

Opportunities for responsible research and innovation to be implemented in sustainable business models

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Abstract:

The world is changing quickly. More and more products are introduced to the market that bears the possibility to entail negative consequences/impacts. According to the European Commission (2013) better anticipation can prevent this from happening. Therefore they introduced the concept 'responsible research and innovation' (RRI), which focuses on better anticipation, as a main aim in the Horizon 2020 framework. The issue regarding RRI is that there is no coherent vision, nor an approach exists how this should be used/implemented/get shape in society.

To give an overview of how RRI can be integrated in businesses this thesis reviews the concepts of business models, business models for sustainability and responsible research and innovation.

The contribution of this thesis to science is the introduction of a new perspective of how RRI can be used in practice, with the use of a stage-gate process. This thesis provides ways how businesses can integrate the concept of responsibility in business models for sustainability. One way is by integrating the concept of responsibility in the different business model building blocks of Osterwalder (2004), as such that the concept of RRI can be used as an enhancement of business models of sustainability. The other way this thesis explores, is by integrating the journey to become sustainable with the journey of becoming responsible.

Keywords: business model, business model for sustainability, responsible research and innovation

Summary

First the concept of business models is elaborated. Business models are defined as: ‘a conceptual tool that contains a set of elements and their specific relationships and allows expressing the business logic at a specific firm. It is a description of the value a company offers to its stakeholders and of the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.’

The second chapter is mainly focused at the importance of business models in an organization. Main questions are, why businesses change their business model, barriers to change a business model and how businesses make changes in their business model. First the five reasons why businesses change their business model are derived from Johnson et al. (2009): (1) The opportunity to serve a new group of customers, (2) exploit a new technology with a new business model, (3) exploitation of unused/unidentified markets, (4) the need to fend off low-end disruptors and (5) business models need to change because of competition. Also some barriers which prevent business model innovation are given, like reluctance to change from the top, to reluctance to change from the bottom. Chapter 2.4 looked how businesses can change their business model, which comes down to good understanding, clear vision, ongoing design and testing, and thinking ahead. Finally, the chapter looks at the building blocks that are used to combine both the concepts of Business models for sustainability (BMfS) and responsible research and innovation (RRI). Chapter is used as foundation for chapter 3, which looks at the features of sustainability.

Chapter 3 starts with stressing the importance of why is chosen to use sustainability in this report, followed by the characteristics of sustainable business models. Afterwards is explained why businesses become sustainable and finally how they can become sustainable. The latter can be achieved by the use of the three steps: first the company has find out to which extend it will become sustainable; secondly they have to choose which features of sustainability they will integrate in the business and finally the company will have to go through the actual implementation stages.

Chapter 4 gives an overview on the vision of contemporary scholars about responsible research and innovation. After explaining why the concept is gaining ground, the four dimensions of Stilgoe et al. (2013) are deliberately discussed. The four dimensions are: (1) anticipation, (2) reflexivity, (3) inclusion and (4) responsiveness. With discussing the four dimensions, the interpretation of other scholars are taken in consideration to give a good overview of the concepts. In chapter 4.3 the author of this thesis has made a contribution about his own vision of how the concept can be used in practice. This vision implies that a company has to go through two different stages, which both have three active dimensions that result in anticipation. Anticipation is therefore seen by the author as the aim for implementing RRI in a company. Chapter 4.4 discusses the literature of how businesses can become responsible, wherefore the five stages of Pavie et al. (2014) are used. Finally the chapter discusses some of the issues facing responsible research and innovation.

Chapter 5 looks at opportunities to embed the two concepts together; this is first done by addressing characteristics of the concepts to the nine building blocks of Osterwalder (2004), and by looking how this can create value. The second part of the chapter looks at an opportunity to integrate both concepts directly in the business using the previous chapters.

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1. Introduction

The world is changing; innovations create opportunities for entrepreneurs to alter the architecture of their company in the benefit of the overall business performance. However, integrating the newest technological features in your company is not always a guarantee for business success. Despite marketing plans, financial feasibility models, or even almost technical perfection, the product can fail once introduced on the market (e.g. genetic modification with crops; although the crop might be better in nearly every perspective, people are cautious about the negative consequences it might have).

Knowing what products the people will approve of, is important to consider, not only because it can lower the amount of money spend on producing the product, but also in terms of brand reputation. Businesses can lose a good reputation due to social media within minutes (Pavie and Carthy, 2013). Sometimes problems occur in a late stage. In that case 'a dilemma of control', also named a Collinridge dilemma (1980), arises. This means that when we finally discover the potential harm of the product it might already be 'locked-in' society, which makes it almost impossible to reverse the innovation. For example, now seeing unwanted impacts in the use of internet, what to do about that? This thesis will not consider the question 'what to do about negative consequences?', but how to avoid negative impacts to begin with.

1.1 Problem statement

The problems mentioned above could be tackled with use of the concept of responsibility. In 2011 the European Commission announced that it would invest 80 billion euros in research and innovation to boost growth and jobs, with a main focus to the concept 'responsible research and innovation' (RRI) (European Commission, 2011; European Commission, 2013).

The European Union wants to implement the concept more broadly into society. The reason is that the R&D budget can be used more efficient, by making both the research system and the innovation system work more responsible, while focusing on global societal challenges at the same time (European commission, 2013). Examples given by the European commission for the inefficient use so far, are the implementation of an electronic health record system due to privacy issues, the implementation of smart energy meters due to privacy concerns and problems with genetically modified food. All these three examples faced serious issues in the implementation phase, which made the anticipated direct implementation, impossible (European commission, 2013).

The main problem with the concept of RRI is that nobody really knows how it should be used in practice. Von Schomberg (2011) sees three anchor points that at least should be reflected in the products to become accepted in society. According to Von Schomberg a new product should meet the following criteria: it has to be ethically acceptable, sustainable and there must be a social desire for this new product.

This thesis searches for opportunities to translate the concept of responsible research and innovation into a template that can be used by businesses, because nobody has developed a good one yet. This will be done from the perspective of sustainable business models, since these models already address sustainability, which is one of the requirements of von Schomberg (2011).

1.2 Research design

Aim of this study is to attribute to the literature on the business opportunities of responsible research and innovation, by reviewing the concepts of sustainable business models and

responsible research and innovation. After reviewing an attempt is made to integrate both concepts, so they will complement each other.

In order to achieve this goal, the following main research question is developed:

‘What are the opportunities for responsible innovation to be implemented in sustainable business models (for innovation)?’

In order to answer the research question, the following sub-questions are developed:

- What are business models?
- What are sustainable business models?
- What is responsible research and innovation?
- What are the opportunities for responsible research and innovation to be embedded in business models for sustainability?

The sub questions are designed to be guiding and attribute to the answering of the main research question. The literature study consists of two main parts; the first part reviews literature on business models in general (chapter 2) and sustainable business models (chapter 3). The second part reviews the literature on responsible research and innovation (chapter 4). In the final sub-question both concepts will be combined (chapter 5). Finally, a conclusion will be given and the applicability of the thesis will be discussed (chapter 6). All sub questions provide support to the main question that will satisfy the research goal. Figure 1 depicts the research framework.

