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Jad Asswad
Carl von Ossietzky University of Oldenburg, jad.asswad@uni-oldenburg.de

Georg Hake
Carl von Ossietzky University of Oldenburg, georg.hake@uni-oldenburg.de

Jorge Marx Gómez
Carl von Ossietzky University of Oldenburg, jorge.marx.gomez@uni-oldenburg.de

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Jad Asswad
Carl von Ossietzky University of Oldenburg
jad.asswad@uni-oldenburg.de

Georg Hake
Carl von Ossietzky University of Oldenburg
georg.hake@uni-oldenburg.de

Jorge Marx Gómez
Carl von Ossietzky University of Oldenburg
jorge.marx.gomez@uni-oldenburg.de

Abstract

The continuous innovation process of the Information and Communication Technology (ICT) sector shape the way businesses redefine their business models. Though, current drivers of innovation processes focus solely on a technical dimension, while disregarding social and environmental drivers. However, examples like Nokia, Yahoo or Hewlett-Packard show that even though a profitable business model exists, a sound strategic innovation process is needed to remain profitable in the long term. A sustainable business model innovation demands the incorporation of all dimensions of the triple bottom line. Nevertheless, current management processes do not take the responsible steps to remain sustainable and keep being in denial of the evolutionary direction in which the markets develop, because the effects are not visible in short term. The implications are of substantial effect and can bring the foundation of the company's business model in danger. This work evaluates the decision process that lets businesses decide in favor of un-sustainable changes and points out the barriers that prevent the development towards a sustainable business model that takes the new balance of forces into account.

Keywords

Business Model Innovation, Sustainable Business Model Innovation, Sustainability-Oriented Innovation, Open Innovation, Triple Bottom Line

1. Introduction

A business model in its traditional definition serves multiple functions including the articulation of the value proposition, the identification of the value chain and the specification of the revenue mechanisms or the positioning of the company in the value network (ecosystem), while formulating its competitive strategy in the market (Chesbrough & Rosenbloom, 2002). In a traditional market environment, it was sufficient to build a profitable business model and protect its position against upcoming competitors that offered a substitute product or service. Having established a product with a high market share allowed businesses that have built a strong position to milk their "cash cows" over years without reinventing the core business idea. It was sufficient to follow an evolutionary development process and keep the eyes open for upcoming newcomers that overlapped with the own market segment.

However, with the growing distribution of ICT in more and more parts of our everyday life and their capability to replace or enhance products and services in their entirety, businesses are forced to innovate their business models from the ground up in order to remain competitive in the long term. The introduction of ICT into our private life and business processes led to four areas that businesses have to incorporate in their decisions regarding the future development of their business models.

First, new product types such as Product Service Systems (PSS) change the way a product needs to be advertised and supported. Not only the good itself is sold autonomously, but in combination with services that increase the utility of the product for the user when consumed in together. The example of Apple's iPod, that encourages the use of iTunes as complementary service to make the purchase and management of music as easy as possible (Johnson, Christensen, & Kagermann, 2008), showed the advantage of a PSS over products that where sold autonomously and neglected the integration of additional services including entertainment subscriptions or cloud services.

Second, staying in constant interdependence to each other, companies are forced to coordinate their business model innovation processes with each other. It remains neither enough to only adapt their own business model with the coopetitor's model nor to force the coopetition in a top-down manner to adapt towards own business model transformations and expect members of the network to follow the lead (Basole, Park, & Barnett, 2015). Such an approach towards business model transformation just targets towards a short term change, but will inevitable fail in long sight. The third area changing the market is the shorter lifecycle of a typical industrial product (Chesbrough, 2007b). The lifespan of a product decreases due to fashion reasons or new technological innovations rather than the product not working anymore. This behavior has both an economical and an ecological impact that a business model has to take into account to not be left behind (Cox, Griffith, Giorgi, & King, 2013). Fourth and finally, customers become more aware of the impact their consumption decisions have on the environment and adapt their purchasing decisions accordingly (Wernink & Strahl, 2015). Hence, a business not only has to take the economical dimension into consideration when defining a new innovation strategy, but has to incorporate the demands of the society and the ecological impact of their processes into account.

Nevertheless, the return on the investment within all these areas becomes only visible in the long term, such that appropriate measures are neglected in short focused management decisions. Hence, stakeholder demands are neglected and the business model innovation lacks a sustainable foundation, which puts the business and its entities in a vulnerable position. Therefore, this work shines a light why traditional business model innovations founder on a sustainable transformation process.

