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Chapter 10
Information Asymmetries and the Paradox of Sustainable Business Models: Towards an Integrated Theory of Sustainable Entrepreneurship

Vincent Blok

Abstract In this conceptual paper, the traditional conceptualization of sustainable entrepreneurship is challenged because of a fundamental tension between processes involved in sustainable development and processes involved in entrepreneurship: the concept of sustainable business models contains a paradox, because sustainability involves the reduction of information asymmetries, whereas entrepreneurship involves enhanced and secured levels of information asymmetries. We therefore propose a new and integrated theory of sustainable entrepreneurship that overcomes this paradox. The basic argument is that environmental problems have to be conceptualized as wicked problems or sustainability-related ecosystem failures. Because all actors involved in the entrepreneurial process are characterized by their epistemic insufficiency regarding the solving of these problems, the role of information in the sustainable entrepreneurial process changes. On the one hand, the reduction of information asymmetries primarily aims to enable actors to become critical of sustainable entrepreneurs' actual business models. On the other hand, the epistemic insufficiency of sustainable entrepreneurs guarantees that information asymmetries remain as a source of new sustainable business opportunities. Three further characteristics of sustainable entrepreneurs are distinguished: sustainability and entrepreneurship-related risk-taking; sustainability and entrepreneurship-related self-efficacy; and the development of satisficing and open-ended solutions, together with multiple stakeholders.

10.1 Introduction

The contribution of entrepreneurs to sustainable development has been increasingly receiving attention in the literature (Hall et al. 2010; Klewitz and Hansen 2014; Parrish 2010; Thompson et al. 2015). Sustainable entrepreneurship is defined as entrepreneurs' quest to contribute to the supply of innovative environmental

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products and services with the potential of substantial market success, societal change and changed market conditions (Schaltegger and Wagner 2011). Whereas traditional entrepreneurs are primarily motivated to address commercial needs and add economic value, without specific concerns regarding sustainability, sustainable entrepreneurs are primarily motivated to address sustainable needs (Trivedi and Stokols 2011). And whereas traditional or commercial entrepreneurs discover and exploit primarily *profitable* business opportunities to address customer needs (Shane 2003), environmental problems are the primary source of profitable business opportunities for sustainable entrepreneurs (Dean and McMullen 2007). The distinction between profit-driven entrepreneurs and sustainable entrepreneurs is not dichotomous however, but rather a continuum ranging from a purely sustainable to a purely profit-driven orientation (Austin et al. 2006). In fact, many entrepreneurs are profit oriented and at the same time generate environmental and social impacts.

In this, the sustainable entrepreneur seems to combine the best of both worlds by initiating those activities and processes that lead to the identification, evaluation and exploitation of profitable business opportunities (i.e., entrepreneurship) in order to contribute to sustainable development. In their framework for recognizing opportunities for sustainable development for instance, Patzelt and Shepherd (2011) identify additional knowledge of the natural environment, in addition to motivation and entrepreneurial knowledge, as crucial to being able to identify business opportunities for sustainable development. Environmental problems are seen as additional sources of new business opportunities, just as contributing to the solution of environmental problems can be seen as adding to the economic value-adding process in eco-entrepreneurship (Dean and McMullen 2007). Sustainable entrepreneurs are thereby expected to be better able to balance economic (profit), social-cultural (people) and environmental (planet) interests by entrepreneurial action. The same picture emerges in the sustainable business model (SBM) literature; whereas regular business models focus primarily on value propositions that generate economic returns, SBMs focus on ecological value propositions in addition to economic returns (Boons and Lüdeke-Freund 2013; Bocken et al. 2014). In this respect, sustainable entrepreneurship builds a specific category of entrepreneurs.

The question is, however, what consequences sustainable development has for the concept of entrepreneurship. Is the presupposition of a win-win, in which economic and environmental interests can be integrated in SBMs, legitimate, or is there a fundamental tension between processes involved in sustainable development and processes involved in entrepreneurial practices (cf. Hahn et al. 2015; Van der Byl and Slawinski 2015)? In this article, we challenge the win-win paradigm of sustainable entrepreneurship and explore a fundamental tension in this concept. This tension is found in the notion of information asymmetries and their impact on SBMs. Information asymmetries can be defined as the situation in which at least one actor in an economic exchange has more or better information than the other actors. The tension in the concept of sustainable entrepreneurship can be preliminarily formulated in the following way: sustainable development involves the reduction of information asymmetries, because it enables collaborative action with multiple stakeholders for sustainable action. At the same time, entrepreneurial processes

require enhanced and secured levels of information asymmetries in order to achieve and secure competitive advantage. This tension between sustainable development and entrepreneurial processes calls for a new and integrated theory of sustainable entrepreneurship.

In this chapter, we synthesize theory from entrepreneurship, SBMs and sustainable development and develop an integrated concept of sustainable entrepreneurship, including the mechanisms by which entrepreneurs can contribute to sustainable development. First, the role of information in collective actions for sustainable development and the need to reduce information asymmetries in order to engage stakeholders in sustainable entrepreneurial action is explored. Subsequently, I investigate the role of information in entrepreneurship, and the need to enhance and secure information asymmetries in SBMs. In the next section, a new and integrated theory of sustainable entrepreneurship that overcomes this paradox is proposed. The basic argument is that sustainable development has to be conceptualized as a wicked problem or a sustainability-related ecosystem failure. Because all actors involved in entrepreneurial action are characterized by their epistemic insufficiency regarding the solving of these problems, information asymmetries are maintained as a source of new sustainable business opportunities. From the analysis of the paradox of sustainable entrepreneurship and its solution, I propose three further characteristics of an integrated concept of sustainable entrepreneurs and draw conclusions in the final part.

