-spanning' was laid out in a seminal article by Aldrich and Herker (1977) as an alternative perspective on organisation-environment interaction. Similar to Aldrich and Herker (1977), Zott and Amit (2010) propose to focus on cross-boundary interdependencies and interaction on a business model level. Although it takes a firm-centric view, the special feature of their activity systems approach is the deliberate integration of third parties' activities into a firm's business model. Based on this understanding, Zott and Amit (2010, p. 216; italics added) argue that this "activity system enables the firm, *in concert with its partners*, to create value and also to appropriate a share of that value." An activity is defined as "the engagement of human, physical and/or capital resources of any party to the business model (the focal firm, end customers, vendors, etc.) to serve a specific purpose toward the fulfilment of the overall objective" and an *activity system* is "a set of interdependent organisational activities centred on a focal firm, including those activities conducted by the focal firm, its partners, vendors or customers, etc." (ibid., p.217). In other words, according to Zott and Amit, business models are open and interactive systems.

3.2 *Business model development from an interaction economics perspective*

Complementary to Zott and Amit's (2010) business model theory, interactive innovation theories highlight three *specific functions of social interaction* (Fichter, 2014). First, the need to *integrate external resources and knowledge* is increasing due to an increasing division of labour and specialisation of knowledge. Accordingly, social interaction is a means to integrate internal and external resources of firms. Second, increasing market dynamics and industry clock speed lead to insecurity about the direction of business development and innovation (Amit and Zott, 2001). Social interaction can help to *integrate the information and provide the directional orientation* firms need to define and execute their development and innovation programs. It can thus serve as a means to reduce technological and market risks. Third, different actors, including firms, private households, regulators and further stakeholders, pursue different values and follow different interests and goals. Conflicts are unavoidable in complex social systems.

Interaction can lead to tensions, but, more importantly, it also acts as a means for their resolution. The more complex and networked our social and economic systems become, the more we need loci for interaction to *resolve conflicts and align the interests and goals of different actors*. A crucial task in this regard, which has only recently been identified as an innovation management issue, is the identification and integration of the normative values of different innovation actors (Breuer and Lüdeke-Freund, 2015a, 2017a, 2017b).

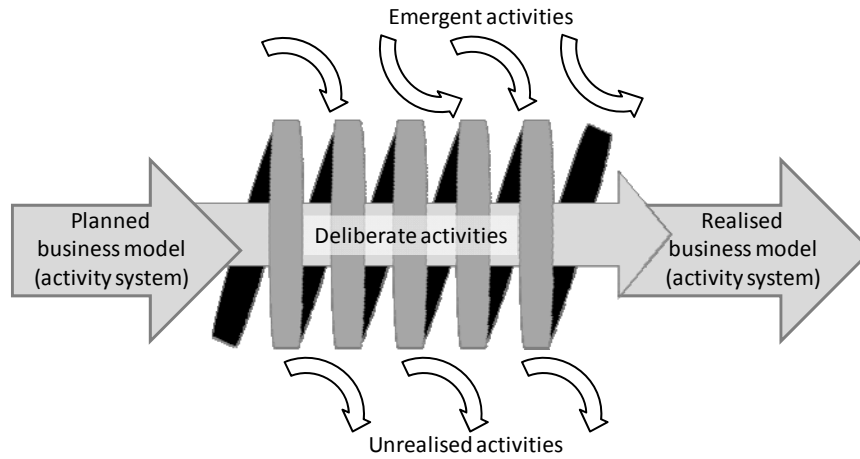
Figure 1 Core functions of social interaction in innovation processes



Source: Fichter (2014, p.75) translated by authors

3.3 The difference between planned and realised business models

In analogy to distinguishing between intended and realised strategies (Mintzberg et al., 1998), we find that Zott and Amit (2001, 2007, 2010) inherently focus on business models as *realised* activity systems. This is different from seeing a business model as a *planned* activity system, e.g., created and described with templates or other kinds of design tools. In SBM development adding social and ecological aspects to a design or planning tool is not the same as actually realising socially or ecologically sound business activities in practice (such as implementing more efficient production processes or creating and marketing products with a social purpose).

Figure 2 From planned to realised business model

Source: Adapted from Mintzberg et al. (1998)

As a consequence, differences between planned and realised business models and their corresponding activity systems are likely to occur (Figure 2). SBM development has to take this into account and should reflect differences between planned and realised business models. The guiding principles and process-related criteria applied in SBM development must therefore give according orientation.

3.4 Summary: theoretical prerequisites for SBM development

Summing up the theoretical prerequisites, the activity system approach (Zott and Amit, 2010) points to the need to see the business model as a boundary-spanning activity system, while interaction economics stresses social interaction not only as crucial to integrate internal and external resources (also in line with Zott and Amit's theory), but also to provide orientation, resolve conflicts and align different actors' interests (Fichter, 2014). Furthermore, we conclude that SBM development needs to be facilitated in a way that allows for managing the divergence between planned and realised SBMs, while keeping up their sustainability potential.

Table 2 Theoretical prerequisites and implications for SBM development

<i>Theoretical prerequisites</i>	<i>Implications for SBM development</i>
1 Spanning organisational boundaries	SBM development facilitates interaction between a focal firm and its stakeholders and integrates their activities
2 Integrating internal and external resources	SBM development provides access to internal and external resources and capabilities, incl. information, knowledge
3 Providing for directional orientation	SBM development defines directives and reduces risks based on actors' interaction and integrated knowledge
4 Resolving conflicts and aligning interests	SBM development allows to identify and resolve tensions between actors and to align their interests
5 Reflecting differences between planned and realised business models	SBM development reflects the differences between planned and realised business models as well as unrealised and emergent activities

Table 2 summarises these theoretical prerequisites and their implications for SBM development as reference points to define and refine distinct guiding principles and process-related criteria for SBM development.