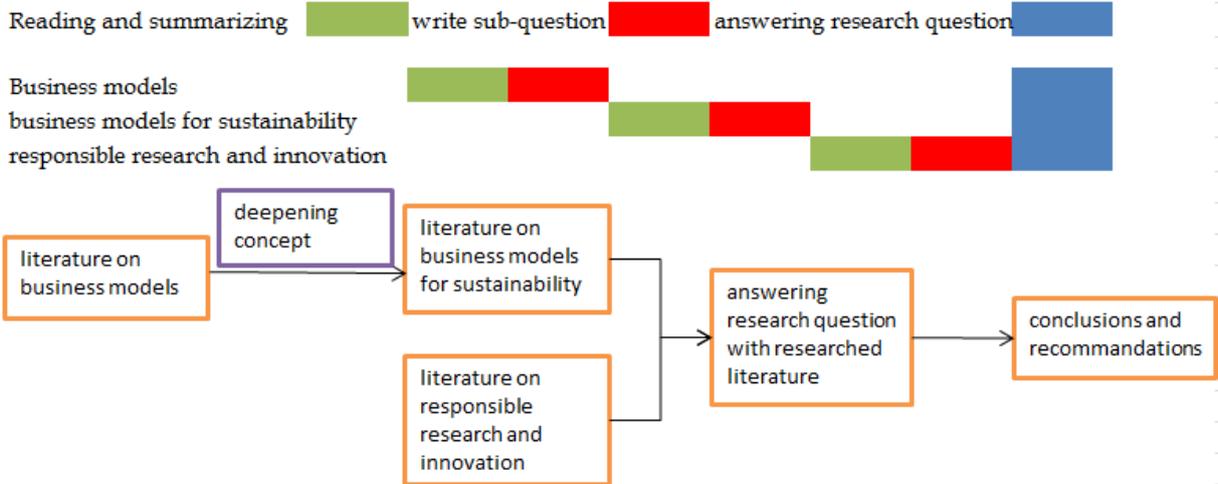


Figure 1: research approach and framework

2. What is a business model?

This first part covers what business models are by looking at different definitions. Section 2.2 zooms in on the relation between strategy and business models. Section 2.3 discusses the use of a business model within an organization and the importance of the business model. Section 2.4 elaborates upon the connection between business models and innovation. It discusses the momentum for innovating the business model, some of the barriers that keep the change from happening, and the implementation of new business models within businesses. Section 2.5 zooms in on the use of the business model concept in this thesis.

2.1 Definitions of business models

The business model has always existed, but the term really gained attention after the internet boom and bubble burst (Margretta, 2002; Yip, 2004). It is therefore that most research on this topic is done after 2001, which has resulted in a lack of consensus amongst various authors, about the precise definitions of business models. It might be questioned, due to a lack of precise definition, why this concept should be used, instead of the broader accepted concept of business strategy. The reason for this is simple, every company has a business model, although it might be implicit and not sketched out, but not every company has a business strategy (Casadesus-Masanell and Ricart, 2010).

A couple of the various definitions will be presented below to give a general overview on the concept and to get acquainted with it.

This first definition of a business model is the one most people will find when searching the term on the internet. It is the definition given by the Cambridge dictionary (2014):

A description of the different parts of a business or organization showing how they will work together successfully to make money

This is a very general description, which contains two key elements that are covered by almost every definition: a business model has to be seen as an interconnected system, and somehow this system makes money.

Margretta (2002) also gives an abstract definition of business models. She sees them as a story that which tells us how something is produced and sold and how these two pieces of the puzzle fit together. She sees this story of a business model as a tool which unites the company and lets everybody know what they have to do.

Stories are easy to grasp and easy to remember. They help individuals to see their jobs within the larger context of what the company is trying to do and to tailor their behavior accordingly. Used in this way, a good business model can become a powerful tool for improving execution. (Margretta, 2002)

Although this is a convenient advantage, Margretta is not clear of the guidelines for a good story. In order to make a good story, more specific definitions are helpful.

A more detailed definition of the business model is given by Johnson et al. (2009); they see the business model as a concept based on three components:

- ✓ Customer Value proposition: the model helps customers to obtain a specific 'job' that alternative offerings do not address. Or as it is clearer explained by Teece (2010):
customers don't just want products, they want solutions to their perceived needs
Besides, the value proposition exists of advantageous cost and risk structures, and it enables value capture (Teece, 2010).
- ✓ Profit formula: The way the model generates value for your company
- ✓ Key resources and processes: the company has the resources (people, technology, products, facilities, equipment and brand) required to deliver the value proposition

to the targeted customer. And it has the processes (training, manufacturing and service) to leverage those resources

These components are key elements for creating a business model. The broad definition of the Cambridge dictionary states that different parts of a business should work together, whereas Johnson et al. (2009) narrows this down in the last component by stating that resources are required and processes are in order to regulate these resources. The first component also introduces the term customer value proposition; this zooms in on the reason for the target market to buy a product, which in itself is the result of product positioning (Kotler and Keller, 2012).

In reflecting upon a company by focusing on these three components, a very important element is overlooked. Namely, the important role other companies play in providing the company services and/or goods. Other companies are important, since they can contribute to the own goals of the company (see section 5.1.7).

Since all definitions are slightly different from each other, it is hard to pick the right (if there is any) definition. In this thesis, however, the nine building blocks of Osterwalder (2004) will be used to define the business model. These nine building blocks (figure 2) do not only consist of the three components of Johnson et al. (2009), but are narrowed down to single aspects that the business can address. This enables integration of the concept of responsible research and innovation in the business model concept, which is the aim of chapter five.

A definition that covers all the aspects mentioned above is a slight adaptation from the definition of Osterwalder et al. (2005):

A business model is a conceptual tool that contains a set of elements and their specific relationships and allows expressing the business logic at a specific firm. It is a description of the value a company offers to its stakeholders and of the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.

The elements mentioned in the definition refer to the different building blocks and, as the next chapter explains, are important to incorporate the value a company delivers to its stakeholders (value proposition). Osterwalder et al. (2005) narrowed it down to customers. But to be sustainable that is not enough (Bocken et al., 2013). Therefore, the word is altered to stakeholders (underlined in definition).

Pillar	Building Block of Business Model	Description
Product	Value Proposition	A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer.
Customer Interface	Target Customer	The Target Customer is a segment of customers a company wants to offer value to.
	Distribution Channel	A Distribution Channel is a means of getting in touch with the customer.
	Relationship	The Relationship describes the kind of link a company establishes between itself and the customer.
Infrastructure Management	Value Configuration	The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer.
	Capability	A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.
	Partnership	A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer.
Financial Aspects	Cost Structure	The Cost Structure is the representation in money of all the means employed in the business model.
	Revenue Model	The Revenue Model describes the way a company makes money through a variety of revenue flows.

Figure 2: nine business model building blocks of Osterwalder (2004).

2.2 Strategy and business models

A business model can be explained as the glue between strategy and processes (Osterwalder, 2004). Or by words of Casadesus-Masanell and Ricart (2010): the layer between strategy and tactics. It is clear that strategy is not the same as a business model (Casadesus-Masanell and Ricart, 2010; Osterwalder, 2004; Yip, 2004). But according to Margretta (2002) some still mix the two terms together to an interchangeable word, which makes both concepts loose value. Since this thesis mainly focuses on business models the difference between the two concepts should be clear.

Yip (2004) sees radical strategy as a way to change the business model and routine strategy to keep the business model as it is. This is confusing, since he uses strategy to speak about changes in business models and another type of strategy where no changes in business models are involved. A better divided definition is given by Casadus-masanell and Ricart (2010). According to them setting up a business model is a strategy. Once the business model is in place, the strategy stage is over. Then only tactical decisions can be made, until it is time to change the business model again. This explanation is clearer because it divides the two concepts of strategy and business models. Therefore, the last interpretation is adopted in this thesis when talking about business models or strategy. Figure 3 gives a representation of how the different concepts connect to each other.