10.2 The Role of Information in Collective Actions for Sustainable Development

The point of departure of this chapter is an economic perspective on entrepreneurship, rather than a moral-based or anthropology-based conception. According to environmental economics, environmental problems can be conceptualized as market failures. Because many natural resources like air and water are not easy to allocate to markets and because it is difficult to hold markets accountable for global phenomena like climate change resulting from increased or changed production and consumption processes, markets fail to ensure the sustainable provision of the natural resources on which economic actors depend (Dorfman 1993).

It is important to take the conceptualization of environmental problems as the result of market failures into consideration, because market failures can also be seen as the source of new entrepreneurial business opportunities. Entrepreneurial opportunities can be defined as "those situations in which new goods, services, raw materials, and organizing methods can be introduced and sold at greater than their cost of production" (Shane and Venkataraman 2000: 220). Sources of opportunities can be found in changes in supply or demand in the market, for instance new products or technologies for production or new preferences of customers. Furthermore, they can be found in different levels of awareness of these changes and their

solution by the entrepreneur, for instance different levels of information about the problem or its solution (Eckhardt and Shane 2003).

Three key factors seem to enable entrepreneurs to identify superior business opportunities: the active search for opportunities, alertness to opportunities and prior knowledge of market failures, the industry or the customer (Baron 2006). Opportunity recognition involves not only the 'alertness to changed conditions or overlooked possibilities' (Kirzner 1985)—i.e. the intellectual capacity and creativity to develop new solutions, new technologies and new products (Shane 2003)—but also the active search for new or alternative solutions for existing or anticipated problems (Shane 2000). The ability to identify superior business opportunities is dependent both on the prior knowledge possessed by the entrepreneur and on how this knowledge or information is processed by the entrepreneur (Gaglio and Katz 2001). In this respect, entrepreneurship can be seen as the *recognition* of opportunities in combination with the ability to *act* upon these opportunities, i.e. explore and exploit these opportunities.

Because on the one hand environmental problems can be conceptualized as the result of market failures, and on the other hand market failures can be seen as sources of new entrepreneurial business opportunities, Dean and McMullen (2007: 57–58) argue: "Whereas environmental economics concludes that environmental degradation results from the failure of markets and the entrepreneurship literature conclude that opportunities are inherent in market failure, the logical conclusion is that environmentally relevant market failures represent opportunities for simultaneously achieving profitability while reducing environmentally degrading economic behaviours. In other words, some market failures which result in environmental damage provide entrepreneurial opportunities whose exploitation promises profit and improvements in social welfare."

If we broaden our perspective on sustainable development however, it becomes clear that environmental problems can be considered as wicked problems (cf. Rittel and Webber 1973). Wicked problems are complex, ill-structured and public problems, like international terrorism, climate change and poverty. Environmental problems are such highly complex problems because they concern global and interconnected issues like climate change, increasing populations and changing consumption patterns, which cannot be solved in traditional ways or by simple solutions (Blok et al. 2015a). Some authors even call global warming a super wicked problem: "time is running out; the central authority needed to address them is weak or non-existent; those who cause the problem also seek to create a solution; and hyperbolic discounting occurs that pushes responses into the future when immediate actions are required to set in train longer-term policy solutions" (Levin et al. 2010: 2).

On the one hand, entrepreneurial action in response to sustainability-related market failures seem to be quite simple, suggesting that sustainable entrepreneurship can eliminate or correct market failures while reducing environmental degradation, pollution and greenhouse gas emissions (cf. Dean and McMullen 2007). If we on the other hand take the biophysical finiteness of planet Earth into account under the condition of economic growth, whether or not as a result of increased world population growth, it becomes clear that the problem is difficult to pin down and

highly complex, just as its solution; environmental problems do not only concern market failures, which can principally be solved by the market when the failure is fixed, as Dean and McMullen seem to assume. On the contrary, they concern an ecosystem failure to provide infinite resources for production and consumption, to provide optimum conditions for sustained production and consumption, and to do justice to intra- and inter-generational equity criteria (Korakandy 2008). As long as environmental problems are seen as market failures, the solution to these failures is found within the economic paradigm, in which the environment is seen as a subset of human economy, i.e. as a resource for production. The wickedness of phenomena like global warming makes clear, however, that the economy is on the contrary a subsystem of the ecosystems of planet Earth (cf. Van den Bergh 2001) and operates within the limits of the carrying capacity of Earth's life-support system. It is in this respect that environmental problems like global warming, which are even expected to increase because of population growth, do not primarily constitute market failures, but an ecosystem failure to provide infinite resources for economic exchange. Sustainable entrepreneurship therefore has to be understood as the process of exploring and exploiting opportunities that are present in sustainability-related ecosystem failures.

The complexity of environmental problems is also confirmed in the cross-sector partnership (CSP) and multi-stakeholder alliance (MSA) literature. Because the primary responsibility for economic, social and environmental issues is allocated to different types of actors in society—the private sector on the one hand and governments, NGOs and civil society on the other—action by multiple stakeholders is needed in order to address wicked problems like global warming (Van Huijstee et al. 2007). Stakeholder engagement, multi-stakeholder alliances and cross-sector partnerships between entrepreneurs and their stakeholders are important to manage wicked problems like global warming (Ayuso et al. 2006; Sharma and Kearnis 2011; Lowitt 2013) and to enhance responsible business practices (Wood 2002). An increasing number of both small and medium enterprises (SMEs) and large corporations (MNEs) are in fact involving stakeholders in order to contribute to sustainable development (cf. Veldhuizen et al. 2013).