2. Research Process

In order to derive a successful approach to develop a sustainable business model, it is necessary to clarify what problems could occur, when designing and implementing an innovative business model that can sustain in the long term. Hence, the research question of this work asks:

"What are the obstacles that hinder the design and implementation of sustainable business model innovation processes?"

In order to illustrate the barriers that companies encounter during a typical innovation process, it is shown in which areas companies misdetermine stakeholder interests and how each of these decisions jeopardizes a sustainable state with regard to the three perspectives of the triple bottom line: economical, ecological and social sustainability. The research process is based on a systematic literature review across multiple scientific disciplines focusing on sustainable business models, business models for sustainability, sustainability-oriented innovations and business model innovations (Bocken, Short, Rana, & Evans, 2014; Chesbrough, 2010; Hansen, Grosse-Dunker, & Reichwald, 2009; Lüdeke-Freund, 2010; Rennings, 2000; Schaltegger, Hansen, & Lüdeke-Freund, 2015; Zott, Amit, & Massa, 2011). In order to derive the barriers, an argumentative-deductive analysis was conducted and adapted to the eight archetypes of Sustainable Business Models (SBM) according to Bocken, Short, Rana, & Evans (2014a).

3. Sustainable Business Model Innovations

In a previous work (Asswad, Hake, & Marx Gómez, 2016), we introduced an integrative model (see Figure 1) that combined the concepts of sustainability-oriented innovations (Hansen et al., 2009), the lifecycle of ICT (Hilty, Lohmann, & Huang, 2011), and open innovations (Chesbrough, 2003).

The target dimension of the model depicts the impact of innovations on sustainability targets, according to the triple bottom line concept (Elkington, 1998). The ICT lifecycle dimension focuses on the sustainable effects of innovations on the physical lifecycle of ICT products. The last dimension, the innovation types dimension, describes product and process (product-related) innovations on the technical level by its 'technological innovations' type, while it describes innovations beyond the technological level by its 'product-service system' and 'business model' innovation types. Other than before, this work focuses on the business model innovation type in general and not only in the ICT sector. As part of the study, the importance of innovating a company's business model will be highlighted and subsequently the concept of sustainable business model innovation will be explored.

The importance of a successful business model can often be forgotten. However, the success of companies is not only determined by how good their products are or how innovative their technologies and ideas are. A successful company is the company that is able to provide an innovative and distinctive business model. Chesbrough emphasized the importance of a good business model over a good technology by stating that a better business model will often beat a better idea or technology (Chesbrough, 2007a) and that an average technology or idea wrapped in a great business model might be more valuable than a great idea or technology that operates within an average business model (Chesbrough, 2010) or, in other words: "Products and services can be copied; the business model is the differentiator" (Edward Giesen, Saul J. Berman, Ragna Bell, & Amy Blitz, 2007, p. 27).