In the next step, after presenting our methodology (Section 4), we introduce six SBM tools (Section 5). We will show how these tools address the previously defined prerequisites and how their responses translate into distinct requirements for SBM development (Section 6).

4 Methodology

While some publications propose requirements for SBM development, so far there is no comparative study available that takes a systematic look at SBM tools and their underlying guiding principles and process-related criteria. Therefore, we build on the available theoretical literature (Sections 2 and 3 and compare currently available tools in a qualitative meta-analysis (Section 5). We analyse their similarities and differences to understand the requirements they imply for SBM development. We applied the following methodology:

- 1 *Extensive literature review*: we used a systematically compiled literature database to identify SBM tools¹. This database was originally compiled for the Network for Business Sustainability South Africa (NBS-SA) and contains SBM articles published between 2003 and 2015 (Lüdeke-Freund et al., 2016). Out of 1,724 articles a subsample of 180 was identified as potentially relevant. While the NBS-SA team refined this subsample for their own research purposes, we used it to identify tools. To do so, the articles were screened and classified (e.g., according to research methods and theories) in an Excel sheet.
- 2 *Selection of relevant SBM tools*: we identified relevant SBM tools based on two selection criteria: first, sustainability is an explicit normative orientation for business model development and second, the tools' underlying assumptions and theoretical foundations are explicated. We identified six tools (Section 5).
- 3 *Analysis and comparison of SBM tools*: we analysed and compared the tools according to three key categories:
 - a target group
 - b guiding principles explicitly mentioned to give orientation for SBM development
 - c process-related criteria explicitly proposed to support SBM development.

This comparison was consolidated in a table where the key characteristics of each tool were grouped according to the emerging guiding principles and process-related criteria (Table 3).
- 4 *Defining and refining requirements for SBM*: based on the previously defined theoretical prerequisites (Section 3) and the systematic tool comparison (Section 5), we defined and refined four guiding principles and four process-related criteria (Section 6). These were enriched by findings from the literature (Section 2).

The methodology involved several iterations combining inductive generalising (identifying principles and criteria from the ‘empirically’ available tools) with deductive reasoning (deriving principles and criteria from theories and basic concepts), as well as abductive inferencing to seek new order based on the interpretation of data and queried knowledge [Reichertz, (2004), p.163]. This approach faces some limitations. SBM theories and concepts are still considered recent and are in need of further empirical validation. Additionally, available SBM tools are scarce. Existing tools are still being refined and their proven practicality, maturity and usefulness differ widely. While our results should be replicable for others working with SBM literature and tools, we aim to produce useful and ‘usable (re-)constructions’ (ibid.) for researchers, tool developers and practitioners.

5 Approaches and tools for developing SBMs

Several tools have been developed to support practitioners in planning and implementing SBMs. Our two selection criteria (Section 4) helped us, on the one hand, to identify the tools described below and, on the other hand, to sort out tools that are not explicitly sustainability-oriented. As a result, we excluded three tools: ‘dialogic change model’ (Collective Leadership Institute, 2013), the ‘social business model canvas (BMC)’ (Social Innovation Lab, 2013) and the ‘social lean canvas’ (Yeoman et al., 2014). The following six SBM tools are used in our comparative analysis:

- 1 The ‘flourishing business canvas’ (FBC) is a visual template based on the ‘strongly sustainable business model ontology’ (Upward, 2013; Jones and Upward, 2014; Kurucz et al., 2017; Upward and Jones, 2016). It proposes a modelling technique for stakeholder-oriented design of enterprises that enable ‘flourishing’ across living ecosystems and organised social systems. The FBC has been iteratively refined and tested by managers and stakeholders through business model design workshops.
- 2 The ‘value mapping tool’ (VMT) was developed to help companies and their wider stakeholder networks design value propositions as a part of sustainable business modelling (Bocken et al., 2013). Building on literature and practice, the VMT was developed and pilot-tested in student and practitioner workshops.
- 3 The ‘business innovation kit’ (BIK) and its extension, the ‘sustainability innovation pack’ (SIP), take a values-based, didactic approach to modelling new and SBMs (Breuer, 2013, 2016; Breuer and Lüdeke-Freund, 2015b, 2017a, 2017b). The BIK was developed with more than 30 student entrepreneurs and start-ups. It was used more than one hundred times in educational settings, corporate innovation projects and corporate ventures.
- 4 The ‘sustainable business canvas’ (SBC) was developed within the context of the StartUp4Climate initiative (i.e., the world’s first national start-up initiative for the green economy) to support entrepreneurs and start-up teams in their design of SBMs (Tiemann and Fichter, 2015). The concept was evaluated in workshops within educational and start-up competition contexts and is available as an online tool.

- 5 Joyce et al. (2015) (updated in Joyce and Paquin, 2016) propose the ‘triple-layered business model canvas’ (triple-layered BMC) to guide organisations in designing more sustainable business models. The structure of the tool was developed by consulting with experts, practitioners and researchers. It has been evaluated in innovation workshops.
- 6 Foxon et al. (2015) developed the ‘business model canvas extended for infrastructure’ (BMC infrastructure) for private and public decision-makers in the area of infrastructure investments. This tool allows designing infrastructure business models that incorporate economic, social and environmental value streams and propositions. Its usefulness has been demonstrated through two case studies on the development of smart power grids and local heat delivery networks in the UK.

Comparing the six tools, we distinguish between:

- a the context and target groups they are designed for (e.g., established companies)
- b the guiding principles they use to give orientation for SBM development (e.g., to extend the notion of value)
- c the process-related criteria that characterise the development process and tool (e.g., to support collaborative processes).

Table 3 presents the results from our comparative analysis. It shows commonly used guiding principles and process-related criteria derived from these tools (Table 3).