In the context of sustainable entrepreneurship, this means that the exploration and exploitation of new sustainable business opportunities presupposes the active involvement of multiple stakeholders. Stakeholders are a broad range of groups or individuals who can affect, or are affected by, an organization, both internal such as suppliers, customers, employees, and external such as governments and NGOs (Freeman 1984). On the one hand, information from stakeholders can open a window of opportunity, i.e. new ideas for sustainable solutions, new forms of green supply and logistics, new substitutions for exhaustible natural resources, new market needs and so forth (Ayuso et al. 2011; Hart and Sharma 2004; Noland and Phillips 2010). In this respect, stakeholder engagement is key in the process of sustainable entrepreneurs' value creation and business model development (cf. Harrison et al. 2010). Because of the complexity of environmental problems

and the high uncertainty of the future impact of (un)sustainable innovations—one can think of biotechnology and nanotechnology—the active involvement of many stakeholders can enable a better understanding of these challenges and the risks and uncertainties involved in new sustainable business opportunities (cf. Belucci et al. 2002; Bulkeley and Mol 2003; Chilvers 2008). Furthermore, it can help to assess the social-ethical risks related to actual developments in sustainable production and consumption (Adriana 2009; Anderson and Bateman 2000; Dunphy et al. 2007; Freeman 1984; Lee 2009; Molnar and Mulvihill 2003; Blok 2014a). In this respect, stakeholder engagement is key to managing ecosystem failures in an entrepreneurial way.

From the previous analysis, we can define sustainable entrepreneurship as the process of exploring and exploiting opportunities that are present in sustainability-related ecosystem failures. Because ecosystem failures cannot be solved by the market alone, sustainable entrepreneurship involves collaboration with multiple stakeholders in the development of SBMs.

However, stakeholders have different, often conflicting, value frames and ideologies with regard to sustainability (De Wit and Meyer 2010; Peterson 2009). They have for instance differing ideas about what the 'real' problem behind sustainable development is, ranging from a market failure to an ecosystem failure, and the solutions they propose are based on multiple viewpoints that can differ widely among stakeholders and are not (always) based on shared values (Batie 2008; Kreuter et al. 2004; Blok 2014b). The active involvement of stakeholders can be hindered by the incompatibility of the value frames of actors in the private sector (i.e. entrepreneurs), NGOs for sustainable development and governmental organizations (Yaziji and Doh 2009; Selsky and Parker 2010), because of power imbalances among partners and so on.

For this reason, research is focusing increasingly on drivers of stakeholder involvement in business practices. The outcome of a collaboration can be influenced by the form and content of a collaboration's initial agreements for instance (Bryson et al. 2006). Such agreements describe the composition, mission and process of the collaboration. When partners do not completely agree on a shared purpose or when power issues are at stake, they may not be able to agree on subsequent steps for instance. Stakeholder engagement in SBM development is more likely to succeed if partners use resources and tactics to equalize power and manage conflicts effectively. Interaction, communication and sharing information can be crucial here, as this increases consensus among multiple stakeholders and helps to explore win-win situations and to establish agreements in resulting SBMs. Sharing information and knowledge is also a way for partners to build trust (Andriof and Waddock 2002; Bryson et al. 2006). Overall, therefore, information sharing increases the level of stakeholder engagement in sustainable entrepreneurial processes and can even be seen as an important predictor of partnership success (Mohr and Spekman 1994; Burchell and Cook 2006).

In the context of sustainable entrepreneurship, we can conceptualize information and knowledge sharing in terms of the reduction of information asymmetries. Information asymmetries, as already stated, can be defined as the situation in

which at least one actor in a collaboration has more or better information than the other actors (Kirzner 1973, 1985). Two specific problems arise in relation to information asymmetries. Information asymmetries may result in adverse selection before the collaboration or engagement with stakeholders is established, because actors' actual motivation to collaborate remains hidden from other actors. One can think of entrepreneurs involved in green washing, but also of entrepreneurs who are bluffing about the sustainability performance of new technologies that are still under development (Husted 2007; Van Oosterhout et al. 2006). Information asymmetries may result in moral hazard after the collaboration or engagement with stakeholders is established, because actors' actual performance remains hidden from other actors. One can think of entrepreneurs who do not keep their promise to contribute to sustainable development and are actually involved in industrial pollution, entrepreneurs who mislead their customers and other stakeholders by manipulating software that measures the sustainability of actual performance, but also of stakeholders who, deliberately or otherwise, share information about the collaboration with the entrepreneur's competitors.

The reduction of information asymmetries enables stakeholders to assess the socio-ethical issues related to the business model, thereby helping to prevent moral hazard and adverse selection problems. Furthermore, by the "linking and sharing of information, resources, activities, and capabilities", sustainable entrepreneurs enhance and secure the involvement of, and collaboration with, stakeholders in order to "achieve jointly an outcome that could not be achieved by organizations in one sector alone" (Bryson et al. 2006: 44). The corporate social responsibility (CSR) literature also acknowledges the importance of reducing information asymmetries (Lopatta et al. 2015). Transparency towards stakeholders is associated with good governance (Christensen and Cheney 2015) and involves all kinds of practices, ranging from financial disclosure statements and CSR annual reports, to stakeholder dialogues and codes of conduct (cf. Floridi 2010). Ethical codes for instance can be seen as a way to reduce information asymmetries in order to reduce stakeholders' adverse selection problems (Beneish and Chatov 1993; Ciliberti et al. 2011).

To conclude, if environmental problems have to be conceptualized as wicked problems and involve collaboration and engagement with multiple stakeholders in the development of SBMs, sustainable entrepreneurs explore and exploit sustainability-related ecosystem failures together with multiple stakeholders. In this respect, sustainable entrepreneurs acknowledge that the market alone cannot resolve ecosystem failures and, therefore, they actively collaborate with multiple stakeholders in collaborative action to address the wicked problem of sustainable development.

The entrepreneurial action that follows logically from this definition is captured in the first proposition:

Proposition 1: In their effort to address sustainability-related ecosystem failures, sustainable entrepreneurs enhance collaborative action with multiple market- and non-market-oriented stakeholders by reducing information asymmetries.