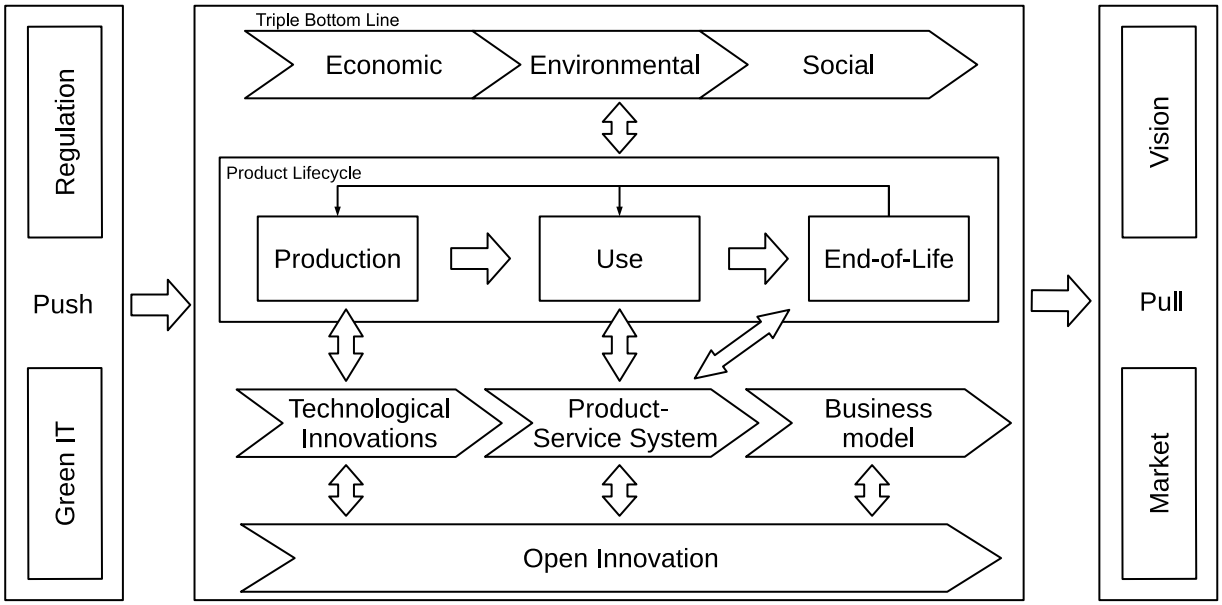

Figure 1: Integration of Sustainability-Oriented Innovation in the Life Cycle of ICT
Source: (Asswad et al., 2016)

A successful business model is about creating and capturing value for the company (Chesbrough, 2007a; Johnson et al., 2008; Zott & Amit, 2010). Establishing and maintaining such a business model is not that easy, especially with regard of the globalization and the continuous emerge of new and advanced technologies. Here the role of innovation becomes critical to create a competitive advantage and differentiation for the company within its marketplace. Back in 2006, IBM's CEO study interviewed 765 corporate and public sector leaders around the world on the subject of innovation. The study emphasizes the increasing importance of business model innovation upon the other two innovation types: products/services/markets innovation and operational innovation (Palmisano, 2006). Massa & Tucci (2013) highlighted two complementary roles for the business model in fostering innovation. On the one hand, business models allow companies to commercialize new ideas and technologies. On the other hand, business models can be the source of innovation in and of itself, and the source of competitive advantage.

One good example of a successfully commercialized business model is the Xerox business model of its new invention and original copier, the Model 914. The copier's manufacturing cost was too high and estimated at $2000 per machine, making it almost impossible to commercialize it at such a price back then. Xerox used the advantage of the affordable price of the machine's papers and supplies to penetrate the market with its new technology. In 1959, Xerox introduced the Model 914 to the market with an innovative business model. They offered customers to lease the copier instead of buying it at a high price. The lease solution was really attractive to the customers to acquire the new technology. Customers had to pay a monthly lease of $95 including 2000 copies per month and 4¢ per copy beyond the 2000 copies, in addition to the required service and support and the ability to cancel the lease on only 15 days' notice. The business model was a huge success as it provided an attractive value proposition for customers and

generated huge revenues for the company as users averaged 2000 copies per day and not per month (Chesbrough & Rosenbloom, 2002).

Other examples of successful business models as a source of innovation can be seen in the business model of Dell in the computer industry, Southwest in the airline industry, or Apple with iPod and iTunes combination in the music industry (Massa & Tucci, 2013).
The later example highlights a common example of an innovative business model from the ICT sector where Apple introduced the iPod as a Product Service System (PSS) in combination with its iTunes store back in 2003 (Johnson et al., 2008). This Introduction was a game changer as it revolutionized the entertainment sector, created a new market and reshaped an entire Industry. In just three years, almost 50% of Apple's revenue came from the combination of the iPod and iTunes. Apple's market capitalization went from $1 billion to over $150 billion between early 2003 and late 2007. The huge success accomplished by Apple is not based on the technology itself, but lies rather in pursuing it with a great business model that combines hardware, software and services and provides an easy and convenient way to download and listen to digital music.

Whereas innovating business models became a postulate for companies to sustain their businesses economically, the other two dimensions of the sustainable development remain frequently uncovered or underestimated. As we presented in our model in Figure 1, the triple bottom line concept is the target dimension that orchestrates innovations, not only for business models but also for the whole lifecycle of the product.

Sustainable business models or business models for sustainability are business models that create and secure the position of the company in the marketplace and support eco-innovations at the same time, providing values and benefits for itself and for society. Lüdeke-Freund defined such a business model as "a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society" (Lüdeke-Freund, 2010, p. 23). In other words, a business model that "positions sustainability as an integral part of the company's value proposition and value creation logic" (Schaltegger, Lüdeke-Freund, & Hansen, 2011, p. 12).

