

# Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models

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## ABSTRACT

Business model innovation has seen a recent surge in academic research and business practice. Changes to business models are recognized as a fundamental approach to realize innovations for sustainability. However, little is known about the successful adoption of sustainable business models (SBMs). The purpose of this paper is to develop a unified theoretical perspective for understanding business model innovations that lead to better organizational economic, environmental and social performance. The paper examines bodies of literature on business model innovation, sustainability innovation, networks theory, stakeholder theory and product–service systems. We develop five propositions that support the creation of SBMs in a unified perspective, which lays a foundation to support organizations in investigating and experimenting with alternative new business models. This article contributes to the emerging field of SBMs, which embed economic, environmental and social flows of value that are created, delivered and captured in a value network. It highlights gaps for addressing the challenges of business model innovation for sustainability and suggests avenues for future research. © 2017 The Authors. *Business Strategy and the Environment* published by ERP Environment and John Wiley & Sons Ltd

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## Introduction

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**B**USINESS STRATEGY AND MANAGEMENT DISCIPLINES ARE INCREASINGLY INCORPORATING SUSTAINABLE DEVELOPMENT into their long-established assumptions and frameworks, stimulating rich, new and diverse fields of study (Winn and Kirchgeorg, 2005), and rethinking the theoretical foundations and the practice of business strategy (Hahn *et al.*, 2010). Theoretical and practical approaches to sustainability have been proposed with some common properties: improving sustainability often implies change, innovation or adjustment of an entity in

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relation to its surroundings or supporting environment (Faber *et al.*, 2005). The ability to innovate in the domain of sustainability represents a necessary business capability, whether related to small incremental steps or to radical, disruptive innovations (Adams *et al.*, 2012). Business model innovation is emerging as a potential mechanism to integrate sustainability into business (Schaltegger *et al.*, 2012; Jolink and Niesten, 2015). However, there is a lack of clarity, conceptual consensus and consistency in the use of the terms 'business model', 'business model innovation' and 'sustainable business models' (SBMs) (Magretta, 2002; Osterwalder and Pigneur, 2005; Boons and Lüdeke-Freund, 2013), and a lack of established theoretical grounding in economics or business studies (Teece, 2010). Moreover, there is no general agreement on the characterization, classification and boundaries of these concepts (Spieth *et al.*, 2014), which results in dispersion of perspectives and significantly slows down and even hampers the progress in these fields (Zott *et al.*, 2011). The lack of theoretical grounding is also reflected in the scarce number of case studies and empirical analyses in the field. There is a paucity of empirical research on business models, business model innovation and SBMs (Stubbs and Cocklin, 2008; Birkin *et al.*, 2009; Schaltegger *et al.*, 2012).

The lack of case studies makes it challenging for firms to understand how to innovate their business models, identify and design alternatives, then assess and select the most adequate one. When considering business model innovations for sustainability, this leads to a higher complexity related to how to preliminarily assess the impact of the sustainability innovations and how to understand their effects on the whole business network. The purpose of this paper is to present a unified perspective for innovation towards SBMs leading to better economic, environmental and social performance of organizations. The paper proposes a conceptual foundation as a basis for experimentation and exposes the potential benefits of using simulation for the design and evaluation of business model innovation alternatives.

This paper explores several bodies of literature. We begin by examining whether and how business models can be innovated to achieve sustainability goals. Based on research in business model innovation (Teece, 2010; Amit and Zott, 2012; Spieth *et al.*, 2014) and sustainability innovations (Hellström, 2007; Adams *et al.*, 2012; Boons *et al.*, 2013), we identify several concepts that characterize SBMs. We also draw on contributions from networks (Provan *et al.*, 2007; Allee, 2008) and stakeholder theories (Haigh and Griffiths, 2009), which underpin the concept of sustainable value flows among multiple stakeholders of the business and elicit the complexity of SBMs; and product-service systems (PSS) (Evans *et al.*, 2007; Tukker, 2015), which brings insights into specific characteristics of what is considered a promising SBM. We develop five propositions that frame the concept of SBMs. We suggest implications for organizations to experiment with business model innovations for sustainability and assess the potential impact of these innovations. We conclude with directions for future research.