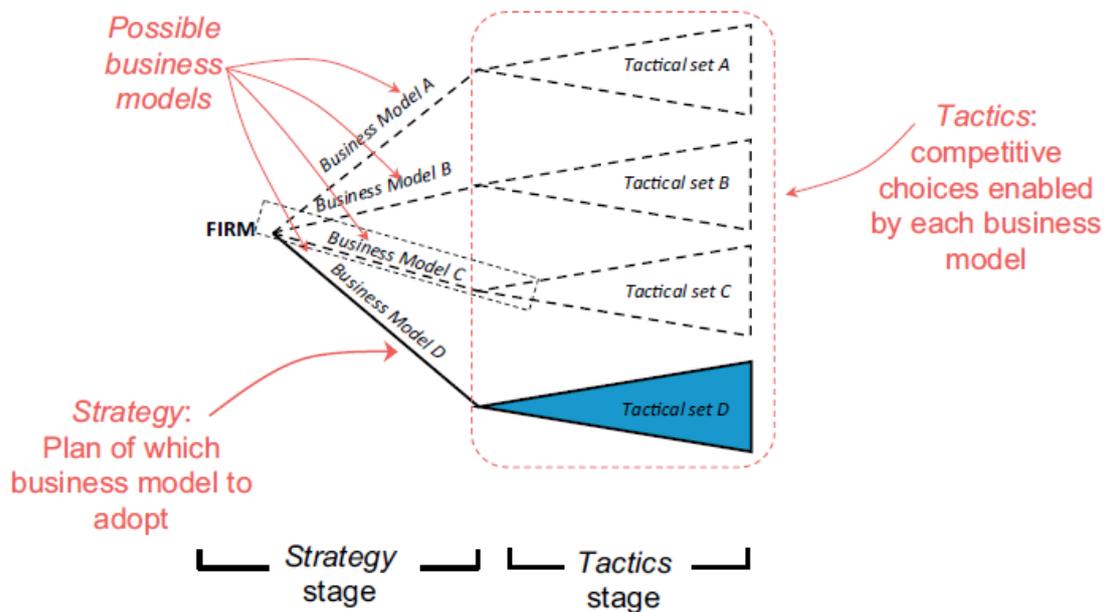


Figure 3: relation between strategy, business models and tactics (retrieved from Casadus-masanell and Ricart, 2010).

Figure 3 clearly shows that, although the company might not have a strategy (a clear vision of what direction to go to). The company does have a business model (it will go in a certain direction), as is mentioned above.

2.3 Importance of business models in an organization

Business models can be highly complex, which makes them hard to work with (Smith et al., 2010). Businesses, therefore, use aggregation to visualize the business model in an understandable way (Casadesus-Masanell and Ricart, 2010). Aggregation is zooming out, while taking detailed choices together into larger constructs. This provides a good (understandable) overview, which makes it easier to explain (like telling a good story, as Margretta (2002) puts it). Understanding the business model is important, not just for managers but for every worker in the firm. If the company can make a model of the business model, then the concept offers an idealistic image of how all constructs (and therefore people within those constructs) should be aligned and where they, as being part of the company, strive for (Baden-fuller and Morgan, 2010).

Besides giving an overview of how the organization operates, a business model also generates money. To stress how important business models are in this context, Chesbrough (2010) states that a mediocre technology persuaded within a great business model may even be more valuable than a great technology exploited via a mediocre business model. In other words, a great business model is able to capture more value from a mediocre technology, than a mediocre business model captures from a great technology.

Osterwalder (2004) also highly values the importance of the business model in an organization. He came up with four important functions for a business model. These functions are:

- Understanding and sharing: to capture the general idea of a business model one can visualize it (aggregation), so it becomes understandable, which makes it easier to communicate and share it.

- Analyzing the business logic: visualization can show which areas need to be monitored and it can be compared with other businesses.
- Managing: the building blocks (see figure 2) make it easier to design changes and see where changes should occur.
- Prospecting: business models are great concepts to implement changes in, which can be tested and simulated.

It is possible to adapt the business model to improve the overall performance of the company, since innovation in business models is actually one of the fundamental features (Baden-fuller and Morgan, 2010).

2.4 Business model innovation

Paragraph 2.4.1, examines the question of why business models need to be innovated. Paragraph 2.4.2, discusses to some obstructions why the innovations do not occur and what is holding the innovation back. Finally, paragraph 2.4.3 discusses how companies can change their business model.

2.4.1 Why businesses change their business models

There can be various reasons for innovating a business model. Johnson et al. (2009) have identified five circumstances in which business models are required to change.

The first is a proactive one, and is the opportunity to address a whole group of potential customers that are shut out of the market because, for example, the current solution is too expensive or complicated for them. Amit and Zott (2010) confirm this by stating that business model innovation can be seen as a source of future value for the company. Osterwalder (2004) also sees this as an opportunity, and focuses on the possibilities that occur because of technological change. An example of this is the market for 3D-printing. The printers are highly expensive at the moment, but there is a big opportunity for the company that can create cheap ones, like the Form 1 (kickstarter 2012).

The second need for business model innovation is the opportunity to capitalize on a new technology by wrapping a new business model around it, or to bring tested products into a new market. A way to exploit this opportunity is by using a differentiation approach. Differentiation involves uniqueness along a dimension that is sufficiently by customers to allow a price premium (Johnson et al., 2012). An example is the introduction of the iPod by Apple. There were already other portable music devices (e.g. mp3, Walkman), but by differentiating, including a play store only for apple products, it attracted a whole group of loyal customers.

Thirdly, Johnson et al. (2009) identified the opportunity of a 'job-to-be-done' focus, where one does not yet exist. This means doing the same things as before but then better, or to satisfy unmet customer needs. An example are the 'AH-to go' stores. They are expensive and do not have the full range of products, but are located on the right places with the right products.

The fourth reason is more negatively loaded. It is the need to fend off low-end disruptors. Osterwalder (2004) sees this as a need to change due to changes in the competitive forces/environment. An example one can think of is the competitive environment in the airline industry, where cheap tickets become more widely available. It is hard for the established Airlines to compete with these prices.

The last reason to change your business model according to Johnson et al. is due to a shifting basis of competition. As seasons change, people demand change (e.g. due to technology changes, almost nobody will buy LPs anymore nor Discmans). Also movies are not bought anymore in shops, but online, so if you are in such type of business you need to change and adapt to the new environment in order to stay competitive. Amit and Zott (2010) also add the

reason that companies change their business model, because it is a powerful competitive tool.

As finishing note: Mitchell and Coles (2003) state that it is important not to just change your business model once, but keep changing it at least every two to four years, and if possible continuously. This is because competitors also do this and falling behind is a prescription for competitive disaster.

2.4.2 Barriers for business model innovation

Although the previous section gives all kinds of reasons to change, they are not all necessities for change. There might be several opportunities for an established company which they neglect. This can be due the fact that they did not see the opportunity, but it could also be that there are some barriers preventing them to take the step. The latter reason will be the main focus of this section.

An important barrier is that, sometimes, functional heads might want to change, but they lack proper authority. The decision then is up to the CEOs, but they might be reluctant for change because they obtained their current position within the old business model. And they are deeply familiar with that one (Chesbrough, 2010; Mitchell and Coles, 2004a). It is therefore that they are the ones that will cling on to the old model, instead of changing direction.

Another barrier can be that, although top managers want to change, they do not know how to, due to 'bounded rationality' (Sosna et al. 2010). This means that managers do not know everything, so they do not have full sight on the risks involved and are therefore reluctant to change. Or as Jim Collins (2001) put it

The vast majority of companies never become great, because the vast majority becomes quite good - and that is their main problem

With this statement he is aiming at companies which are comfortable where they are and therefore they do not see the need to change, although it might benefit them.

Sometimes, when the top management wants to change, the people on the work floor are resisting. This can have various causes like habits, inertia, fear for the unknown or anxiety that they lack the skills they will need after the change, and subsequently they lose their position (Michalak, 2010).