We made the following observations. The underlying concepts consider (sometimes implicitly) different *target groups and contexts*. There is a strong focus on practitioners, but academic lecturers and students are also considered (BIK, SBC). The practitioner target groups vary from established organisations (triple-layered BMC) to start-ups (SBC). Some tools consider different decision-makers, e.g., those who make decisions for private or for public infrastructure investments (BMC infrastructure).

In terms of *guiding principles*, the six tools share an explicit sustainability orientation (e.g., ‘triple bottom line’ for the triple-layered BMC and SBC, ‘strong sustainability’ for the FBC, or ‘values-based and normative management’ for the BIK). They all take a broadened perspective on value and value propositions, consider multiple stakeholders and take a systems perspective. Differences include varying definitions and interpretations of some terms (e.g., system thinking or stakeholders) and which assessment approaches they reference, e.g., life cycle assessment (triple-layered BMC and SBC) or corporate ecosystem valuation (FBC).

The applied *process-related criteria* all link to the BMC (Osterwalder and Pigneur, 2009). However, we observed different adaptation strategies: the adjustment or extension of single components (extension of ‘value proposition’ in the VMT) or several components (extension of ‘value proposition’ and ‘revenue stream’ in the BMC Infrastructure), the substitution of original components with new components (‘stakeholders’ instead of ‘customers’ in the BIK and FBC), the addition of new components (FBC, SBC and BIK) or whole additional layers (triple-layered BMC and FBC), the integration of sustainability-oriented guiding questions (BIK and SIP, SBC, triple-layered BMC), as well as the definition of new relationships between components (FBC, triple-layered BMC).

Table 3 Guiding principles and process-related criteria found in SBM tools

Approach	Guiding principles					Process-related criteria		
	Target group	Sustainability orientation	Extended value creation	System thinking	Stakeholder integration	Business model components		Other
						Adjusted	New	
Flourishing business canvas (Upward and Jones, 2016)	Not explicitly defined. "Further work is under way to determine applicability across a number of sectors, sizes, and stages of organizational development" (p.117)	Strong sustainability (p.99)	Value creation and destruction in businesses and value networks as social systems (p.104)	Business as a social system within its containing systems of economy, society, and environment (p.107)	Co-creation of value with all an organisation's stakeholders (p.104f)	Adjustments of BM perspectives: stakeholder, product, process and measurement (p.112ff)	Environmental, social, and financial context; new specific entities and interrelations (p.113f)	Instrumental principles of 'strongly' SBM (p.106ff), tri-profit as integrated measure
Value mapping tool (Bocken et al., 2013)	"The tool is envisaged to have applicability to all organisations, new start-ups, established large corporations, public sector and NGOs" (p.17)	Three dimensions of sustainability within the business planning process (p.5)	Different forms of value: destroyed, missed, new value opportunities (p.8)	System-perspective of value (p.10)	Stakeholder segments to facilitate a multiple stakeholder view of value (p.10)	Extension of value proposition (p.9ff)	Different stakeholder groups	Value mapping process: instruction for use in practice (p.12ff)
Business innovation kit (Breuer 2013, 2016), sustainability innovation pack (Breuer and Ludeke-Freund, 2015b, 2017a, 2017b)	Start-ups and students, innovation managers and corporate venturing units, existing organisations (Breuer 2013)	Values-based and normative management, sustainability drivers, and maturity levels (p.5)	Grounding in an exploration and negotiation of business-critical, fundamental and directional values (2015b, 2017a, 2017b)	System and network innovation (2015b, 2017b)	Collaborative modelling and stakeholder segments as component	Extended value(s) proposition; stakeholder; review of all components with respect to sustainability drivers (2015b, 2017a)	Grounding in terms of vision/mission/purpose; sustainability drivers, sustainability maturity levels, touchpoints	Normative management; organisational learning; modelling process, lean start-up and lean venturing

Table 3 Guiding principles and process-related criteria found in SBM tools (continued)

Approach	Target group	Guiding principles				Process-related criteria			Other
		Sustainability orientation	Extended value creation	System thinking	Stakeholder integration	Business model components		Network perspective	
						Adjusted	New		
Sustainable business canvas (Tiemann and Fichter, 2015)	Start-ups, business plan competitions and entrepreneurship education (p.15f)	Normative requirements; sustainability principles, triple bottom line (p.6)	Holistic view, extended value creation for customers, relevant stakeholders, environment and society (p.6f)	System thinking, use/result-oriented product service systems (PSS), life cycle thinking (p.7)	Stakeholder Concept (p.6)	Sustainability-oriented guiding questions (p.10ff)	Vision/mission, stakeholders, competitors (p.4f)	--	Basic strategies for SBM: (1) integrative, (2) additive; function-oriented business models (p.5f)
Triple layered BMC (Joyce et al., 2015; Joyce and Paquin, 2016)	Not explicitly defined: "organizations whom wish to innovate upon their current business model and create concepts of more sustainable business models" (p.1)	Broad triple bottom line approach (p.7)	Multiple forms of value according to triple bottom line (p.6)	Systems approach to business model innovation (p.22ff), life cycle approach (p.10)	Stakeholder approach (p.16)	--	Two additional layers as a projection of the original BMC (p.8f)	--	New forms of analysis: vertical coherence and layered systems thinking (p.23f)
BMC extended for infrastructure (Foxon et al., 2015)	Private and public decision-maker for infrastructure investments (local delivery network operator, municipal and others)	Wider social and environmental benefits to new actors and society (p.8)	Multiple forms of value: direct/indirect values (p.9)	Systemic values and approaches (p.3f.), Particularities of infrastructure: multi-agent, level, objective (p.9)	--	Extension of value proposition and revenue stream (p.9f)	--	Physical/social networks, stakeholders partnerships (p.10ff)	Approach to complex systems modelling of infrastructure investment decisions (p.9ff)

The similarities between these tools point to common directions for SBM development. Those aspects that are consistently used are discussed below as general SBM requirements. While the tools' similarities contribute to our understanding of general guiding principles and process-related criteria, their various differences show that we are still missing a common understanding of what constitutes SBMs and how they can be developed. In the following, we develop basic requirements for SBM development by systematically connecting the knowledge from the literature (Section 2) and our theoretical framework (Section 3) to the insights from our comparative tool analysis (Table 3).