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## Understanding Business Model Innovation for Sustainability

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Commonly accepted explanations consider that business models refer to the logic of how a firm does business, and explain how the firm creates, delivers and captures value (Magretta, 2002; Teece, 2010). However, there is no general agreement on the concept of business models. De Reuver *et al.* (2013) even highlight differences between American and European scholars' approaches to business model research: the former focusing on classifications and the relation with open innovation, while the latter concentrates on causal modelling and design approaches. Lambert (2015) reveals that empirically grounded classifications of business models are still scarce and adopt two perspectives: classification schemes with no explicit criteria, and theoretical typologies including ad hoc criteria based on prior theories in economics, strategy and entrepreneurship.

Spieth *et al.* (2014) suggest that the business model concept goes far beyond simple storytelling of how a firm does business and has a potential to provide a holistic perspective of the firm's activities. Teece (2010) suggests that the design of business models enables the reconfiguration of business capabilities to adapt the firm to the changing business environment. Business models are seen as a vehicle for innovation and a necessary means for commercializing technological innovations, as well as a subject of innovation, e.g. open innovation, collaborative entrepreneurship, the business model itself as part of the intellectual property (Teece, 2010; Zott *et al.*, 2011).

In the search for greater adaptive capacity and sustainable ways of doing business, novelty, creativity and positive innovation are bound to play a crucial role (Winn *et al.*, 2011; Hall and Wagner, 2012). Sustainability innovations

refer to novelty not only in technology, but also in processes, operating procedures and practices, business models, systems and thinking (Szekely and Strebel, 2013). Researchers from different disciplines (economic sociology, innovation, history, technology studies) have attempted to explain business model innovation for sustainability from various perspectives. Existing studies can be structured into organizational, inter-organizational and societal levels (Boons and Lüdeke-Freund, 2013). Sustainability innovations require more integrated thinking and the reconfiguration of several business aspects such as capabilities, stakeholder relationships, knowledge management, leadership and culture (Adams *et al.*, 2012). Schaltegger and Wagner (2011) reflect on sustainability innovations as those envisaged to make real and substantial improvements by developing superior production processes, products and services, and by exercising strong market influence and social or political influence. Stubbs and Cocklin (2008) highlight that business model innovations for sustainability tend to be ad hoc and neither systematic nor systemic. The generation of SBMs is multidimensional and complex, hence there are few known successful cases (Hart and Milstein, 2003; Lüdeke-Freund, 2010). We summarize the main challenges found in the literature in Table 1.

## Theoretical Foundation for Innovation Towards Sustainable Business Models

This section examines existing theories and concepts related to value, stakeholders, networks, PSS and sustainability. We develop five propositions that provide a theoretical foundation for innovation towards SBMs.

### Value and Sustainable Business Models

The concept of 'business model' is widely underpinned by the concept of 'value' in the literature. It has been specifically related to the realization of economic value (Chesbrough and Rosenbloom, 2002), to the delivery of customer value (Magretta, 2002), to the interlocking elements that create and deliver value (Johnson *et al.*, 2008) and to the support of the value proposition for the customer (Tece, 2010) among other things. However, the word value does not mean the same to everyone in every context (Den Ouden, 2012).

Challenges	Authors
<b>Triple bottom line</b> The co-creation of profits, social and environmental benefits and the balance among them are challenging for moving towards SBMs.	Hart and Milstein, 2003; Stubbs and Cocklin, 2008; Schaltegger <i>et al.</i> , 2012
<b>Mind-set</b> The business rules, guidelines, behavioural norms and performance metrics prevail in the mind-set of firms and inhibit the introduction of new business models.	Johnson <i>et al.</i> , 2008; Yu and Hang, 2010; Boons and Lüdeke-Freund, 2013
<b>Resources</b> Reluctance to allocate resources to business model innovation and reconfigure resources and processes for new business models.	Chesbrough, 2010; Zott <i>et al.</i> , 2011; Björkdahl and Holmén, 2013
<b>Technology innovation</b> Integrating technology innovation, e.g. clean technology, with business model innovation is multidimensional and complex.	Hart and Milstein, 2003; Yu and Hang, 2010; Zott <i>et al.</i> , 2011
<b>External relationships</b> Engaging in extensive interaction with external stakeholders and business environment requires extra efforts.	Stubbs and Cocklin, 2008; Vladimirova, 2012; Boons and Lüdeke-Freund, 2013
<b>Business modelling methods and tools</b> Existing business modelling methods and tools, e.g. Osterwalder and Pigneur (2010) and Johnson <i>et al.</i> (2008), are few and rarely sustainability driven.	Björkdahl and Holmén, 2013; Girotra and Netessine, 2013; Yang <i>et al.</i> , 2014