Hence, a sustainable business model targets towards a sound position in the market while maximizing the utility of the customer and taking the demands of society into account, which defines the objective a sustainable business innovation aims towards. In order for a business model innovation to be sustainable, it has to incorporate the dimensions of the triple bottom line. Traditionally, the concept of the triple bottom line distinguishes three perspectives of sustainable development: economic aspects, environmental issues and social factors. The driving force towards such a sustainable business state is the innovation process (Elkington, 1998). Bocken et al. (2014) outline in their work that business model innovations for sustainability are "innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organization and its value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions" (Bocken et al. 2014, p. 44). Therefore, a sustainable business model shifts innovation towards sustainability changes in the way a business creates value and integrates a new perspective that includes the value-network and its environment.

4. Sustainable Business Model Innovation Barriers

A sustainable business model innovation is mainly driven by two mutual reinforcing sides: push- and pull-drivers, as depicted in Figure 2. From the one side, pushing drivers force a business to react to regulations coming from outside the ecosystem, while on the other side pulling drivers change the variables of the ecosystem a business interacts in. Pushing drivers of a sustainable innovation process are technological determinants along the supply chain such as material efficiency, product quality, the product palette or energy efficiency. In addition to technological achievements that shape the market, regulatory drivers push the innovation by forcing companies in a top-down manner to adapt to existing laws, new standards that improve quality, health or safety related issues and expected regulations.

Pulling drivers, on the other hand, are mostly market driven external variables a business has to adapt to in the long term. Those include the overall customer demand, the image of the business and its products, labor costs, new markets and their market share with regard to their competition (Rennings, 2000).

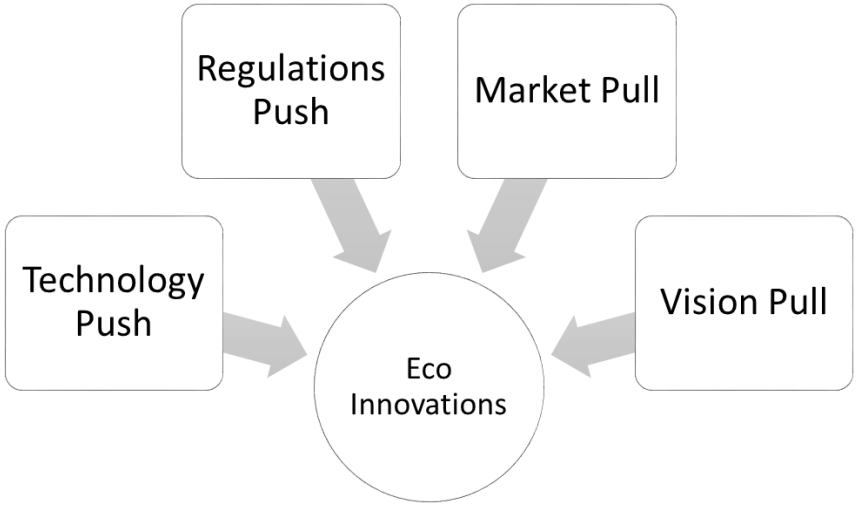

Figure 2: Eco-innovation push and pull drivers
Source: (Rennings, 2000, p. 326) (modified)

Being forced to act (pushed) and to follow (pulled), business models cannot be designed isolated from external stakeholders anymore. Sustainable business models take the demands and desires of all stakeholders into account. In an extensive literature review, Bocken et al. (2014) identified eight business model archetypes that are required to derive a sustainable business model. The archetypes are categorized as technological, social and organizational archetypes. The technological dimension includes (i) the maximization of the material and energy efficiency during the production process, (ii) the reevaluation of waste as a value and (iii) the substitution of source materials with renewable and natural processes. The second dimension, the social archetypes, are categorized with the goal to induce the business to (iv) focus on functionality instead of the ownership of a good, (v) take over the leadership in sustainable business efforts and (vi) promote sufficiency. Finally, the organizational group covers the notion to (vii) repurpose the business not only for economic reasons, but for the society and the environment.