6 Guiding principles and process-related criteria as requirements

An understanding of the requirements for SBM development, in terms of guiding principles and process-related criteria, is elaborated upon with the aim to support sustainability-oriented entrepreneurs and experimentation with business model design patterns and to facilitate comparative research. The reasons and goals of defining such requirements are as follows:

- 1 Provide a *starting point and guidance for practitioners* (entrepreneurs, innovators, intermediaries such as mentors, consultants) developing SBM; thus, to have a reliable framework to start with, including categories to help understand similarities and differences among initiatives. Moreover, it should facilitate the sharing of insights and learning from experiences.
- 2 Support *experimentation with business model design patterns* by clarifying the conceptual background for a comparative analysis of SBM and its distinctive components and by addressing recurring challenges for SBM development. By using a contextual analysis of cases and a comparative evaluation, it becomes possible to compile and experiment with alternative business design patterns in order to address sustainability-related problems. Additionally, it allows for the aggregation and sharing of knowledge among actors in this field, including practitioner and researchers.
- 3 Provide *guidance for researchers* that are analysing cases and developmental paths of SBM: a shared set of principles and criteria makes it possible for researchers to better understand and compare the distinct foundations and trajectories of sustainability-oriented business endeavours.

In order to foster the exploration and elaboration of SBM based on a shared understanding and to define minimum requirements, we differentiate between *guiding principles* and *process-related (process and tool) criteria*. While guiding principles differentiate the global notion of sustainability in the context of modelling business, process-related criteria provide cornerstones and design elements for their SBM development.

6.1 Guiding principles

Guiding principles can be understood as a form of guidance and heuristic to help entrepreneurs and managers keep their most important orientations in sight – such as a particular definition of corporate sustainability. Such principles provide means to increase the possibility of designing SBM, but without predefining a distinct outcome. They can be used to create a *checklist* of issues that any SBM needs to address. By synthesising theory-driven top-down (Sections 2 and 3) and tool-based bottom-up analysis (Section 5), we identified four guiding principles. Summarising the core ideas of what is proposed in the reviewed literature and tools, these principles can serve as guidance for researchers as well as practitioners.

6.1.1 Principle 1: sustainability orientation

Sustainability-orientation itself is a key requirement for SBM development. Based on the theoretical understanding of business models as boundary-spanning and interactive systems, this orientation provides a shared normative reference for the interacting parties (e.g., if those involved in business development agree on the reduction of ecological harm as an overarching mission of their endeavour). Sustainability-oriented innovation and business model development have to deal with normative aspects and need to include a values-based management approach (Breuer and Lüdeke-Freund, 2015a, 2017a, 2017b). Accordingly, the different modelling approaches and tools intentionally include sustainability goals and requirements. Vision and mission statements, for instance, will typically include references to sustainability goals and values (Fichter and Tiemann, 2015).

Stubbs and Cocklin (2008, p.121) also make this point: “A sustainable organisation expresses its purpose, vision and/or mission in terms of social, environmental and economic outcomes.” However, the concept of ‘sustainability’ has to be clarified on different levels of detail to unfold effective guidance in business model development. Here, it is helpful to differentiate three levels:

- 1 a general level, which describes the basic idea of sustainability
- 2 a level of action-oriented principles of sustainability
- 3 a level of practical concepts, which help entrepreneurs to implement sustainability in business model development.

On a *general level*, sustainability can be defined as “development that 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.16]. Sustainable development has emerged as the guiding principle for long-term global development. Consisting of three pillars, sustainable development seeks to achieve, in a balanced manner, economic development, social development and environmental protection (United Nations, 2016). In more than 40 years of intensive scientific reflection and international political debate, it has become clear that at the core of the sustainability concept is the idea of equity (intra-generational and inter-generational equity). Based on this notion, Ehrenfeld (2008) proposes sustainability as a collective goal and vision for humanity.

In order to allow practical implementation of sustainability as an equity concept, *action-oriented principles* have been developed in the last two decades. Guidance for normative management is provided through principles such as eco-efficiency, consistency, self-sufficiency, fair distribution of wealth and the avoidance of unacceptable risks [Fichter, (2005), p.55ff].

In order to transfer these principles to business model development and business activities, *practical concepts* have been elaborated on. Implementation-oriented guidance provided by concepts such as zero emission, biomimicry or cradle-to-cradle (McDonough and Braungart, 2002), social impact, or by management and accounting approaches like the ‘sustainable value added’ concept (Figge and Hahn, 2005), can support sustainability orientation in business model development. Reflecting political sustainable development goals can also give guidance in the design of business models. The United Nations (2015) just recently announced 17 sustainable development goals for ‘transforming our world: the 2030 agenda for sustainable development’.

6.1.2 Principle 2: extended value creation

Theoretical contributions and modelling tools alike emphasise an orientation toward total sustainable value creation (e.g., Figge and Hahn, 2004). SBM development is different from conventional approaches due to its aim to create sustainable value, e.g., in the form of social value added (e.g., Weber and Kratzer, 2013) or the triple bottom line (Elkington, 1999). Instead of placing the focal firm’s economic profits in the centre of consideration, SBMs require negotiating and defining normative values, interests and goals related to multiple kinds of social, ecological and economic outcomes (this point is similarly highlighted in the above reviewed frameworks by Boons and Lüdeke-Freund, 2013; Stubbs and Cocklin, 2008; Upward and Jones, 2016).