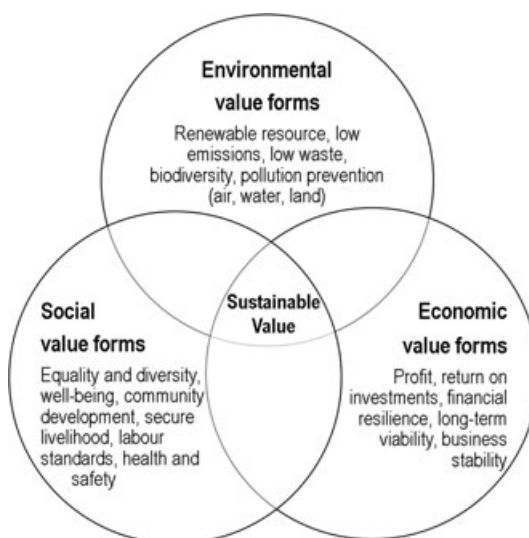
**Table 1.** Challenges for creation of SBMs

Adam Smith's view of 'exchange value' has been the cornerstone of economic thought that largely prevails in today's business practice (Ueda *et al.*, 2009). More recent debate has introduced the terms 'value-in-use' (Vargo and Lusch, 2007), as manufacturers move towards more service-oriented business models with a stronger customer focus; and 'shared value' (Porter and Kramer, 2011), suggesting that economic value should be created in a way that also creates value for society.

Economics is not the only lens used to look at the concept of value. Psychology, sociology and ecology also offer perspectives on value (Den Ouden, 2012), bringing both objective and subjective dimensions, such as belonging, eco-footprint and meaningful life. From a sustainability perspective, a firm's value creation logic should consider the integration of social and environmental goals into a more holistic meaning of value (Schaltegger *et al.*, 2011). The creation of social value in addition to economic value is seen as a main driver of social entrepreneurship (Acs *et al.*, 2013). Environmental or eco-entrepreneurship seeks to solve environmental problems while creating economic value (Schaltegger and Wagner, 2011). Sustainable value then represents not only environmental sustainability but also social and economic value (Ueda *et al.*, 2009). Sustainability drivers, such as footprint reduction, poverty alleviation, fair distribution, waste reduction and transparency, and their associated business strategies – understood as clean technology, sustainability vision, pollution prevention and product stewardship – can take forward the creation of sustainable value for the business (Hart and Milstein, 2003). Figure 1 illustrates a holistic view of sustainable value integrating economic, environmental and social value forms.

Encompassing economic, environmental and social aspects while considering the needs of all stakeholders rather than giving priority to shareholders' expectations (Stubbs and Cocklin, 2008) and aligning the interests of all stakeholder groups (Evans *et al.*, 2014) are seen as key aspects of SBMs. Lüdeke-Freund (2010) reflects on business models that create superior customer value, understood as creating value for customers and contribution to the sustainable development of both the firm and society.

SBMs are not necessarily achieved through technology, products or service innovation alone, but also through the innovation of the business model itself (Girotra and Netessine, 2013; Yang *et al.*, 2017). This implies changes in the way business models are conceptualized in regard to their exchanges and relations with stakeholders. The relationships that connect the firm to its stakeholders influence the way a firm is governed and, in turn, are influenced by the firm's behaviour (Perrini and Tencati, 2006). Leading companies are transforming these relationships by taking a wider and longer-term view, which enable the move from a transactional mindset towards the development of trust-based, mutually beneficial and enduring relationships with key internal and external stakeholders (Gulati and Kletter, 2005). Clarkson (1995) classified stakeholders into primary, whose participation is imperative for the firm to function, such as employees, suppliers, consumers and shareholders/investors; secondary, who are not en-



**Figure 1.** Sustainable Value

gaged in transactions with the firm and not essential for its survival, such as media; and public stakeholders who provide external support to the firm, such as governments, universities, communities, internal organizations and local and international non-governmental organizations. Edgeman and Eskildsen (2014) state that long-term enterprise success is 'a consequence of balancing both the competing and complementary interests of key stakeholder segments, including society and the natural environment, to increase the likelihood of superior and sustainable competitive positioning'. Hence, treating society and nature as stakeholders of the firm are important elements of the conceptualization of SBMs (Stubbs and Cocklin, 2008). The role of the natural environment as a valid primary stakeholder was finally argued by Haigh and Griffiths (2009), who demonstrate that the natural environment has an economic stake in organizations and 'affect or is affected by' the business.