10.3 The Role of Information in the Entrepreneurial Process

The reduction of information asymmetries is, however, problematic from an entrepreneurial point of view. A fundamental characteristic of entrepreneurship is the ability to identify and pursue business opportunities (Kirzner 1973; Shane and Venkataraman 2000), which can be found in market or ecosystem failures as we have seen. These sources of opportunities can be conceived as additional *information* of which the entrepreneur takes advantage in the development of business models. Opportunities arise from information about market and ecosystem failures and their solution, and, in this respect, entrepreneurial engagement in, and the active search for, new opportunities is an active search for appropriate information (Shane 2003). It involves entrepreneurial alertness to information about demand conditions (customer needs, customer tastes and so on) and supply possibilities (new technologies, newly found resources and so on), but also overlooked possibilities resulting from emerging market and ecosystem failures (Kirzner 1985); it concerns the intellectual capacity and creativity to develop new solutions, new technologies and new products based on this information (Shane 2003).

The crucial role of information in business model development shows that it is the main source of competitive advantage (Conner and Prahalad 1996). Entrepreneurs' competitive advantage is based on information asymmetries, i.e. additional knowledge that enables them to identify business opportunities in the market, while others do not (Amit and Schoemaker 1993). This additional or 'prior' knowledge (McMullen and Shepherd 2006) may consist in the ability to "see where a good can be sold at a price higher than that for which it can be bought" (Kirzner 1973: 14, 1985). In this case, information asymmetries result from market participants' ignorance or imperfect knowledge with regard to *existing* information, and new business opportunities "arise out of the entrepreneur's alertness to [these] information asymmetries existing in the economy" (Dutta and Crossan 2005: 431). Information asymmetries may also be related to market and ecosystem failures that create market gaps that can be filled by entrepreneurs; new business opportunities arise then in entrepreneurs' efforts to develop markets for preserved environmental resources (Dean and McMullen 2007). Finally, information asymmetries may be *created* by the development of new information or new knowledge. This information provides opportunities for new or alternative solutions for existing or anticipated ecosystem failures.

The importance of information asymmetries as a source of competitive advantage means that, from an entrepreneurial perspective, sustainable entrepreneurs cannot reduce information asymmetries unlimitedly in favour of information symmetries among multiple stakeholders. The reduction of information asymmetries might create vulnerability by revealing the company's core competencies to other actors (Bigliardi and Galati 2013). This can affect the entrepreneur's ability to compete,

Table 10.1 The paradox of sustainable business models

	Sustainable entrepreneurial value creation	Collaboration for sustainable value creation
Reducing information asymmetries	Needed to explore and exploit opportunities that are present in sustainability-related market and ecosystem failures; may cause the loss of core competencies, knowledge or information	Needed to enhance collaborative action with multiple stakeholders to address sustainability-related market and ecosystem failures; may cause the loss of competitive advantage
Maintaining information asymmetries	Needed to enhance and secure competitive advantage; may limit access to new knowledge and information about sustainability-related market and ecosystem failures and their solution	Needed to secure and enhance competitive advantage; may hinder the engagement of, and collaboration with, multiple stakeholders

and this could have a negative influence on its competitive advantage (Islam 2012). Regarding economic actors, therefore, withholding information from other stakeholders is acceptable in order to enable entrepreneurs to achieve competitive advantage (Nayyar 1990), whereas such practices would not be acceptable in the public or political domain for instance (Dahl 1997).

To conclude, if entrepreneurship has to be conceptualized as the ability to take advantage of information asymmetries, sustainable entrepreneurial action does not only consist in the enhancement of collaborative action with multiple stakeholders by reducing information asymmetries (proposition 1). On the contrary:

> *Proposition 2: In their effort to address sustainability-related ecosystem failures, sustainable entrepreneurs maintain and enhance information asymmetries in order to achieve and secure competitive advantage.*

The analysis of sustainable development as an ecosystem failure and entrepreneurial practices confronts us with the paradox of SBMs, which becomes concrete in the first and in the second proposition formulated. The reduction of information asymmetries during the sustainable entrepreneurial process results in the integration of sustainable development within the business model. However, this reduction of information asymmetries undermines the entrepreneurial process at the same time, i.e. the ability of the entrepreneur to enhance and secure competitive advantage. This paradox is depicted in Table 10.1.

In the next section, I take advantage of the paradox of SBMs in order to build an integrated theory of sustainable entrepreneurship in which this paradox is resolved by the introduction of a new concept in the conceptualization of sustainability and entrepreneurship (Lewis 2000; Poole and Van de Ven 1989; Smith 2014): epistemic insufficiency.

10.4 Information Asymmetry as Epistemic Insufficiency

How can the paradox of SBMs be resolved? There seem to be at least two strategies available: a radical preference for information symmetry over information asymmetry in sustainable entrepreneurship, which seems to be Dean and McMullen's position, or a radical preference for information asymmetry over information symmetry, which requires a new and integrated theory of sustainable entrepreneurship. Let us focus first on the first solution and see its advantages and disadvantages.

According to Dean and McMullen (2007), we should not perceive the disequilibrium in the economic system—i.e. sustainability as a market or ecosystem failure—to be a state of nature, in which entrepreneurs take advantage on the basis of existing and created information asymmetries. "The environmental and welfare economics literature recognize not only the ignorance of producers or potential producers, but other barriers that, when overcome, allow the generation of economic rents and the movement of markets towards superior states of equilibrium and efficiency" (Dean and McMullen 2007: 57). According to these authors, imperfect information is one of these market failures, which, if sustainable entrepreneurs are able to overcome them, prevent or mitigate environmental degradation (Dean and McMullen 2007: 67).