The second principle demands that SBM development should contribute to generating not just value for single companies and their customers and shareholders. Instead, it should be guided by the principle of extended value creation and generate value for market and non-market actors in monetary and non-monetary terms. Even otherwise ignored normative orientations and values and their implications for value creation, need to be considered (Bocken et al., 2013; Breuer and Lüdeke-Freund, 2017a). Values are reflected within the normative statements (such as corporate vision, mission, or purpose), distinct business model components and in particular in the value proposition (Breuer and Lüdeke-Freund, 2017a). Patala et al. (2016) tested the development of sustainable value propositions in practice. They show that companies in a business-to-business setting are capable of developing value propositions that consider quantitative monetary aspects (e.g., through increased service performance) and non-monetary aspects such as employee turnover and workplace satisfaction.

But to speak of total sustainable value creation we have to go beyond value proposition design and consider the bottom line of the whole business model (see process-related criterion 4). Extensions of single-bottom line to triple bottom line approaches raise the challenge of defining priorities and directions among multiple bottom lines. If participants do not a priori share or agree upon well-defined goals, measurable key performance indicators, or commonly accepted financial measures, then direction needs to be negotiated and communicated at first. Breuer and Lüdeke-Freund

(2017a, 2017b) radicalise the multi-direction approach in order to position the negotiation and integration of different values (as notions of the desirable) as overarching directives. Directives create a common ground for engagement, define an initial framing of issues to be addressed and solved and support decision making and pivoting.

6.1.3 Principle 3: systemic thinking

The theoretical foundations developed in Section 3 as well as the practical approaches and tools introduced in Section 5 underline the necessity to apply a systemic approach in SBM development. The notion of the business model as a boundary-spanning activity system stresses the fact that business models are systems of interdependent activities, which require systemic thinking by entrepreneurs and managers – a position that is also emphasised in the reviewed theoretical SBM literature.

Principle 3 puts particular emphasis on interaction and bidirectional relations, which resembles Stubbs and Cocklin's (2008) internal and external perspectives, but goes beyond the more impact-focused perspective stressed by Boons and Lüdeke-Freund (2013), for example. The interaction economic perspective makes clear that due to increasing specialisation in economic activities and division of labour in innovation processes, the need to integrate external resources and knowledge also increases. Social interaction is a means to integrate internal and external resources of firms and requires systemic innovation approaches (Fichter, 2014). Furthermore, the implementation of principle 1 'sustainability orientation' and principle 2 'extended value creation' requires a more holistic and systemic approach than in single-bottom line business model development. It comprises different aspects of systemic thinking and management:

- 1 *Life cycle thinking*: concepts like circular economy and sustainability require taking the whole physical product life cycle [from 'cradle to cradle', Braungart and McDonough (2002)] into account. This in turn requires life cycle thinking and management approaches that enable innovators and entrepreneurs to appropriately deal with the whole life cycle of products and services (e.g., through concepts like eco-design or cleaner production). Some of the practical approaches and tools introduced above therefore suggest the application life cycle approaches in SBM development (Tiemann and Fichter, 2016; Joyce et al., 2015; Joyce and Paquin, 2016)
- 2 *Product-service systems (PSS)*: the notion that economic, environmental and social effects do not come from single (physical) products or technologies, but rather stem from the whole PSS in which they are embedded, leads to the necessity to holistically consider, analyse and design PSS in the process of business model development (Fichter and Tiemann, 2015). That is why more recent policy approaches, like the EU Eco-Innovation Action Plan and related funding schemes, ask for systemic eco-innovation [European Commission, (2015), p.72].
- 3 *Reflecting outcomes*: the principle of systemic innovation also involves the reflection of the (potential) outcomes of a new business model. Does a new business model actually generate sustainable value for multiple actors? The assumption that sustainable value is generated most effectively by involving all relevant value partners and stakeholders (Principle 4) in the innovation process requires a reflection of the outcomes. This has to be considered in processes of business model

development (process-related criterion 4). Working with alternative outcomes, e.g., in terms of future scenarios (some included in the BIK) and tools like value mapping (Bocken et al., 2013), supports this endeavour. This can also comprise the assessment of intended and unintended positive and negative effects resulting from the business model such as rebound effects (Mortimer, 2016).

6.1.4 Principle 4: stakeholder integration

Freeman's (1984) stakeholder theory draws attention to the varied and often conflicting interests both within and outside the corporation and has important implications for the development of SBMs. He essentially posits that an organisation's sustainability is determined, in large, by the extent to which it considers the interests of its stake-holding communities. His definition of a stakeholder as "any group or individual who can affect, or is affected by, the achievement of a corporation's purpose" [Freeman, (1984), p.vi] is relevant for the economic viability of a start-up or company. Additionally, as such, it puts stakeholders in an important role of an organisation's sustainability orientation and its pursuit of social and ecological goals. It is also important to pursue ecological and social goals (Principle 1). Theoretical frameworks, such as Stubbs and Cocklin's (2008), practical approaches and tools for SBM development therefore propose stakeholder integration as an important guiding principle.

Upward and Jones (2016) suggest co-creation with all organisation's stakeholders and Bocken et al. (2013) provide a practical tool to facilitate a multi-stakeholder view on value propositions. However, stakeholder needs must be recognised, before they can be satisfied. Social responsiveness and cultural competencies (Antoni-Komar et al., 2010) are important elements in pursuing the principle of stakeholder integration. Litz (1996) underlines the importance of stakeholder interdependence, ethical reflection and issues management in a resource-based-view of the company. The business model as a boundary-spanning concept and interaction economics expand the resource-based-view by pointing out that social interaction is a means to integrate the internal and external resources of firms (Zott and Amit, 2010; Fichter, 2014). Here, stakeholders become crucial for accessing and acquiring resources and capacities necessary for developing and implementing business models.