To summarize, the scope of value should include not only economic transactions but also relationships, exchanges and interactions that take place among stakeholders (Allee, 2011) and that can be represented by value flows (Den Ouden, 2012). Identifying all the value flows among stakeholders, including the natural environment and society as primary stakeholders, can reveal opportunities for business model innovation.

*Proposition 1. Sustainable value incorporates economic, social and environmental benefits conceptualized as value forms.*

*Proposition 2. SBMs require a system of sustainable value flows among multiple stakeholders including the natural environment and society as primary stakeholders.*

### Value Networks and Stakeholder Mutuality

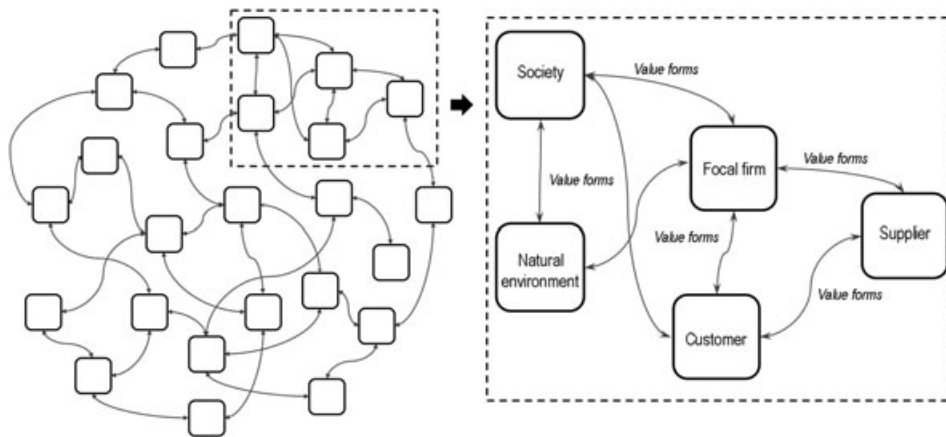
Integrating sustainability into business models requires a systemic view that considers the global perspective and different elements of the system and their interrelations (Stubbs and Cocklin, 2008). Value networks analysis provides such a view and can inform changes regarding a firm's business model (Kothandaraman and Wilson, 2001; Allee, 2011).

The term 'network' refers generally to a group of three or more organizations, either self-initiated or contracted, connected in ways that facilitate the achievement not only of their own goals but also of a common goal (Borgatti and Foster, 2003; Provan and Kenis, 2007). Scholars in organizational studies use different terms to refer to this phenomenon, such as partnerships, strategic alliances, interorganizational relationships, coalitions, cooperative arrangements or collaborative agreements (Gulati and Kletter, 2005; Provan *et al.*, 2007). The overall focus of the network has been a source of differentiation between disciplines, giving the general concept several names depending on the motivation of the network, e.g. innovation networks (Dhanaraj and Parkhe, 2006; Corsaro *et al.*, 2012), supply networks (Harland *et al.*, 2004; Van Bommel, 2011), and manufacturing networks (Rudberg and Olhager, 2003). Introducing the concept of value, including both tangible and intangible values, into business networks has broadened the research area and established the concept of value networks. A value network is seen as a set of roles and interactions in which organizations engage in both tangible and intangible value exchanges to achieve economic or social good (Allee, 2008). Value networks involve different roles and organizations with different needs, hence it is necessary to make specific propositions that create value for all participants in the network (Den Ouden, 2012).