This perspective seems to be promising in the case of sustainable entrepreneurship, because it allows the entrepreneur to reduce information asymmetries while maintaining his/her role in exploring and exploiting new business opportunities to solve sustainability-related market failures, leading to superior states of equilibrium and efficiency—i.e. more perfect levels of competition because of information symmetry—in which environmental issues also are addressed. This strategy solves the paradox of SBMs by highlighting the reduction of information asymmetries so that sustainable entrepreneurs can address sustainability-related market and ecosystem failures. Is this a suitable solution of the paradox discerned in the previous section?

From a theoretical perspective, information asymmetries and market failures represent a departure from Pareto efficiency, as Dean and McMullen (2007) rightly acknowledge. "Pareto efficiency is often equated with a state of perfect competition in which prices are equal to average total costs and, as a result, economic profits, or rents (profits) above all costs (including a risk-adjusted return to capital), are non-existent" (Dean and McMullen 2007: 54) thanks to perfect or symmetric information (Scherer and Ross 1990). Although Dean and McMullen acknowledge that it is questionable whether perfect knowledge and perfect competition can ever be reached, the *ideal* of sustainable entrepreneurship is that sustainability-related market failures are solved by the reduction of information asymmetries; the solution of these failures will allow sustainable entrepreneurs to develop business models that generate economic rents *and* that move markets towards superior states of equilibrium and efficiency, according to Dean and McMullen (2007).

But this is only one side of the story. The solution of market failures will indeed contribute to superior states of equilibrium and efficiency (information symmetry as

a solution for market failures), but, with this, it will no longer generate economic rents *after* the market failure is solved. Indeed, the more perfect the knowledge (information symmetry), the more perfect the competition, and the more perfect the competition, the lower the economic return of sustainable entrepreneurs, and the lower the competitive advantage of sustainable entrepreneurs. This concept of sustainable entrepreneurship focuses, in other words, indeed on the solution of sustainability-related market failures by the reduction of information asymmetries, but the price it has to pay for this achievement is the denial of entrepreneurial potential, which requires levels of information asymmetry to be maintained. It is precisely for this reason that entrepreneurs in fact maintain information asymmetries in practice in order to benefit economically from the opportunities provided by sustainability-related market and ecosystem failures.

The first solution to the paradox of SBMs does in fact not solve the paradox, but prefers one aspect of the concept (sustainable development) at the expense of the other aspect (entrepreneurial practices). What this solution in fact introduces is a duality between sustainable development on the one hand and entrepreneurial practice on the other in SBMs, in which sustainable development is preferred at the expense of entrepreneurial practice (reduction of information asymmetries). Reality, however, shows that the opposite can also happen (maintenance of information asymmetries). The advantage of this concept of sustainable entrepreneurship is that it explains the internal tensions within the concept of sustainable entrepreneurship—the continuous trade-offs between sustainability- and entrepreneurship-related interests—and it explains why and how these tensions may result in scandals and cases of fraud (cf. Hahn et al. 2015; Van der Byl and Slawinski 2015). The disadvantage of this dual concept of sustainable entrepreneurship is that it does not solve the paradox of SBMs. Negatively speaking, we learn from this dual concept of sustainable entrepreneurship that, in order to remain entrepreneurial, sustainable entrepreneurs should try to overcome ecosystem failures without any ideal of competitive equilibrium, because information symmetry would involve the self-denial or self-destruction of the entrepreneurial potential to explore and exploit new business opportunities.

In fact, reality meets this requirement of sustainable entrepreneurship, because information *is* often imperfect and incomplete and even *made* imperfect by entrepreneurs. In general, one can already question whether the reduction of information asymmetries, for instance the enhancement of transparency about business models and innovation practices, in fact promotes corporate responsiveness towards stakeholders (Christensen and Cornelissen 2015). Crilly et al. (2012) found that, in the case of information asymmetries between firms and their stakeholders, managers' responses to stakeholder pressures may consist in an intentional decoupling of firm policies and actual practices in favour of their own interests. Especially because entrepreneurs deal with multiple stakeholders with different and often opposing value frames, ambiguity seems to be a better strategy than transparency in order to serve one's own interests while being open to multiple stakeholders without offending them (Eisenberg 1984; Christensen and Cheney 2015). Information asymmetries are not only enhanced and secured in order to be *seen* as responsible,

rather than *being* responsible (Robert 2001), but are also sometimes enforced by privacy laws and regulations regarding the disclosure of competitive information.

In open innovation practices also, the paradox of information sharing and information protection can be recognized (Bogers 2011). Sometimes, firms discourage or restrict their employees from collaborating with stakeholders (Flipse 2012; Blok et al. 2015b) in order to prevent knowledge leakages (Mohamed et al. 2006). Notwithstanding the expected benefits of open innovation, the risk of negative knowledge leakage and, with this, the loss of competitive advantage, is significant for most companies (Gould 2012). Sometimes, entrepreneurs even increase information asymmetries to claim features of their innovations that are not (yet) justified, such as technical features or sustainability impacts in order to attract investments, or social features or impacts of new products in order to attract stakeholder support (cf. Millar et al. 2012). We therefore reject the preference of information symmetries to solve the paradox of SBMs, because the reduction of these asymmetries would involve the self-destruction of the entrepreneurial potential to exploit sustainable business opportunities.

Let us therefore turn to the other possible solution of the paradox of SBMs, which involves a preference of information asymmetry over information symmetry. This approach seems to be more legitimate because environmental problems have to be considered as wicked problems as we have seen, i.e. as problems that result not only from market failures but also from ecosystem failures; they concern highly complex problems regarding climate change with no finite set of clearly separated causes and effects, and they involve multiple visions and value frames (see Sect. 10.1).