Stakeholder integration is not a simple, linear approach of recognising and adapting to stakeholder's interests, but a necessity to develop viable and sustainable business models. This is true for various reasons: first, acquiring resources (e.g., finance) through stakeholders (e.g., investors) usually affords a complex interaction process. Second, stakeholder interests might conflict with the company's sustainability goals. Third, different stakeholders might have different and conflicting interests. Fourth, it might not always be clear what the stakeholder's interests are, especially when it comes to 'wicked problems' (Camillus, 2008) like climate change, where detailed mid- and long-term effects are not fully clear and adequate responses for climate change adaptation are not easy to determine. Therefore, the principle of stakeholder integration in business model development requires the combination of acknowledging stakeholder interdependence, social responsiveness to adequately perceive stakeholders' interest and their influence on the achievement of a corporation's purpose, ethical reflection with regard to sustainability goals and the company's corporate social responsibility (CSR) and the successful handling of issues management.

6.2 *Process-related criteria*

Whereas guiding principles provide reference points to work toward, process and tool criteria describe how to get there and inform the design of suitable tools accordingly. These criteria provide the minimum requirements that every process and tool for SBM development needs to fulfil. We found that SBM development requires a collaborative and inclusive process – all facilitation tools support such collaboration. The tools also involve a broader set of business model components than traditional tools. Different external effects of primarily profit-oriented business models are considered in the process and by the tools. From the theoretical prerequisite to span organisational boundaries and resolve potential tensions between actors we learn that the development process for SBMs and suitable tools need to address the interfaces and interactions with contextual instances and stakeholders. Acknowledging the divergence between planned and realised models, the development process and its actors should also consider the impacts and outcomes of realised business models. However, appropriate tools to evaluate a business model's sustainability performance are still missing (Lüdeke-Freund et al., 2017).

6.2.1 *Criterion 1: reframing an extended set of business model components*

Most approaches to business modelling and most of the tools we compared work with a differentiation and recombination of business model components. Component-based approaches to modelling new business have been widely adopted (also within the toolkits we examined). One purpose of the popular BMC by Osterwalder and Pigneur (2009) was to establish a shared language for the description, assessment and change of business models. Their canvas allows mapping the distinct features of business models into nine different components that are assumed to be universal.

However, sustainability-orientation in the development of a new business model is not a matter of simply adding new sustainability components and questions to merely profit-oriented business model frameworks. Such an additive understanding can be suggested by business modelling approaches that are based on ontologies and components as they tend to neglect process-oriented views on changing business models and values-based or normative views on the directions of such change.

When modelling sustainability-oriented business, all components need to be put into a sustainability perspective, i.e., the specification of each component needs to consider with respect to its sustainability impact and potentials, e.g., through the consideration of sustainability business case drivers (Schaltegger et al., 2012; BIK/SIP). The same is true for the dynamic relations, configurations, or patterns between components. In particular, the value proposition as a key component of business models must cater to the principle of extended value creation, thus considering not only value-added created for customers but also values of distinct stakeholders as well as potentially missed values or values being destroyed. A framing phase [Fichter, (2005), p.336ff; Patzelt and Shepherd, 2011] precedes 'identifying or recognising business opportunities'. Methodologies and method collections like anthropology and design thinking suggest stepping back (Breuer and Lüdeke-Freund, 2017a) from the initial situation and reframing the questions to be asked and investigated.

In SBM literature and tools, different strategies have been applied to select, adapt, integrate and configure components beyond single-bottom line approaches, such as:

- 1 the integration of sustainability-related aspects, questions and criteria in existing 'standard' components like, e.g., 'customer segments'
- 2 the integration of sustainability-specific aspects and components into the core of the modelling process.

For instance, the BIK applies a normative approach in the modelling process; this is done through an initial reframing and a grounding exercise to negotiate shared values rather than using a prescribed set of sustainability-oriented components.

In sum, in the process of developing SBM, developers need:

- 1 to work with new components in addition to those found in the profit-first model
- 2 to deal with components in a different way, e.g., by considering sustainability business case drivers or a sustainability-oriented perspective for each component
- 3 to deal with components as an integrated sustainability-oriented process defined by the principles above.

6.2.2 Criterion 2: context-sensitive modelling

Boundary spanning and interactive business model innovation for sustainable value creation need to demonstrate contextual sensitivity, e.g., by making boundary-spanning interactions and relations explicit and concrete. Specific contexts such as different institutional backgrounds of companies in different regions and countries as well as diverse size and maturity of companies (incumbents, start-ups, etc.) will help to specify sustainability challenges to be addressed and to identify potentially available and accessible resources within each domain.

Context-sensitive modelling integrates instances that are considered to be externalities in traditional business models. Identification and consideration of case-specific contexts and stakeholders (Kolk and Lenfant, 2015) is an initial part of the exercise (see the fourth principle). Resolving conflicts and aligning interests and goals of diverse actors is not an extraordinary obstacle to an else-wise linear effort, but an essential challenge of the SBM development. Accordingly, the modelling tools we looked at add extra components and exercises to deal with these instances. Management of the divergence between planned and realised business models must also account for the different contexts and actors it impacts.

Contextual sensitivity also implies awareness of the different user groups, stages and maturity levels of the entrepreneurial journey to model and implement new business. Consequently, modelling tools should specify the user groups that they are designed to support. For instance, tools may be suited for an educational context (e.g., entrepreneurship and innovation education at universities) or a business plan competition context (e.g., the SBC), for start-ups or incumbents trying to advance their strengths and assets and discover new business opportunities (e.g., the BIK), or to ensure directional orientation within the implementation process.

6.2.3 Criterion 3: collaborative modelling

Collaborative modelling is not an option, but is required to deal with the challenges of developing sustainability-oriented business-spanning organisational boundaries. Systemic

thinking and the integration of diverse stakeholders and sources of knowledge lead to collaborative settings as a default mode of modelling new business. While the criterion of context-sensitive modelling requires adequate consideration and representation of different contexts in the process, the criterion of collaboration defines who is actively involved in the process and how its participants interact.