Traditional network research has extensively investigated the organizations that compose the network, while the whole network as a form of governance has not been so frequently studied (Provan *et al.*, 2007). Understanding network dynamics would influence managers' decisions regarding entering into new alliances by providing information on constraints from their current ties (Gulati, 1998). Network governance is needed for goal-oriented networks if they are to be effective (Provan and Kenis, 2007). Stable networks reinforce relational ties among members and ensure equitable distribution of value (Dhanaraj and Parkhe, 2006). A new governance model is needed to realize a system in which 'sustainability issues are integrated in a way that ensures value creation for the firm and beneficial results for all stakeholders in the long term' (UNEP, 2014; Vermeulen, 2015).

The implementation of sustainability in networks lacks a systemic approach so far, focusing mainly on improvements of environmental aspects and limiting the social aspect to recent developments of codes of conduct, guidelines and conventions (Van Bommel, 2011). The integration of sustainability at network level (Figure 2) and the





**Figure 2.** Sustainable Value Network

achievement of common and individual goals within the network could be then enhanced by new governance mechanisms. Rethinking the purpose of the firm as part of a value network could enable innovations towards new SBMs.

Balancing the ecological, social and economic sustainability aspects of a system requires an approach that builds on the assumption that each of the three sub-systems must be viable and healthy if the planet system is to *flourish* (Ehrenfeld and Hoffman, 2013). Faber *et al.* (2005) conceptualize sustainability in firms as ‘equilibrium between an artefact and its supporting environment, where they interact with each other without mutual detrimental effects. Sustainability explicitly refers to this equilibrium’. Achieving the equilibrium, however, is a formidable undertaking for firms and society at large. Argandoña (2011) states that as long as the focus of the firm remains in economic value any solution adopted will be insufficient, because the process of capturing that value will be vulnerable to conflicts. If the value created in firms is of several types, however, it is possible to find better ways of creating economic and non-economic value in a sustained way, so that all stakeholders who help to create the value also share the benefits (Argandoña, 2011). Pandey and Gupta (2008) propose that socially conscious organizations are based on mutual recognition and acceptance of others, including customers and other stakeholders, as ‘responsible’ parties.

In order to realize an integrated and balanced system, deliberate interaction, partnering, networking and learning from multiple and diverse stakeholders is critical (Winn and Kirchgeorg, 2005). It is no longer a choice for firms whether to engage with stakeholders or not; the challenge is rather how to engage successfully (Jeffery, 2009). Thus, greater stakeholder engagement, alongside greater trust and innovations to their business models, are among the big changes that firms need to undertake in the pursuit of a long-term aim of sustainability (Krantz, 2010; Bolton and Landells, 2015). Den Ouden (2012) suggests that specific arrangements are required for all parties in order to have a sustained portion both at the beginning and in the longer term, so they contribute to the flourishing of the whole system. The analysis of the value flows within the network shows how different choices affect the mutual satisfaction of stakeholders, and hence the sustainability of the network (Shaw, 2010). Mutual value creation in SBMs, therefore, requires systemic consideration of a wide set of stakeholders who have a stake and responsibility in the value creation system.

Proposition 3. *SBMs require a value network with a new purpose, design and governance.*

Proposition 4. *SBMs require a systemic consideration of stakeholder interests and responsibilities for mutual value creation.*

### Product–Service Systems

Innovation opportunities arise from considering wider system boundaries that integrate externalities such as environmental impacts, the use and the end-of-life phases of products, and social implications, into the value network

(Evans *et al.*, 2009). A debate on environmental externalities, their relation to sustainability and their implications for environmental and sustainability related policies arose in the field of ecological economics (Baumgärtner and Quaas, 2010). From this viewpoint, environmental externalities are seen as unwanted side effects related to welfare losses and environmental damage that can be internalized by using conventional economic instruments, such as taxes and permits (Bithas, 2011). Maxwell and Van der Vorst (2003) suggest a similar approach, by monetizing environmental externalities, e.g. costs of products' end-of-life recovery, reuse, treatment or disposal, to optimize the economic aspects as part of the criteria for sustainable product and service design.

An example of new business models that integrate additional activities and risk in the product use phase are the service-based business concepts (Lay *et al.*, 2009). PSS, one of these emerging business concepts, are seen as a combination of tangible products and intangible services that are jointly capable of fulfilling final customer needs (Tukker, 2015). Many authors have discussed the potential of PSS to achieve sustainability through reduction of environmental impact and fomenting sustainable production and consumption (Tukker, 2015; Vezzoli *et al.*, 2015).