Another barrier, given by Cannarella and Spechler (2014), is that the value of new technology is unknown or at least uncertain and therefore it is difficult for managers to back up the need for change. A source of uncertainty can be new social media; Facebook, LinkedIn and Twitter can possibly decline the next few years and fade away just as Myspace. Does this imply that companies need to reach to the customer via new (marketing) channels? Or will Facebook retaliate and hold on to their users via new products/services? And if not, which new (social) media should be invested in?

Change is always difficult, because if you want to optimize a certain process or activity it is possible to create inefficiencies and weaknesses in other activities and/or processes (Mitchell and Coles, 2003). Therefore these barriers show that even though change might seem a logical path, it is certainly not an easy one. To actually consider changing, one needs to be fully convinced in order to be able to make the change (Johnson et al., 2009).

2.4.3 How businesses change their business models

After deciding that the business model needs adaptation, the company has to/will go through three important steps. The first step is to put into words the success of the current business model. The second step is to be able to give signals why business models need to be changed. Finally one must consider whether changing the business model is worth the effort.

So one understands whether the current business model needs revising and to become fully aware of the impact this will have. Mitchell and Coles (2004b) identified four steps to change the business model.

1. Understand and optimally apply the current business model.
2. Establish, understand and follow an appropriate business model innovation vision.
3. Ongoing design and testing of potential business model improvements, replacements and innovations.
4. Understand and begin installing the next business model improvement or replacement.

The last step is because business model improvement is never finished according to Mitchell and Coles (2003).

During the process of changing the business model, Mitchell and Coles (2004b) consider it to be important to keep talking with the stakeholders; make sure they know what they are supposed to be doing and also stress their benefits that come along with your business model innovation. Furthermore, it is important to involve your stakeholders in proposing new benefits, because all parties should benefit (Amit and Zott, 2010) and the best ideas usually come from outside your own organization (Mitchell and Coles, 2004b).

2.5 The basis of the thesis

As mentioned above, the nine building blocks of Osterwalder (2004) will be used in this thesis to integrate the concept of responsible research and innovation in the concept of business models for sustainability. The business model building blocks are chosen, because they cover the most relevant parts of a business model. Besides, the two concepts might not fully overlap each other, using different blocks creates the opportunity to look at the blocks separately and fit in the two concepts where possible. Used in this way the blocks can create a good overview of how responsible research and innovation can be implemented in the concept of business models for sustainability in a detailed way, while simultaneously spotting the parts of the business model that keeps unaffected by the concepts.

Moreover, the building blocks provide a good overview of a company; this lowers the chances that important aspects of the business will be overlooked.

Figure 2, shows the nine building blocks including a short description of how these building blocks should be interpreted. These descriptions are customer focused. In order to become sustainable, a company has to take other stakeholders into account, as stated in the business model definition given above. This will be discussed in the next chapter.

The building blocks are used by Osterwalder and Pigneur (2009), whom created an almost blank sheet which they called the business model canvas. This canvas is an easy tool to insert certain characteristics to the different building blocks. Besides, the canvas is a popular tool to work with within companies (Bocken et al., 2013). Eppler et al. (2011) used the canvas in a case study where they found out that it had an improved effect for group collaboration when the topic was about complex and abstract tasks, like business models. The negative side effect is the perceived lower creativity by the people who worked with it, which probably was enhanced since the canvas is a type of in-the-box thinking.

Filling the white gaps in the business model canvas is not the goal of this thesis, but the tool makes it easier to spot how the different characteristics of both sustainable business models and responsible research and innovation relate to each other.

3. What are business models for sustainability?

This chapter reviews the concept of business models for sustainability. First is explained why this particular concept is used in this thesis. Paragraph 3.2 elaborates what sustainability is, by looking at the most common characteristics. Finally, paragraph 3.3 explains why and how businesses become sustainable.

3.1 Why use business models for sustainability in this report?

“There is no alternative for sustainable development” (Nidumolu et al., 2009, p. 5)

Nidumolu et al. (2009) see businesses aiming to become sustainable as the logical way the world is transforming. Bocken et al. (2014) supports this vision by stating that keep doing business as usual, is not even an option if we want a sustainable future. Boons et al. (2013) see that firms who have short-term profitability mindsets are often not sustainable. Therefore, it is needed that things are done differently. This is because sustainable organizations can survive the shock of a global recession (NBS, 2012).

Besides the question of the necessity to get a sustainable business models, Schaltegger and Wagner (2011) found that being a sustainable entrepreneur, in other words a firm using a business model for sustainability, is considered the best of all other options. The other firms they look at are: eco-preneurs, social entrepreneurs and institutional entrepreneurs. They used a scale, with on the one side the positive effects for the firm, and on the other side the positive social and environmental effects. Sustainable entrepreneurs turned out to make the most positive impact. This is because other types tend to focus on niche markets or only dealing with a single aspect, as in being good for the environmental or (not and) the social environment (Schaltegger and Wagner, 2011).

That sustainable business models are considered the best option is not only acknowledged by scholars, companies already bundle forces to become sustainable. An example is the ‘Dutch Sustainable Growth Coalition (DSGC)’. This coalition consists of eight Dutch multinational companies who:

“Strongly believe that the sustainable growth business model is the business model of the future” (DSGC, 2012).

In the perspective of the DSGC Jan Peter Balkenende, former prime minister of the Netherlands, who is currently working at Ernst & Young and is chairman of the DSGC, states in an interview:

There is a reason for companies to ask themselves the following question: what is our responsibility for tomorrow’s society? How can we contribute to make the society better? (Translated from Dutch, source: MVOdatabase.nl, 2013)

With this statement he wants to encourage companies to create a sustainable business model. And:

The fact is that, luckily, more and more evidence becomes available that if companies choose for sustainability, it pays off in the long run. (Translated from Dutch, source: MVOdatabase.nl, 2013).

This claim; that becoming sustainable will pay off, is used to encourage entrepreneurs even more.

3.2 Characteristics of sustainable business models

The idea behind sustainability is to ensure that development meets the needs of the present, without compromising the ability of future generations (Brundtland commission, 1987). And although every sustainable business model has different characteristics (Boons et al., 2013), they do have comparable features to achieve this. The most common characteristic every sustainable business model shares is the need to meet besides economic value also social and

environmental value (Boons et al., 2013; Bocken et al., 2013). The most common approach to tackle this characteristic is by the use of the triple bottom line (Hansen et al., 2009; Stubbs and Cocklin, 2010; NBS, 2012). Stubbs and Cocklin (2010) boldly state that a real characteristic of a sustainable company is that they see money as means instead of a goal. In other words, have profits to exist instead of existing for profits. This view is in line with the seventh archetype from Bocken et al. (2014), which will be covered in the next paragraph. But this characteristic is not embedded in all archetypes, therefore is this statement not useful in identifying sustainable business models per se.

The most important element in a sustainable business model is the value proposition (Boons and Lüdeke-Freund, 2013; Bocken et al., 2013). The value proposition is the value a company creates for its customers and partners, with its products (Osterwalder, 2004). Bocken et al. (2013) see the business model canvas, although it is a popular tool, as being too narrow with regard to the value proposition. The canvas is based on the definition of Osterwalder, who focuses on the customer, instead of the wider stakeholders. It is therefore that they developed a tool that can be used during a workshop session, which also addresses all the wider stakeholders. Since it is necessary to involve environment and society as well in the companies' structure they decided that these are important features to account for in the value proposition as well as the network actors. Their 'value mapping tool' is meant for idea generation and discussion and supports sustainable business modeling (Bocken et al., 2013).