With respect to required participants, key stakeholders will be involved in the process aligning interests and resolving conflicts. Aiming at wide diffusion and impact, modelling is not merely performed on a corporate level, but may also be applied in the development of values-based networks. In this case, participants of diverse organisations and industries can elaborate upon shared values and directional orientation and re-model their own business, which may include interfaces and interactions among one another and with the environment (Breuer and Lüdeke-Freund, 2017a, 2017b).

With regard to how to collaborate, different facilitation methods have been proposed and evaluated. The ‘collaborative business modelling’ method developed by Rohrbeck et al. (2013) aims to overcome barriers to systemic innovations. Inspired by process developments in the software industry, lean management approaches are widely adopted in entrepreneurial activity. The ‘lean venturing’ approach (Breuer, 2013), for instance, integrates business modelling with lean management and corporate venturing. Accordingly, tools like the SIP are suited to be embedded in an iterative, lean venturing approach. But the other six available tools are also suitable for collaborative modelling; each facilitates ideation and negotiation with different emphases. Each implements an answer to the question: How to proceed in collaborative modelling of sustainability-oriented business?

Existing tools facilitate collaboration and interaction among the process participants in a live workshop format. Most support a network perspective and most assume several iterations – more comprehensive collaboration support throughout the different development phases of a new business model is usually left up to individual management and engagement.

6.2.4 Criterion 4: managing impacts and outcomes

Reflecting upon and managing impacts and outcomes is crucial since the results of planning typically differ from those of implementation just as intended models differ from realised businesses (Section 3.3). The tools we found are applied in live workshop settings. But, how do they impact entrepreneurial collaboration, potential deviations from directional orientation and potential tensions between actors after the workshop? Most tools recommend their iterative usage. Still, after each iteration participants are left alone with a mapped projection of components and relations, without instructions and evidence on how to proceed. Follow-up work in business model development and empirical studies of users’ interactions and their outcomes are missing; therefore, Criterion 4 is primarily derived from theoretical discussion and from other research fields such as technology assessment, future research and sustainability-oriented innovation management (Paech, 2005; Fichter and Pfriem, 2007). While most tools consider iterative application and process design within their modelling approach, potential future outcomes are only superficially considered. Approaches from technology assessment and futures research such as scenario methods (e.g., Breuer et al., 2012) and vision-oriented integrative road-mapping (Beucker et al., 2011), concepts of user-integration from sustainability-oriented innovation management (e.g., Fichter and Pfriem, 2007; Liedtke

et al., 2014) as well as values-based innovation management methods (Breuer and Lüdeke-Freund, 2017a) may be adapted here in order to enrich business models and even in the early phases of new business development.

Table 4 Theoretical prerequisites matched with guiding principles and process-related criteria

<i>Requirements for SBM development: guiding principles and process and tool criteria</i>	<i>Guiding principles</i>				<i>Process-related criteria</i>			
	<i>Sustainability orientation</i>	<i>Extended value creation</i>	<i>Systemic thinking</i>	<i>Stakeholder integration</i>	<i>Reframing extended components</i>	<i>Context-sensitive modelling</i>	<i>Collaborative modelling</i>	<i>Managing impacts and outcomes</i>
<i>Theoretical prerequisites of SBM development</i>								
Spanning organisational boundaries								
SBM development facilitates interaction between a focal firm and its stakeholders and integrates their activities			X	X	X	X	X	
Integrating internal and external resources								
SBM development provides access to internal and external resources and capabilities, incl. information, knowledge			X	X	X	X	X	
Providing for directional orientation								
SBM development defines directives and reduces risks based on actors' interaction and integrated knowledge	X		X				X	X
Resolving conflicts and aligning interests								
SBM development allows to identify and resolve tensions between actors and to align their interests	X	X	X	X		X	X	X
Managing the divergence between planned and realised business models								
SBM development reflects the difference between planning and realisation throughout the collaborative process			X			X		X

One of the primary outcomes of SBMs should be a positive impact and relative increase in sustainability, a contribution to equity and enhancing survival or ‘flourishing’ of the business. These potential outcomes of SBM imply a broad range of both monetary and non-monetary returns (Principle 2). Already in early phases of business development, consideration and approximation of such impacts, but also of unintended consequences, should become part of the development process (Mortimer, 2016). Potentially unintended and unexpected results as well as rebound effects not only need to be part of sustainability reports, but should also inform and guide the modelling process and the documentation of its (intermediate) results as, for example, shown by Patala et al. (2016) who use multi-dimensional key performance indicators to guide sustainable value proposition development. Bocken et al. (2013) propose to map both expected positive and negative outcomes of a business model’s value proposition, but leave it open on how these outcomes can be explicitly measured. A recently published approach by Obst (2016) addresses this gap by using indicators from the global reporting initiative framework, which is the most widely applied sustainability reporting standard worldwide and mapping these indicators onto the BMC. Starting points for the development of SBM assessment tools could be derived from methods such as life cycle assessment or concepts such as user-integrated innovation in sustainable living labs (Liedtke et al., 2014), user-integration in testing innovative products and services in real world settings (Fichter and Pfriem, 2007), or sustainable value added (Figge and Hahn, 2004, 2005); these will also be discussed as a field for future research in the final section.

Table 4 gives an overview of which theoretical concepts and characteristics of SBM development and which tool characteristics were synthesised to define and inform the basic requirements for SBM development.

7 Conclusions

The main contribution of this paper is to compile the most relevant theoretical works on SBM, to provide a comparative overview of all the existing tools to facilitate their development and to extract, synthesise and condense the diverse sources in order to derive a simple and actionable set of requirements that any initiative, process, or tool working toward SBM should fulfil. The differentiation and specific content of four guiding principles and four process-related criteria answer the *two research questions* of this paper: *what* are the minimum requirements to constitute SBMs and *how can* their development be supported in practice?