Life cycle thinking is considered an essential concept for developing sustainable PSS in a holistic way (Aurich *et al.*, 2006; Linder and Williander, 2015). From a network perspective, supply chain management also plays a key role in PSS design (Vezzoli *et al.*, 2015). PSS contractual agreements could reflect the internalization of some activities under the service provider responsibility during the use phase and the end-of-life phase of products. Some characteristics of these contractual agreements regard ownership and property rights, personnel involved and customers served, payment model and end-of-life activities such as retrieval and recycling (Lay *et al.*, 2009).

The nature of PSS – providing functionalities or outcomes to customers, as opposed to products – makes firms accountable for the economic, environmental and social issues during and after the product use phase. These externalities of product-based business models are brought into the core of the PSS concept. In order to internalize them, it is important to incorporate the concepts of life cycling thinking and to establish new modes of ownership that bring firms higher responsibilities. Developing PSS or transforming an existing business model towards PSS has been a pioneering innovation of business models for sustainability.

Proposition 5. *Internalizing externalities through PSS enables innovation towards SBMs.*

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## Implications for Organizations

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This section presents two significant implications for firms considering innovation towards SBMs, namely, how organizations can experiment with SBMs and how to assess the impact of business model innovations.

### Experimentation with Sustainable Business Models

Business model innovation can be a large undertaking for a firm and its stakeholders, the effects cascading throughout the value network. Given the uncertainty regarding processes and outcomes of business model innovation, it is widely understood that firms are hesitant to pilot business model innovations in the real world (Thompson and MacMillan, 2010). Nevertheless, several authors suggest that experimentation, trial and error and learning are all methods required for discovering new business models and simultaneously obtaining a better grasp of the business model as a unit of analysis (Baden-Fuller and Morgan, 2010; McGrath, 2010). These methods, however, require significant resources (e.g. financial capital) and carry substantial risks (e.g. failure).

Researchers can instil practitioners with confidence regarding business model innovation by conducting further empirical analyses and recommending ways in which companies can easily experiment with business models (Girotra and Netessine, 2013). Baden-Fuller and Morgan (2010) challenge researchers to experiment with business models as biologists and economists experiment with model organisms and mathematical models, respectively. One solution for inexpensive and low-risk experimentation is simulation (Thomke *et al.*, 1998), which can provide researchers and practitioners with an environment for testing business models without the financial and physical resources required to test in the real world.

As a business model will ultimately be the mediator between various actors in a real-world value network, the simulation environment for business model innovation must reflect human behaviour and decision making. Increasingly, researchers and practitioners are adopting and validating the use of behavioural models such as system dynamics (Duran-Encalada and Paucar-Caceres, 2012; Kampmann and Sterman, 2014; Abdelkafi and Täuscher, 2015) and agent-based models (Bonabeau, 2002; Zhang and Zhang, 2007; Vanhaverbeke and Macharis, 2011) to simulate business model innovation and other business-related activities. The range of examples in the literature suggests the validity of pursuing a behavioural model, with its ability to methodically address complexity and to enable firms to experiment with SBMs, as the experimentation method of simulation involves less cost and risk.

This journey around the current literature on experimentation with business models demonstrates a gap in the knowledge regarding the drivers of successful business model innovation and the methods by which new business models can be safely pursued. Furthermore, the knowledge on experimentation with SBMs is even scarcer. Researchers therefore need to find ways to provide companies with the confidence that they need to innovate towards SBMs.

### Assessing the Impact of Sustainable Business Models

Since business model innovation is considered a value creation mechanism as elaborated in this paper, it raises the question of how we assess the impact and the value creation potential of SBMs.

UNEP (2014) identified over 200 academic reports that demonstrate positive and statistically significant relationships between sustainability performance and financial performance, and an increasing number of financial reports that cover sustainability issues ranging from climate change and energy efficiency to gender diversity. In response to pressures in the areas of corporate social responsibility and social and environmental accounting, more and more firms are publishing 'triple-bottom-line' and 'sustainable development' reports (Brown and Fraser, 2006). At the time of writing this paper, over 78 797 sustainability reports were listed on CorporateRegister.com. At the same time, the 'triple-bottom-line' perspective is exponentially increasing the scope of measurement options, with emerging competing frameworks that are complex and with no indication of reaching an agreement on a common reporting standard (Hubbard, 2009; Lee *et al.*, 2016). These multiple financial, social and environmental measurements are often presented under the umbrella of 'environmental, social and governance' (ESG) metrics (Porter *et al.*, 2012; Beckmann *et al.*, 2014). Despite a myriad of existing ESG metrics, it is still difficult to measure the gains achieved by business model innovation, especially in the area of sustainability, where many metrics are still under development (e.g. local water stress) or not well understood (e.g. wellbeing, biodiversity).