This means that the asymmetry of information has a permanent and structural character; this implies that the ideal of perfect knowledge can never be reached; the sustainable entrepreneur has to acknowledge and deal with imperfect foresight. For this reason, we can conceptualize information asymmetries in the case of wicked problems in terms of actors' *epistemic insufficiency* regarding sustainability-related ecosystem failures. That is, our knowledge of the solution of environmental problems—i.e. SBMs—is principally imperfect and therefore insufficient to distinguish between good and bad strategies to solve these ecosystem failures. Climate smart innovations, for instance, may have unintended consequences or even irreversible consequences that may be harmful for future generations.

Actors' epistemic insufficiency regarding sustainability-related ecosystem failures implies that the sustainable entrepreneurial ideal of perfect knowledge and perfect equilibrium in the economic system has to be dropped, and that the fact of permanent information asymmetries has to be acknowledged by the entrepreneur. This means, first of all, that, irrespective of the sustainable entrepreneur's epistemic insufficiency regarding these ecosystem failures, information asymmetries can still be seen as a source of new sustainable business opportunities. This means, secondly, that sustainable entrepreneurs can enhance collaborative action with multiple stakeholders by reducing information asymmetries in their development of SBMs (proposition 1), because actors' epistemic insufficiency regarding these ecosystem failures will principally prevent the achievement of information symmetry and enable the

entrepreneur to uphold information asymmetries in order to maintain and enhance competitive advantage (proposition 2).

The epistemic insufficiency of sustainable entrepreneurs, their stakeholders and their competitors sheds another light on the meaning of entrepreneurship. The word entrepreneur comes originally from *entre-* (between) and *prendre, prehendere,* to grasp, to get hold of. What the sustainable entrepreneur *grasps* and *acts* upon is the wickedness—or in more philosophical terms, the strangeness or otherness—of sustainability-related ecosystem failures, which can only be 'apprehended', with no ability to 'know' them or to 'predict' their solution. It is this apprehension of sustainability-related ecosystem failures that is the source of new sustainable business opportunities. Hence, the third proposition:

> *Proposition 3: The maintenance of information asymmetries as a source of new sustainable business opportunities is enhanced and secured by the epistemic insufficiency of entrepreneurs and their stakeholders and competitors regarding sustainability-related ecosystem failures, which can be 'apprehended' by the sustainable entrepreneur as a source of new sustainable business opportunities.*

By reformulating the maintenance of information asymmetries in terms of actors' epistemic insufficiency regarding sustainability-related ecosystem failures, we provide a solution for the paradox of SBMs.

10.5 Consequences of Entrepreneurs' Epistemic Insufficiency for an Integrated Concept of Sustainable Entrepreneurship

Entrepreneurs' epistemic insufficiency regarding sustainability-related ecosystem failures has some additional consequences for an integrated concept of sustainable entrepreneurship. First of all, it makes clear why it is crucial to involve and engage multiple stakeholders in the sustainable entrepreneurial process, as we have seen in the previous section.

The critical stance of stakeholders towards the exploration and exploitation of sustainable business opportunities is crucial, because sustainable entrepreneurs' epistemic insufficiency makes the development of SBMs a highly risky and uncertain endeavour. This risk is not necessarily problematic from an entrepreneurial perspective, because risk-taking is traditionally seen as one of the main characteristics of entrepreneurship. Knight (1921) distinguishes between insurable and uninsurable risk, and argues that the entrepreneur takes an uninsurable risk by exploiting business opportunities that are highly uncertain upfront, for instance investment in new sustainable product development without any guarantee of sufficient returns on investment.

Although Knight's concept of uninsurable risk assumes a general equilibrium economic system in which risks occur as a consequence of economic changes and differences in the entrepreneurial ability of different actors within this economic

system, we can see risk-taking that results from the entrepreneur's epistemic insufficiency regarding sustainability-related ecosystem failures as a key element of sustainable entrepreneurship. The reason is that sustainability also can be considered as an uninsurable risk. No insurance can cover the risk of limited availability of natural resources like oil and gas for future generations—all opportunities to satisfy the needs of the current generation will change the conditions of the opportunities for future generations—and no insurance can cover the risk of the future negative impacts of new technologies like GMOs, nanotechnology or synthetic biology for future generations. In this respect, both sustainability and entrepreneurship concern radical uncertainty, and sustainable entrepreneurs deal with this radical uncertainty in their exploration and exploitation of new sustainable business opportunities in SBM development. This leads to the fourth proposition:

> *Proposition 4: In their effort to address sustainability-related ecosystem failures, sustainable entrepreneurs take risks by exploring and exploiting radical, uncertain sustainable business opportunities. The risks and uncertainty involved in sustainable entrepreneurship concern not only the entrepreneurial risk involved in the exploration and exploitation of new business opportunities in SBM development, but also sustainable entrepreneurs' epistemic insufficiency to assess the long-run sustainability of their solution to ecosystem failures.*

The difference between the risks taken by the entrepreneur and the risks concerning sustainability-related ecosystem failures is that the uncertainty relating to entrepreneurship is not necessarily problematic—one could argue that the free market decides which entrepreneur will be successful in his/her risk assessment—whereas uncertainty relating to sustainability is in fact problematic if we take into account the urgency to address global warming for instance. Because sustainable entrepreneurs apprehend the sustainability-related ecosystem failures without the ability to 'know' them or to 'predict' their solution, they acknowledge that the exploration and exploitation of new sustainable business opportunities in SBM development involve not only entrepreneurial risks, but also sustainability-related risks and uncertainties that may decrease but also may increase sustainability-related ecosystem failures.

This brings us to a second consequence of epistemic insufficiency for an integrated concept of sustainable entrepreneurship. Although sustainable entrepreneurs acknowledge this fundamental uncertainty, for instance the potential harm they can cause for others (customers, civil society, future generations and so forth), and, although they will continuously have to recapture their business models in their struggle against their possible unsustainability for future generations, the acknowledgement of their epistemic insufficiency does not necessarily have to lead to an entrepreneurial attitude characterized by *prudence* with regard to new innovative technologies and business models.