To achieve sustainability, innovation is of utmost importance (Hansen et al., 2009). And it is in the innovation process that Boons and Lüdeke-Freund (2013) found three other important elements of sustainability. The first of them is the supply chain. The company should not shift the burden of sustainability to the rest of the chain, but has to take responsibility for its own focal firm; this requires a firm to actively engage in sustainable supply chain management. The second element is the customer interface; they have to motivate customers to take responsibility for their consumption as well as for the focal company's stakeholders. The last element Boons and Lüdeke-Freund (2013) found is the financial model; this model has to reflect appropriate distribution of economic costs and benefits among actors involved in the business model. This is in line with what is mentioned before that when speaking of business model innovation all parties involved should benefit (Amit and Zott, 2010).

Other specific characteristics can be found in the archetypes of Bocken et al. (2014), which will be discussed below, but these are not especially applicable to every business model for sustainability.

3.3 How and why businesses (will) become sustainable

This sub question consists of two parts; the first part covers the underlying reasons why businesses (want to) become sustainable. The second part covers the process of how a company can do this. This process consists of the following three steps: first a company has to choose to what extent he want to be sustainable. The second step is to choose an option of how a company wants to integrate sustainability in the company. Helpful are the eight archetypes of Bocken et al. (2014), which will be given. Finally, in the third step, the company has to go through the implementation stages, in order to actually become sustainable.

3.2.1 Why businesses become sustainable

Innovating business models to become sustainable is a necessity. Eventually it will become common to be sustainable (Haanaes et al., 2011; Nidumolu et al., 2009) and changing to sustainability now will gain companies' early movers' competencies that will be hard-pressed for rivals to match (Nidumolu et al., 2009).

To see the necessity of becoming sustainable for competing in the future, Haanaes et al. (2011) surveyed 3000 business executives and managers from all over the world. In the

survey they asked whether or not being sustainable will be necessary in the future. The answers among different industries are shown in figure 4 and show the importance of sustainability in 2011.

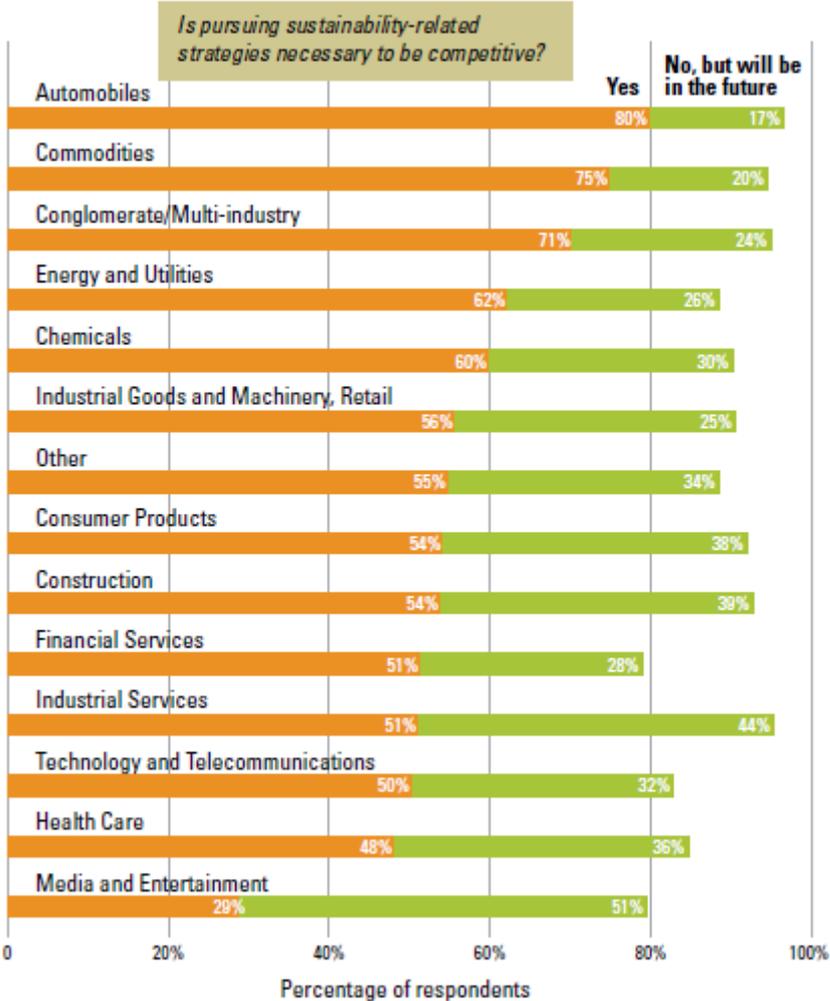


Figure 4: industry comparison on the role that sustainability plays in being competitive retrieved from Haanaes et al. (2011).

Behind these numbers are reasons why becoming sustainable is necessary to keep competitive. The most prominent reason is probably because the law is changing towards becoming more sustainable oriented (Haanaes et al., 2011). Example can be found in legislation around carbon dioxide emissions, which resulted into lighter (and hybrid) cars. These cars drive more kilometers per gallon and have lesser CO2 emission. Besides, these types of cars are considered interesting by the people, since they can offer tax reductions.

Another reason can be that sustainability offers opportunities that benefit the company’s performance. Schaltegger et al. (2011) searched in the literature and found six of these benefits that made companies decide to become sustainable. These opportunities are:

- Costs and costs reduction
- Sales and profit margin
- Risk and risk reduction
- Attractiveness of employer
- Reputation and brand value
- Innovative capabilities

(Not all areas will benefit always from becoming sustainable)

Besides those six reasons, Boons and Lüdeke-Freund (2013) found three other important reasons/streams of why businesses integrate the concept of sustainability in their business

model. The first stream of businesses adapted a business model for sustainability, due to technological innovation. They see three different trends of why and how companies innovate in this stream, namely by: (1) using a new business model for an existing technology (e.g. use of a new business model to sell books in a new market), (2) integrate new technologies into existing business models (e.g. use a new technology to deliver a more efficient and customer focused product), and (3) new business models are triggered by new technology and vice versa (e.g. implement a 3-D print technology in a business, while simultaneously attract a new customer segment) (Boons and Lüdeke-Freund, 2013).

The second stream of businesses becomes sustainable due to organizational innovation. This can be achieved by changing paradigms, doing jobs differently and change the way of doing business towards sustainable development. An example can be to become cradle to cradle. Braungart and McDonough (2002) created this concept, with the aim of reviewing the product line. The aim is to make the same type of product only in a completely different way, by exterminating the concept of waste. The products should be easy detachable and the materials used should not contaminate each other. In this way the materials can either stay in the technological or the biological cycle.

The last stream Boons and Lüdeke-Freund (2013) found in their research, were businesses who change their business models due to social innovation. In this stream businesses try to become self-sustaining instead of profit maximizing. Businesses want to create social value and maximize social profit, in other words becoming a social entrepreneur. It is said before that, according to Schaltegger and Wagner (2011), social entrepreneurs, although they might have a form of a business model for sustainability, was not considered to be the best option. The best option was to become a sustainable entrepreneur. That perspective might be a bit one-sided. According to Grassl (2012), social entrepreneurs who want to become sustainable should become a hybrid enterprise. A hybrid enterprise is an organization where two enterprises co-exist. The first enterprise is a for-profit enterprise and the second is a not-for-profit enterprise, which focuses on social and/or environmental products or services. This is a way to bridge the change to business models innovation for sustainability, since it may not be economically viable from the start (Bocken et al. 2014). In this way the last stream stays a viable option for businesses to become a company with a sustainable business model.

Another important reason for becoming sustainable is found by Haanaes et al. (2011). They spot, besides some trends mentioned above, that financing companies, like banks and pension funds, tend to become more sustainably focused. So in order to be invested in, you need to show that your company is sustainable oriented, which practically makes it a necessity.