It is becoming increasingly clear that sustainability performance measurement must extend beyond the boundaries of any one firm, and needs to consider the broader issue of enterprise sustainability (Searcy, 2014). The measurement of a firm's success, therefore, cannot be limited to the creation of value for only one stakeholder group, typically the shareholders, but rather extend to the entire set of stakeholder relationships that become strategic for the long-term success and survival of a firm (Perrini and Tencati, 2006).

We identify two fundamental issues that firms face when trying to assess the impact of SBMs. On the one hand, there is a lack of a clear measurement system for the economic, environmental and social value creation potential of SBMs. On the other hand, the assessment involves multiple stakeholders with different stakes, goals and value creation abilities in the business model. How this assessment is performed in a meaningful manner presents a challenging task for practitioners and researchers in the field of SBMs.

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## Conclusions

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This paper aims to strengthen the theoretical foundation of the emerging field of SBMs by presenting a unified perspective drawing on multiple bodies of literature – business model innovation, sustainability innovation, networks theory, stakeholder theory and PSS. This paper also contributes to the broader research area of business model



innovation by unpacking the concept of value creation from a sustainability perspective. We develop five propositions (Table 2), which lay the foundational concepts for innovation towards SBMs.

### Implications for Research

The study of SBMs is evolving rapidly, but little effort has been spent exploring their successful adoption. This work attempts to address this gap, identify opportunities to enhance outcomes of SBM innovations and contribute to the development of new theory that will be of utility to the wider SBM community. Based on the discussions in this review we propose the following directions for future research. Further research might investigate the development of a set of variables from the five theoretical propositions, and the relationships among the variables to deepen the understanding of the ideas exposed in the propositions. A main source of complexity in business model innovation is given by the uncertainty of impacts and behaviours of network members regarding the three sustainability dimensions. A simulation model, therefore, should be built to support a focal firm to identify value flows and exchanges, which could reveal opportunities for business model innovations and de-risk experimentation. The simulation model should demonstrate the environmental, economic and social impact of new business models.

### Implications for Business Strategy

Our most important recommendation to business practice is to encourage firms to understand their current business model better, embrace the concepts of SBMs and potentially identify entirely new and more appropriate future business models. The implication for business strategy is that firms need to understand the challenges in the adoption of SBMs. Their business strategy should reflect the scale and complexity of business model innovation for sustainability and the demand to develop new business models through experimentation. Business model innovation should not be taken lightly, as the impact assessment of new business models is complex and context dependent. Nevertheless, these endeavours will be of interest to industrialists seeking to meet the pressing need for sustainable development and the transition to more sustainable industrial systems to respond to growing economic, environmental and social challenges.

### Implications for Policy

This work also aims to increase the understanding of how policy makers can best deliver system-level sustainability outcomes concerning energy use, resource depletion, waste to land-fill, emissions and wealth creation. To achieve this, policy makers need to better understand what business model characteristics lead to real triple-bottom-line sustainability, and what operational, behavioural and policy interventions might be required to facilitate such innovations. Policy makers, and other interested stakeholders, may want to pay special attention to the proposed challenges and propositions about when stakeholders are most likely to contribute to the successful innovation towards SBMs. Policy can have an impact at the individual firm level and also at the wider industrial system level, transforming stakeholders' behaviour accordingly through appropriate policy interventions such as regulation, legislation, taxation, education and incentives.

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P1	Sustainable value incorporates economic, social and environmental benefits conceptualized as value forms.
P2	SBMs require a system of sustainable value flows among multiple stakeholders including the natural environment and society as primary stakeholders.
P3	SBMs require a value network with a new purpose, design and governance.
P4	SBMs require a systemic consideration of stakeholder interests and responsibilities for mutual value creation.
P5	Internalizing externalities through PSS enables innovation towards SBMs.

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**Table 2.** Unified perspective for innovation towards SBMs

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