As actor in a business ecosystem this inheres the (viii) collaborative approaches that allow scale-up solutions. However, today's business models are not intended to include social and environmental norms, as they are designed from an economic perspective. In order to illustrate the obstacles that hinder developing business models towards each business archetype, we identified eight barriers that prevent businesses to take appropriate measures to sustainably secure their long term position. The barriers identified in this work present our point of view and our conclusion, which is based on an extensive research from various literature sources. The literature that have been incorporated cover the concepts of sustainable business models in general, the barriers of business model innovations, and the past and future research in the business model field (Bocken et al., 2014; Chesbrough, 2010; Hansen et al., 2009; Lüdeke-Freund, 2010; Rennings, 2000; Schaltegger et al., 2015; Zott et al., 2011).

In the following, as depicted in Table 1, each barrier is presented individually and for each obstacle the long term consequences are shown if neglected by the industry:

Barrier 1 - Material/Energy efficiency adds no visible value:
Even though a business is not reluctant to improve their processes in order to maximize energy/material efficiency, in most cases appropriate plans are discarded, as there are no reliable measurements available at the moment that distance a more sustainable product from an unsustainable one. Hence, the endeavors would remain unnoticed by the target audience and won't find the necessary support in the first place (Randles & Laasch, 2015; Upward & Jones, 2015). *Consequences:* Due to high costs in R&D, more efficient technologies are neglected and cheap materials and energy sources are still used, even though they have a negative impact on the environment.

Barrier 2 - See waste as worthless/problem:
From the traditional industrial production company to service providers that trade intangible goods, the production and consumption of goods results in waste, be it energy emissions or material waste. Though, efficient waste management can be profitable from an economical viewpoint, it requires a fundamental change in the way waste is handled today. In most cases, the end-of-life phase in a product life-cycle marks a hassle and cost factor for most companies.
Consequences: Even when residues and by-products are considered to be valuable, they are regained mainly for profit without consideration of their impact on the environment or society.

Barrier 3 - Changes take long, are expensive and include risks:
The substitution of resources with renewables and the integration of natural processes into the business model are processes that can't be overtaken within a short time period. Like all long term investments, returns on the investments made are not always visible right away, as they include changes in the ecosystem as a whole. *Consequences:* Long term investments such as the use of renewables or adjusting processes to reduce environmental footprint are still assessed solely on their economic value rather than their impact on climate or society.

SBM Archetypes	Barriers preventing SBMs	Effects of the Barrier
Maximize material and energy efficiency	Adds no visible value in the eye of the customer	Substitute efficiency for cheap materials/energy
Create value from waste	See waste as worthless/problem	Dismiss waste and loose valuable resources
Substitute sources with renewables	Changes are expensive and not visible	See environmental damages as cost factor
Functionality instead ownership	Path dependency	Ignore changing consumption patterns
Adopt a stewardship role	Missing foresight of what will be a future standard	Comply only to current standards
Encourage sufficiency	Lack of framework to communicate changes	Positioning only by directly visible attributes
Repurpose for society/environment	Problem in determining stakeholder demands	Focus solely on economic profit
Develop scale up solutions	Collaboration takes effort and requires openness	Find solutions isolated and miss synergy effects

Table 1: The Barriers of Sustainable Business Models

Barrier 4 - Path dependency:
The archetype that proposes functionality instead of ownership demands businesses to change their perspective away from the idea of selling a physical good towards the provisioning of services and solutions. However, that idea does not take into consideration that industries shaped over years and can't decline their traditional selling strategy on a short term. For companies it remains difficult to pull off the new growth that business model innovation can bring (Johnson et al., 2008; Roome & Louche, 2015). In addition, innovative business models may often conflict with existing industry structures and threaten the ongoing value of the company (Amit & Zott, 2000). *Consequences:* An elementary shift in the way business was done over a long time period will not be realized and will result in stagnation.

Barrier 5 - Missing foresight of what will be standard in the future:
Although companies show awareness for the ways business changes over time, in order to adopt a stewardship role, it remains inevitable to take over as a trailblazer. However, this means to be aware of the technological development in their market and its consumption patterns. Disruptive technology and disruptive innovation can force a change on the existing market without fundamentally changing the company's own business model (Christensen, 1997). *Consequences:* Businesses remain reluctant to take over the role as precursor as they are unaware of the future developments until it might be too late.