3.2.2 How businesses become sustainable

Businesses become sustainable through innovation (Hansen et al. 2009; Schaltegger et al. 2011). Schaltegger et al. (2011) have made a framework with three types of sustainability strategies. The three possible innovation strategies are defensive, accommodative and proactive:

- **Defensive innovation:** the motivation behind defensive innovations is not to gain competitive advantage with sustainable performance, but rather the need to comply with regulations. The degree of business model innovation is that of adjustment or adoption (copying competitors' business models). The effects on the business are marginal, no changes are made to the value proposition and minor amount of other business elements will be affected.
- **Accommodative innovation:** accommodative innovations integrate environmental or social objectives in most of the business processes, however without questioning the revenue logic or the core business as such. The degree of business model innovation

is that of business model improvement. The effects on the business are like renewing production processes, changing value network partners, or approaching new market segments.

- **Proactive innovation:** proactive innovation integrates environmental and/or social objectives as part of the core business logic. The core business, consisting of all business processes, the whole product range, and the revenue logic, is directed towards sustainability. The degree of business model innovation is that of business model redesign. Cost and efficiency-oriented measures are applied to support the new products and/or services and to gain competitive advantage through sustainability performance, which in turn pays in terms of risk management, reputation and corporate brand value.

Even though companies might want to adapt to sustainability, it can be hard to realize the change, since research does not have a coherent answer how a business model for sustainability should look like (Schaltegger et al., 2011). This is because sustainable innovation has different meanings and characteristics in different contexts (Boons et al., 2013). To make sustainable innovation easier accessible for companies, Bocken et al. (2014) have developed, through research, eight archetypes that have the potential to embed sustainability into the business. These archetypes and the amount of examples given in the paper make it easier for companies to oversee what they can do to become sustainable. Especially, since the examples are derived from practice. The archetypes of Bocken et al. (2014) are the following:

1. Maximize material productivity and energy efficiency: this archetype contributes towards system-wide reduction of resource consumption.
2. Create value from waste: this archetype contributes towards improved resource efficiency.
3. Substitute with renewables and natural processes: this archetype seeks to reduce environmental impact of industry and it contributes to the wider need of reducing the use of planets finite resource supply and reducing unwanted waste and pollution.
4. Deliver functionality rather than ownership: this archetype is about shifting towards the pure service model.
5. Adopt a stewardship role: this archetype seeks to maximize societal and environmental impacts of the firm on society by ensuring long term health and wellbeing of stakeholders.
6. Encourage efficiency: this archetype aims to address overconsumption by tackling sustainability from the perspective of sustainable consumption
7. Repurpose the business for society/environment: this archetype focuses on changing the duty and structure of the firm in such a way that social or environmental benefit maximization becomes the goal objective.
8. Develop scale-up solutions: this archetype is introduced to consider the scale-up for existing business models for sustainability.

These eight archetypes are not the only ways to become sustainable, and combinations of multiple archetypes will enhance sustainability even more (Bocken et al., 2014).

Even when a company knows to which degree, and what types of sustainability they want integrate in their company, it still needs to be implemented. This is not easy as Nidumolu et al. (2009) found out when they researched the journey every company goes through when

becoming sustainable. The research shows that companies go through five different stages when becoming sustainable. These five stages of Nidumolu et al. (2009) are the following:

Stage 1: Viewing compliance as opportunity: the first step in becoming sustainable usually arises from the law. This stage aims to directly comply with the most stringent rules, before they are enforced. By doing so, companies do not have to deal with different component sourcing, production standards, and logistics in every single market. By doing this, they can make a uniform product with the same standard everywhere.

Stage 2: Making value chains sustainable: at this stage companies work with suppliers and retailers to develop eco-friendly raw materials and components, while reducing waste. The initial is usually to create a better image, but companies end up reducing costs or creating new businesses as well. Central to creating a sustainable supply chain are operational innovations that lead to greater energy efficiency and reduce company's dependence on fossil fuels.

Stage 3: Designing sustainable products and services: at this stage executives try to compete with their rivals by being the first to redesign existing products or to develop new ones. In order to develop sustainable products, companies have to understand consumers concerns and carefully examine product life cycles.

Stage 4: Developing new business models: successful sustainable business models include novel ways of capturing revenues and deliver services in tandem with other companies.

Stage 5: Creating next-practice platforms: next practices change existing paradigms. To do this, managers need to keep questioning the implicit assumptions behind current practices.

These archetypes and the implementation stages will be used in chapter 5 where the two concepts (RRI & BMfS) will be integrated into each other.

4. What is responsible research and innovation?

“Responsible innovation can thus be used to refer in the realm of innovation to whatever invites, accommodates, stimulates, enhances, fosters, implies or incentivizes responsible action and the mental states that are typically associated with it.” (European Commission, 2013, p. 57)

This chapter covers the characteristics of the concept of responsible research and innovation (RRI). Paragraph 4.1 explains the emergence of the concept of RRI. Paragraph 4.2 examines the features that define RRI, according to the current lead authors. In paragraph 4.3 the author of this thesis adds his own view of the concept, by introducing a table which makes the concept more applicable in practice. Paragraph 4.4 covers the way to implement the concept into a company. Finally, in paragraph 4.5, light will be shed on the main of many issues regarding this upcoming concept.

4.1 Why RRI is coming up

In the world we live in today, being responsible is more important than ever. New innovations stand under constant scrutiny, because of global social media users who have the power to destroy the reputation of a company within minutes (Pavie and Carthy, 2013). It is not only companies that will become responsible; the concept has also gained visibility and traction in the European Commission policy context (Owen et al. 2012). The priority of the European Commission is mainly focused on becoming responsible regarding the innovation and research systems. Reasons are various examples of inefficient R&D funding in the past (e.g. introductions of: electronic health records, smart meters and genetically modified organisms) and to anticipate on contested technologies of the future (e.g. nanotechnology, stem-cell research, biotechnology). Meanwhile, the European Commission (2013) sees responsibility as a way to cope with the ‘grand problems’ of the world today.

Since the world is changing fast and not all new innovations can simply put back in the box (Sutcliffe, 2011), RRI should make it possible to overcome the fear for unintended, or even irreversible, negative consequences. Part of these unwanted consequences is due to the rapid advance in technology, which is faster than the law-making process. New products then fall into what Hajer (2003) calls an ‘institutional void’. This is a stage where there is not enough regulation available to properly govern the new technology.

Irresponsible people are most of the time not the reason why irresponsibility occurs, often it is due to the complex and coupled systems of science and innovation (Stilgoe et al., 2013). Another problem nowadays is that the issue not always lays in the ability of science to realize a project; it is now sometimes in the ethics and responsibilities concerns of the choice between doing and not doing (Pavie, 2012). Think in this case about Uber, the new taxi application. This App, introduced in 2009 to the market, is seriously debated because they steal jobs from the ‘real’ taxi drivers. Or, and this is a more contested issue, the use of NIPT-tests (non invasive prenatal testing). These tests make it possible, very early in the pregnancy, to detect whether the unborn child will have the syndrome of down (and in the future other malfunctions). When babies are tested positive, up to 88% of the parents have the baby removed (Boyd et al., 2008). The expectation is that people with the Down syndrome, will not be borne anymore in the near future.

An issue that responsibility challenges is the Collingridge dilemma (1980). As mentioned before, this dilemma means that when we finally see potential harm of the innovation it might already be locked in society, which makes it almost impossible to reverse the innovation, i.e. people with down are now seen as different/outcasts, but when they are not around anymore that bar could be raised. This could ultimately lead to the vision that

perfect/flawless humans should/need to be created/born, with various negative consequences (see movie: Gattaca from 1997).