One of the key individual competencies of entrepreneurs is found in entrepreneurial self-efficacy. Self-efficacy concerns an actor's belief in his/her own ability to perform well (Bandura 1982), and entrepreneurial self-efficacy concerns an actor's belief in his/her own entrepreneurial competence to explore and exploit new business opportunities (cf. Ploum et al. 2017; Rauch and Frese 2007). Interestingly, the concept of self-efficacy has also emerged in the literature on competencies of sustainability professionals. Here, self-efficacy determines the action competence

of sustainability professionals (Almers 2013; Mogenson and Schnack 2010). Action competence can be defined as the "capability . . . to involve yourself as a person with other persons in responsible actions and counter-actions for a more humane world" (Schnack 1996: 15). In the context of sustainable entrepreneurship, self-efficacy means that, because of the epistemic insufficiency regarding sustainability-related ecosystem failures and their solution, sustainable entrepreneurship does not consist in prudence. On the contrary, self-efficacy means that the sustainable entrepreneur is involved in actions to address sustainability-related ecosystem failures and also believes that he/she is capable of addressing these failures. Whereas self-efficacy in the context of the action competence of sustainability professionals means that actors feel themselves responsible for, and capable of, acting in a more sustainable way—a trait that is not necessarily present in entrepreneurial self-efficacy—self-efficacy in the context of *sustainable* entrepreneurs concerns their belief in their own responsibility and capability for addressing sustainability-related ecosystem failures (Lans et al. 2014; Ploum et al. 2017). Indeed, entrepreneurship originally means an undertaking, i.e. the ability to undertake action to address sustainability-related ecosystem failures, leading to the fifth proposition:

> *Proposition 5: Notwithstanding their epistemic insufficiency and the risks and uncertainties involved in the exploration and exploitation of new sustainable business opportunities, sustainable entrepreneurs feel responsible for, and capable of, addressing sustainability-related ecosystem failures, and act upon these failures in their development of new SBMs, on the basis of their sustainable entrepreneurial self-efficacy.*

The undertakings of the sustainable entrepreneur are focused primarily on the solution of sustainability-related ecosystem failures, and, in this respect, sustainability is definitely a normative concept. It does not describe the world as it is but the way it *should* be and focuses on Earth's sustainability as a life-supporting ecosystem. This does not mean, however, that the sustainable entrepreneur embraces pre-given norms in his/her exploration and exploitation of new sustainable business opportunities: neither the norm of economic growth nor the norm of economic degrowth (cf. Jackson 2011; Schneider et al. 2010; Van Griethuysen 2010), neither the norm of prudent innovation nor the norm of reckless innovation like geoengineering and so on. If we take actors' epistemic insufficiency regarding sustainability-related ecosystem failures seriously, responsibility cannot mean that we apply pre-fixed norms and values regarding proposed solutions; they are not available upfront and are often in conflict among multiple stakeholders (Blok et al. 2015a). For this reason, the sustainable entrepreneur's responsibility is not informed by pre-given norms, but these norms and principles of the exploration and exploitation of new sustainable business opportunities are developed, negotiated and reconciled on the basis of multiple stakeholders' judgements. This process of developing and negotiating norms is unique in every situation, in which the interests of multiple stakeholders have to be weighted and revised over and over again because of changing circumstances or new insights.

In this respect, the responsibility of the sustainable entrepreneur can be seen as irreducibly *futural*: principles and norms regarding sustainable solutions are always

only applicable in a limited way, i.e. there always remain sustainability-related ecosystem failures that are not covered by these norms and principles. Responsible action by the sustainable entrepreneur therefore consists in his/her paradoxical responsibility to develop, negotiate and apply norms and principles in his/her exploration and exploitation of new sustainable business opportunities in SBM development, and at the same time to reflect, renegotiate and suspend these norms and principles in light of his/her epistemic insufficiency regarding sustainability-related ecosystem failures (cf. Morton 2013). Blok et al. (2015a) explored this paradoxical responsibility of the sustainable entrepreneur in terms of a virtuous competence.[1]

This brings us to a third consequence of epistemic insufficiency for an integrated concept of sustainable entrepreneurship. In practice, this means that the sustainable entrepreneur is not looking for perfect solutions, which in any event do not exist in the case of wicked problems like sustainable development, but for *satisficing* business models that, on the one hand, are satisfactory *and* sufficient to maintain Earth as a life-supporting ecosystem and, on the other, are always open to future subversions, revisions and improvements. The sustainable entrepreneur feels responsible for exploring and exploiting such satisficing business models together with multiple stakeholders, but acknowledges the futural status of his/her responsibility in light of the wickedness of sustainability-related ecosystem failures. This leads to a final proposition:

> *Proposition 6: Sustainable entrepreneurs take responsibility for sustainable actions by engaging in the exploration and exploitation of new sustainable business opportunities together with multiple stakeholders, thereby providing satisficing and open-ended business models for sustainability-related ecosystem failures.*

10.6 Conclusions

In this chapter, I pointed to the paradox of SBMs in the current conception of sustainable entrepreneurship in the literature. Although at first sight environmental problems seem to provide an additional source of new business opportunities, we raised the question of the consequences of the integration of sustainable development and the opportunity recognition process for the concept of entrepreneurship. The win-win paradigm of sustainable entrepreneurship was challenged by pointing to a tension between processes involved in sustainable development and processes involved in entrepreneurial practices, conceptualized as the paradox of SBMs. Sustainable entrepreneurship contains a paradox, because sustainable development involves the reduction of information asymmetries whereas entrepreneurial practices involve enhanced and secured levels of information asymmetries.