7.1 Key insights and contributions

The first key contribution of this paper is a *theoretical framework* that defines SBMs as boundary-spanning and interactive systems. Our framework integrates Zott and Amit’s (2010) business model interpretation as *boundary-spanning and interactive system* [see Aldrich and Herker (1977) for foundations in the field of organisation sciences] with an *interaction economics perspective on innovation* (Fichter, 2014). In framing SBMs accordingly, we were able to theoretically justify stakeholder integration and argue that openness and interaction (Zott and Amit, 2010; Fichter, 2014) are not only necessary to

develop and realise SMBs but also to provide orientation and resolve conflicts among stakeholders. The identified theoretical features of SBMs translate into specific requirements for SBM, which are captured by our guiding principles and process-related (process and tool) criteria.

The second key contribution is that we defined a set of *guiding principles* and *process-related criteria* of SBM based on a theoretical discussion and a comparative analysis of currently available tools supporting the exploration and elaboration of SBMs. In order to specify these guiding principles and process-related criteria, we combined a deductive approach (deriving guiding principles and criteria from theories and basic concepts) with an inductive approach (identifying principles and criteria from practical approaches and tools). Based on this proceeding, we provide an answer to our first research question (What are minimum requirements?). The guiding principles are:

- 1 sustainability-orientation
- 2 extended value creation
- 3 systemic thinking
- 4 stakeholder integration.

They also provide a ‘checklist’ of design principles that any SBM and thus any method and tool for its development, needs to consider and address. Process-related criteria include:

- 1 reframing an extended set of SBM components and their relations
- 2 context-sensitive modelling
- 3 a collaborative modelling process
- 4 managing impacts and outcomes.

They provide an answer to our second research question (how to support the development of SBM?).

Table 5 Requirements for SBM development

<i>Guiding principles</i>		<i>Process-related criteria</i>	
1	Sustainability orientation	1	Reframing business model components
2	Extended value creation	2	Context-sensitive modelling
3	Systemic thinking	3	Collaborative modelling
4	Stakeholder integration	4	Managing impacts and outcomes

Our contribution is not so much the novelty of these principles and criteria, but their consolidation, consistency and comprehensiveness, which should offer a solid theoretical foundation to advance sustainability-orientation in business modelling and models. In this regard, our work confirms and extends the relatively scarce literature on SBM principles (e.g., Boons and Lüdeke-Freund, 2013; Stubbs and Cocklin, 2008; Upward and Jones, 2016).

7.2 *Implications for research and practice*

This paper holds important implications for entrepreneurship theory and research as well as for entrepreneurship practice.

Entrepreneurship theory: in order to frame this paper, we have connected and integrated two theoretical approaches that had been thus far unrelated. We built our theoretical framework on three pillars: first, Zott and Amit's theory of business models as boundary-spanning and interdependent activity systems; second, an interpretation of innovation from an interaction economics perspective; and third, the process-oriented notion of intended versus realised strategies. For entrepreneurship theory, the notion of business models as boundary-spanning and interactive activity systems provides a powerful basis for conceptualising, describing and explaining entrepreneurial processes as, for example, explored by Becker et al. (2015) in the context of venture development models. Especially for conceptualising and analysing SBM development, our theoretical framework proved to be very helpful. Also the distinction between planned business models and realised business models, which we have developed in this paper, is relevant for theoretical and empirical research on business modelling as it has been neglected so far in the respective literature. *Future research and experimentation* are needed to better understand the dynamics between plan and realisation and to support managing impacts and outcomes.

With regard to *empirical research on business models* and business model development, this paper provides relevant conclusions: empirical research on business model development should be clear and explicit whether the investigation is on firm-centric and/or network-centric business models and whether the focus is on planned and/or realised business models. The three key functions of social interaction in business model development presented in this paper can support the conceptual framing of empirical investigations. Also the normative and cultural aspects of business model development that we have elaborated on in this article are relevant topics for empirical research.

Managerial implications: as minimum requirements, the principles and criteria are proposed to streamline entrepreneurial efforts; to learn from others' experiences with different modelling approaches, models and components; and to advance the development of suitable SBM tools and methods. They provide orientation for business modelling tool developers, for sustainability-oriented consultants and business developers.

Within established companies different operational, strategic and normative management functions are affected (Breuer and Lüdeke-Freund, 2017a, 2017b). The differentiation of guiding principles contributes to normative and strategic management moving into the sometimes fuzzy domains beyond the pursuit of profits. They also help to align the operational management functions engaged in product and service innovation, marketing, human resource development and operative environmental management.

7.3 *Limitations*

The most important limitation is that our major contribution is a meta-analysis of tools and frameworks for SBM that are still being refined and evaluated. One key research question is, how different characteristics (size, age, motivation, etc.) and institutional

backgrounds of companies in different regions and countries influence SBM development and whether our basic requirements actually fit for every company and entrepreneur, no matter where they operate or originally come from.

7.4 Future research

By proposing requirements for SBMs, we provide a basis for further research; empirical evaluation of different approaches and tools is needed, reaching from case studies (e.g., Beltramello et al., 2013; Breuer, 2013) to comparative experimental studies (e.g., Eppler and Hoffmann, 2012) showing how different features of tools may lead to different outcomes. The *assessment of SBM outcomes* is another crucial area for future research. The discussion of the process-related Criterion 4 led to the conclusion that so far no comprehensive and widely accepted business model assessment method or tool exists. But assessing the outcomes of realised models is a precondition to knowing whether we are really making progress with SBMs or, in the worst case, are just shifting ecological and social burdens across time and space maybe without recognising it (Hahn et al., 2010). Conceptual and empirical research could start from established methods such as life cycle assessment, user-integration in sustainability-oriented innovation (living labs, testing in real world settings, etc.) and integrated road-mapping, which can be applied on the organisational and product level, so why not on the business model level?

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Notes

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