Responsible innovation tries to avoid these possible negative outcomes with use of anticipation. Full anticipation, however, can never be achieved (Blok and Lemmens, 2014), but doing nothing cannot be the answer either. Therefore is the concept of responsible research and innovation, at this moment, the best concept to become responsible. It raises the most opportunities for parties to get involved, give their opinions, and let the company rethink their current application of the product, before it causes negative impacts.

Von Schomberg (2007) identified four reasons for declining responsibility. (1) Due to professionalization a multitude of new roles became available, which blurred the primary responsibility. (2) In parallel with the former reason, the area for which an individual can be held responsible has narrowed. This is causing that people know more and more about less and less, which makes it harder to foresee consequences of their behaviour. (3) The number of roles a person holds in this world increased dramatically. Due to interchangeability of those roles, the individual responsibility becomes more dependent on the role than on the person possessing that role. And since people own more roles, the weight of a single role lowers. (4) Contemporary society is not only characterized by the differentiation of roles, but also by the intensified institutionalization of the social-institutional spheres in which the role differentiation takes place. Meaning that regulation needs to be done more and more internally, this reduces the overall responsibility.

To summarize, due to the increasing complexity of the world, where people possess multiple roles, each role they fulfil becomes narrower and has less individual responsibility. Pavie (2012) tries to challenge this, by stating that responsibility can be enhanced when the dichotomy between the work/life balance disappears. Now we fulfil different roles, and with them different responsibilities. But, according to Pavie, if we want to become more responsible, we should see our roles and with them our responsibilities, not separate from each other, but complementing each other. In that case the private and the public sphere will eventually merge. In this way, innovation for others will be done in the same way as we would innovate for ourselves (for all the roles we possess), instead of innovating because it is best for the business only.

This discussion, however, mainly focuses on personal/individual responsibility, while this thesis aims at how whole companies can bring more responsible products to the market.

4.2 Characteristics of RRI

Responsible research and innovation should be able to anticipate the aforementioned issues, while being a part of the answer in solving the 'grand challenges' of today (European Commission, 2013). By making it an important topic in the Horizon2020 framework, the concept faces the possibility that it will be misused. Pavie (2012) already foresaw this and warns for an upcoming phenomenon he calls: 'responsibility washing'. This could become the new hype after 'green-washing'. It is therefore important to set good boundaries and guidelines of what the characteristics responsible innovation are.

Stilgoe et al. (2013) have developed four main dimensions that characterizes a responsible innovation process. These four dimensions are: anticipation, reflexivity, inclusion and responsiveness. The work of other scholars will be elaborated in the light of these four dimensions. Paragraph 4.2.5 shortly reviews the work of Pavie and Carthy (2013) and Von Schomberg (2013) separately, in order to achieve a more complete view of what the concept involves.

In section 4.3, the author of this thesis gathered all the characteristics in one single scheme, so a simple overview will show how the characteristics can be seen and used interrelated.

4.2.1 Anticipation

Stilgoe et al. (2013) state that one way to deal with responsibility is to succumb to ‘moral luck’ as is mentioned by Williams (1981). This means that if we were unable to ‘reasonably foresee’ something to happen, we also cannot be held morally accountable for our actions (Stilgoe et al., 2013).

“If someone has acted justifiably from a moral point of view, then no-one can justifiably complain, from that point of view, of his so acting.” (Williams, 1981, about moral luck)

That is where anticipation comes in, because when can we say that we could not know? This question is even harder to answer, since technological forecasting is already an abandoned idea, since the 1970s (Von Schomberg, 2013).

Of course we cannot predict everything upfront, this might ethically also be unwanted, but still there are opportunities to anticipate (more) on the (negative) impacts of innovation. For instance, can it be that the new innovation is desired by, and/or best for most of the people? According to Owen et al. (2012), RRI should seek beyond what we do not want innovation to do, but what we want it to do¹. Von Schomberg (2011) shares this statement and calls this the ‘right impacts’. The ‘right impacts’ can never be truly found, because people have different needs. To give an example of what current ‘right impacts’ could be, he suggests the use of the normative anchor points from the European Union (2010). These anchor points are targets that are democratically agreed upon (Von Schomberg, 2011) and therefore wanted by most of us. Important to consider with right impacts are both the longer term and the negative impacts. This is different than current practices, since nowadays companies mainly focus on the good impacts and the benefits of products (Eden et al., 2013).

Besides anticipating on the right impacts, there is also the option to avoid types of irresponsible innovation. There are four reasons/causes for/of these ir-responsible innovations detected by Owen et al. (2013), which are the following:

- Technology push: introducing a product without conformation of stakeholders (see 4.2.3).
- Neglect of fundamental ethical principles: ignoring privacy issues during design and implementation stage could dissatisfy customers (e.g. electronic patient record).
- Policy pull: technology can be demanded, but is not yet tested or even feasible, which makes it vulnerable to unforeseen impacts.
- Lack of precautionary measures and technology foresight: trying to save time and money, on the cost of possible harm from the product.

The next parts of reflexivity, inclusion and responsiveness have some overlap with anticipation, e.g. the life cycle assessment, is that being reflexive, or a form of anticipation?

Chapter 4.3 argues that it can be the same, in other words that reflexivity (but also inclusion and responsiveness) is actually a form of anticipation, because by reflecting, including and being responsive, you are anticipating.

4.2.2 Reflexivity

Reflexivity is like holding a mirror up to one’s own activities, assumptions and commitments. It is being aware of the limits of knowledge and being mindful that particular framing of an issue is not universally held (Stilgoe et al., 2013). In this stage the internal conversations about the innovation are important; include the direct stakeholders in the conversation of what the impacts of the innovation might have. To do this properly it is useful to have guidelines or standards to coordinate the conversations in the right direction.

¹ This is the purpose of their first feature of RRI, namely: Science for society: Democratizing the governance of intent, which can be found in Owen et al. (2012).

Since governmental law is not fast enough to keep up with the pace of innovation, the ‘institutional void’ of Hajer (2003), companies can use codes of conduct as a reflective procedure. Codes of conduct are not the same as government law, but according to Von Schomberg (2011) do codes of conduct allow a constructive steering of the innovation process, with use of a set of basic and widely shared principles of governance and ethics. Von Schomberg (2013) sees ethics as being only a constraint of technological advances, since they can lead to well accepted technological advances. As example he uses the ‘privacy by design’ method, where new technology is developed by taking into account privacy issues at the designing stage. Seeing ethics as just a constraint can have the disadvantage that negative perceived impacts can be outweighed by the positive perceived impacts. The problem is that the perceived impacts will differ per stakeholder, and therefore creates the opportunity to get labeled unethical (e.g. A company can make a very profitable product, and therefore wants it into society even while the product is still highly controversial, like GMO’s).

A company can also make standards for themselves to assure every new innovation will get proper internal reflection, by use of self-regulation. An example is the case study by Assante et al. (2014), which takes place in the financial world. In their study a RIAD registration form was developed as supporting tool to measure process during the study (after it was approved by a formal review group). This method consist the following steps:

“(1) summarize risks (R) and issues (I) identified with regard to a new product/project and (2) monitor the progress made on these in terms of actions (A) and decisions (D), supported by a key decisions log summarizing key decisions taken on risk/issues identified.” (Assante et al., 2014).

This registration form helped, among others, to reflect on the new product/process in order to make it responsible.