Because the paradox of SBMs calls for a new theory of sustainable entrepreneurship, theory from entrepreneurship, SBMs and sustainable development was

[1] Further elaboration of this concept is beyond the scope of this article.

synthesized in order to develop an integrated conception of sustainable entrepreneurship in this article. We defined sustainable entrepreneurship as the process of exploring and exploiting opportunities present in sustainability-related ecosystem failures. Because ecosystem failures cannot be solved by the market alone, sustainable entrepreneurship involves collaboration with multiple stakeholders in the development of SBMs. On the basis of this definition of sustainable entrepreneurship, it is possible to identify the paradox of SBMs. On the one hand, it was argued that, in order to collaborate with multiple stakeholders to address collectively sustainability-related ecosystem failures, sustainable entrepreneurs should reduce information asymmetries. On the other hand, it was argued that, in order to achieve and secure competitive advantage, sustainable entrepreneurs should maintain and enhance information asymmetries.

A possible solution to the paradox of SBMs was provided by the preference of information symmetry over information asymmetry in sustainable entrepreneurship. This solution was rejected in this chapter, as it indeed focuses on the reduction of information asymmetries needed to address sustainability-related ecosystem failures, but at the price of its denial of entrepreneurial potential, which requires levels of information asymmetry to be maintained. What this concept of sustainable entrepreneurship introduces is a duality between sustainable development on the one hand and entrepreneurial practice on the other, in which either sustainable development is preferred at the expense of entrepreneurial practice (reduction of information asymmetries) or the other way around (maintenance of information asymmetries). The first contribution of this chapter is that it articulates a duality in the traditional concept of sustainable entrepreneurship found in the literature, thereby explaining the internal tensions in sustainable entrepreneurial practices—the continuous trade-offs between sustainability- and entrepreneurship-related interests—and why and how these tensions occur in SBMs.

The second contribution of this chapter is that the analysis of this dual concept of sustainable entrepreneurship enables us to criticize the traditional concept of sustainable entrepreneurship. On the one hand, this dual conceptualization of sustainable entrepreneurship does not solve the paradox, but only prefers one aspect (sustainable development) at the expense of the other aspect (entrepreneurial practices). On the other hand, this dual conceptualization of sustainable entrepreneurship shows that, in order to remain entrepreneurial, sustainable entrepreneurs should try to overcome ecosystem failures without any ideal of competitive equilibrium, because high levels of information symmetry would involve the self-denial or self-destruction of their entrepreneurial potential to explore and exploit new business opportunities.

The third contribution of this chapter is that the reflection on sustainable development as a wicked problem enables us to solve the paradox of SBMs by developing an integrated theory of sustainable entrepreneurship. The basic argument is that sustainable development has to be conceptualized as a wicked problem or a sustainability-related ecosystem failure. Because all actors involved in the development of SBMs are characterized by their epistemic insufficiency regarding the resolution of these ecosystem failures, the role of stakeholder information in the

sustainable entrepreneurial process changes. On the one hand, the reduction of information asymmetries aims primarily to enable actors to become critical of sustainable entrepreneurs' actual business model; stakeholder information helps to question the limitations of the value frames and interests involved in the actual business model and the possible one-sidedness of the provided solutions as a result of entrepreneurs' epistemic insufficiency. On the other hand, even if this requires the reduction of information asymmetries in collaborative entrepreneurial action, the epistemic insufficiency of sustainable entrepreneurs and their stakeholders guarantees that information asymmetries remain as a source of new sustainable business opportunities.

This resolution of the paradox of SBMs implies three other characteristics of an integrated concept of sustainable entrepreneurs. First, sustainable entrepreneurs take risks by exploring and exploiting radical, uncertain sustainable business opportunities in SBM development. This uncertainty concerns not only the classical entrepreneurial risk involved in the exploration and exploitation of new business opportunities, but also the sustainability-related risks that proposed solutions do not, or do not sufficiently, solve sustainability-related ecosystem failures. Second, notwithstanding their epistemic insufficiency and the risks and uncertainties involved in exploring and exploiting new sustainable business opportunities, sustainable entrepreneurs feel responsible for, and capable of, addressing sustainability-related market and ecosystem failures, and act upon these failures in their development of SBMs on the basis of their sustainable entrepreneurial self-efficacy. Third, sustainable entrepreneurs take responsibility for sustainable actions by engaging in the exploration and exploitation of new sustainable business opportunities together with multiple stakeholders, thereby providing satisficing and open-ended business models for sustainability-related market or ecosystem failures.

In conclusion, this chapter contributes to our understanding of the role of entrepreneurs in addressing sustainability-related ecosystem failures, i.e. sustainable entrepreneurship. By viewing sustainable development as an ecosystem failure, we conceptualize sustainable entrepreneurship as the process of exploring and exploiting, together with multiple stakeholders, the new and innovative business opportunities present in these sustainability-related ecosystem failures. Sustainable entrepreneurs feel responsible for exploring and exploiting new SBMs to address sustainability-related ecosystem failures, and, notwithstanding their acknowledgement of the fundamental risks and uncertainties involved, they feel capable of providing, together with multiple stakeholders, satisficing and open-ended business models for sustainability-related market or ecosystem failures.

A possible limitation of this chapter is its focus on the economic perspective on entrepreneurship as its point of departure. In future research, moral-based and anthropology-based conceptions of entrepreneurial activity, to name just a few, should also be considered and contrasted. Another potential limitation of this study is its focus on the environmental aspects of sustainability, with the social and anthropological aspects of sustainable development receiving less attention. Finally, because of the theoretical orientation of the current contribution, future work is needed to operationalize the theory both from a managerial perspective

and from the perspective of empirical research. With this contribution, I hope to fuel such future theoretical and empirical research in the field of sustainable entrepreneurship and the development of SBMs.

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