Barrier 6 - Lack of framework to seize and communicate changes:
In order to encourage sufficiency, it remains important that the positive measures that have an ecological impact can be communicated to the respective recipients. In addition, a business also needs to prove standards towards its stakeholders to encourage adopters. In a business ecosystem, it is unavoidable in the long term to validate that all involved parties adhere to a specific level of quality, environmental or social sustainability. However, until today there is no agreement on a common framework or standard in industry or in research on how sustainability measures can be classified and communicated between all stakeholders (Schaltegger, Lüdeke-

Freund, & Hansen, 2012; Upward & Jones, 2015). *Consequences:* Without a mutual agreement on a standard that substantiates the efforts made, an encouragement goes unheard.

Barrier 7 - Problem in determining stakeholder demands:
Stakeholders such as customers or business partners do not explicitly express their needs and wants. Even worse, stakeholders often do not know for themselves what change within their ecosystem they wish for. Reasons can be that new technological developments are unknown or alternative solutions have not been promoted. Furthermore, this phenomenon applies to the ecological dimension as well, as it remains unclear how to seize the as-is and to-be state. *Consequences:* Companies focus on economic profit instead of determining how to position themselves in the market in order to suit social and environmental requirements.

Barrier 8 - Collaboration takes effort and requires to open up:
In today's business ecosystems it gets impossible to isolate completely from stakeholders. From a sustainability perspective, however, it is still unusual to coordinate the efforts taken. Most businesses to go their own way when it comes to recycling, reuse and repair activities. This eliminates any possibility of gaining synergy effects that could lead to more efficiency in energy or material use. Furthermore, it makes it impossible to gain enough influence to form a more sustainable supply chain, and it takes effort to initiate and maintain a possible collaboration towards a more sustainable business network (Gauthier & Gilomen, 2015). *Consequences:* Avoiding a collaboration for more sustainability has no measurable effect in short term. Therefore, without appropriate push- or pull-drivers no change in behavior can be expected.

5. Discussion and Future Work

The barriers introduced earlier in this work present a challenge for companies, and there is no unique or single solution to contain the problems and overcome the barriers. Different scholars suggested frameworks or strategies to shift towards more sustainable business models, but in our point of view, creating such business models and overcoming the barriers of sustainable business model innovations can only be achieved by opening up the boundaries of the company and get use of the advantage of the ecosystem that the company belongs to.

Such approaches are not new, and were introduced by different scholars. Zott and Amit (2010) discussed the concept of ‘Open Business Models’, where a company opens up its business model to rely on resources and capabilities from outside its boundary and benefits from external ideas and technologies. On the other hand, Chesbrough (2003) introduced the notion of ‘Open Innovation’, a new innovation paradigm that encourages companies to not limit themselves to their internal R&D but also use external resources and ideas as input for their innovation processes and at the same time expand the markets for external use of innovation.

Open innovation is summarized in three types: Outside-In (Inbound), Inside-Out (Outbound) (Chesbrough, 2003; Chesbrough & Bogers, 2014; Lichtenthaler, 2011; West, Salter, Vanhaverbeke, & Chesbrough, 2014), and Coupled Open Innovation (Bogers, 2012; Enkel, Gassmann, & Chesbrough, 2009; Gassmann & Enkel, 2004; West et al., 2014). Each type of them embodies different open innovation mechanisms. In our future work we will suggest a roadmap to overcome the previous defined barriers of sustainable business model innovations through the use of the different mechanisms of open innovation.

6. Conclusion

The barriers that stand against innovating sustainable business models are an undeniable problem that requires all stakeholders within a business ecosystem to cooperate. In this work we identified the barriers that need to be addressed in a sustainable business model innovation process and outlined the necessity to overcome these barriers and pave the way for companies to integrate eco-innovation standards in their innovation processes and move towards achieving corporate sustainability. To identify the barriers, a comprehensive literature review on the issues of sustainable business models, business models for sustainability, sustainability-oriented innovations and business model innovations has been conducted. The barriers were assigned accordingly to eight archetypes of SBM according to (Bocken et al., 2014) and then short descriptions of the barriers were given subsequently.

This work is part of a requirement analysis of a platform for implementing sustainability-oriented innovations in the life cycle as well as the business models of ICT through open innovation. In a previous work we developed a model that integrates the concept of open innovation along with sustainability-oriented innovation and product's life cycle in general and ICT as a special case. In summary, we identified the barriers of sustainable business model innovations. In following publication, we will present a roadmap to overcome the barriers we identified in this work, which will serve then as an artifact towards developing a platform that facilitates the integration of sustainability in organizations' business models.

7. Acknowledgement

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