To make an overview of the impacts of new innovations, a company could conduct a life cycle assessment. This is a methodological framework for estimating and assessing the environmental impacts attributable to the life cycle of a product, such as climate change, stratospheric ozone depletion, tropospheric ozone (smog) creation, eutrophication, acidification, toxicological stress on human health and ecosystems, the depletion of resources, water use, land use, and noise – and others, by analyzing the impact each stage has (Rebitzer et al., 2004). Rebitzer et al. (2004) plead to spend enough time in assessing the design stage, since that stage strongly predetermines (up to 70%) the environmental impacts of an innovation in the subsequent phases. Doing such an assessment can give lots of input to reflect upon. To make use of it a company can benchmark the output of the assessment with other similar products, or with the company goals regarding the impacts.

4.2.3 Inclusion

The dimension of inclusion is easy to grasp, but hard to achieve. In this step the wider audience has to be able to have a voice. It is all about participation, going beyond stakeholders to include the members of the wider public (Stilgoe et al., 2013).

Important here is at least to be able to respond to the five areas of generic concern from the public, as mentioned by Owen et al. (2013). These areas are the following:

- The purpose of specific science/innovations and the motivations of those involved.
- The question of trust: are you credible enough to not cheat the people.
- Perception of powerlessness: people like feeling included, so make sure they are able to give their voice to something.
- Concerns about the speed and direction of the innovation process: be able to assure the people that you are aiming at fulfilling the ‘right impacts’.
- Ethical concerns: how will the innovation affect the social environment? And do we want that?

When applying stakeholder engagement, the people will be able to support or oppose decisions. By making the people influential in the organization one can affect the success of the innovation in the long term. Besides, stakeholders can prevent the company from accepting a solution to a problem which will, once it is introduced to the market, give even more problems (Pavie et al., 2014).

A form of stakeholder engagement is privacy impact assessment. Privacy impact assessment is a tool that identifies privacy risks at the development stage of a product. The interest for this assessment is growing due to the perceived benefits it has, namely: the building of public trust, complying with (inter)national regulation and the assessment helps to avoid risky investments regarding privacy issues (Wright et al., 2011). Privacy issues are likely to change in the future due to new technologies. Hauptman et al. (2011) lists all kinds of future technologies and how this could affect our privacy in the future. They also (already) detect changes in perception of privacy from the new generation (digital natives), compared with older generations (digital immigrants). These changes in perception are important when assessing the future impact on privacy.

A lot of scholars use technology assessment as means to identify consequences, by including people in the innovation process (Hellström, 2003, Sutcliff, 2011, Von Schomberg 2013 and Von Schomberg, 2011). Hellström (2003) sees technology assessment mainly as a tool to identify risks in order to prevent future costs. Russel et al. (2010) on the other hand try to see technology assessment within a social context. Seeing the social context is complex, because social effects are influenced by other changes, occurring in society at the same time, which are cumulative and compounding in complex ways. This type of technology assessment is about including people, it is not focused on one particular group of stakeholders, rather, it seeks to ensure that all potentially interested and affected parties can be considered and, preferably, engaged (Russel et al., 2010).

To include people successfully in a dialogue about the innovation process means that companies have to become more transparent. Being transparent gives a better view of what the company does, in order for stakeholders to give more meaningful opinions. Businesses, however, might be reluctant to become transparent, as will be elaborated in paragraph 4.5, which reduces the value of the assessments.

4.2.4 Responsiveness

Being responsive requires the capacity to change the shape or direction of the company in response to stakeholders and public values and changing circumstances (Stilgoe et al., 2013).

When the inclusion of stakeholders and public sheds light on (before) unseen problems, the company should address that problem by making changes in the innovation. After the changes, the people should again be included to verify that the changes are done correctly and the (before) foreseen problems are diverted, without making new problems.

This can be achieved by the use of stage-gating. A stage-gate system is both a conceptual and an operational model for moving a new product or service from idea to launch. It is a blueprint for managing the new product process in order to improve effectiveness and efficiency (Cooper, 1990). Difficulties in this are setting it up, the bureaucracy it brings along and knowing when enough has been done.

4.2.5 Other characteristics

Pavie and Carthy (2013) developed three axes as being central to responsible innovation. These axes are related to the four dimensions of Stilgoe et al. (2013), but face the concept in another way. The axes are three questions an innovator should be able to answer. The questions are the following:

The first question is whether the need, which will be fulfilled by the innovation, is necessary. According to Pavie et al. (2014), who explain the three axes in more detail, this question can be answered, not only by looking at needs of the consumer, but also to the needs of the company and their shareholders. Companies can bring innovations to the market, which are supposed to benefit the consumer, but the underlying reason is that they guarantee short-term profit so the shareholders stay happy. This, however, makes the need of the product not a necessary one.

The last two questions have as goal to anticipate, as is in line with the first dimension of Stilgoe et al., still these questions have added value as will be explained in paragraph 4.3. Since the two remaining questions stay important, they are given below.

The second question is whether you, as innovator/company, are fully aware of the (in-) direct impacts of the innovation. Pavie et al. (2014) state that in this question proper forecasting is essential. This axis is about understanding, accepting and therefore anticipating the consequences of any given product or service, medium and long-term, on the health or even lifestyle of the end user.

And the last question is if you are aware of the consequences the innovation has for non-users. According to Pavie et al. (2014) this degree of responsibility requires a certain maturity, because the company has to envision being held accountable to somebody who seems to be outside the scope of their actions.

Another way to determine what responsibility means is given by Von Schomberg (2013). He states that responsibility consists of two interrelated dimensions namely the product and the process dimension. The product dimension answers whether the product is (ethically) acceptable, sustainable and socially desirable. According to Pavie et al. (2014), this dimension includes the product to be market ready and financially feasible. The process dimension is meant to arrive at a more responsive, adaptive and integrated management of the innovation process. Von Schomberg (2013) sees five mechanisms that can help the company with acting on the five interrelated dimensions. Four of these mechanisms are already integrated in the four dimensions of Stilgoe et al. (2013) and therefore do not need to be discussed anymore. The only new feature is the second mechanism; the application of a precautionary principle. This mechanism means that governments should be able to intervene much quicker in risk management decisions whenever they think this is necessary, even though no regulation or laws are made with regard to the new technology (fights the institutional void). In this way they will be able to avoid perceived negative consequences.

4.3 Combining the characteristics

The three authors all have slightly different perspectives when looking at the concept, still there is quite some overlap. Combining the three perspectives together will create a better overview of what RRI is all about. The overview that is created by the author of this thesis, see table 1, shows how the characteristics interrelate.

The combination of all the characteristics can be seen in the following way:

The whole idea behind responsible innovation is to anticipate on negative future consequences. These consequences can be from concern by the customer about the security of privacy in the product (e.g. the electronic patient record), till not anticipated innovative ways of using the product, which change social life (internet). These products are burdened with the possibility that they will give problems after they are marketed (e.g. DDT or asbestos). In order to become as anticipated as possible, a company will have to go through several dimensions, in two different stages.

4.3.1 Stages

The first stage is the need stage; main question here is whether the need fulfilled by the product actually needs fulfilling. Pavie et al. (2014), give an example of homework: do we need a device that makes our homework for us? Another question can be: do we need a robot that can learn and think by itself? After going through the dimensions explained below, the innovation arrives at the second stage.

The second stage is about the impact of the innovation. A perceived need will be fulfilled, but there might be more issues that the product/service addresses which was not intended. These side-consequences need to be dealt with before the product/service will enter the market, this means that all possible negative consequences need to be found and need to be accounted for.

4.3.2 Dimensions

Addressing the dimensions simultaneously can be difficult, because the dimensions will strangle into each other, which makes it hard to know when the process is finished. To make it easier for companies to oversee what they are doing, how far they are and what still needs to be done; the dimensions are placed in an order. Using this order can make it easier to measure the progress of the process. The progress can be measured because the goals of the dimension should be clear before any action has been taken. Goals could be to make sure the product meets all guidelines; that the product has been reflected upon in six multidisciplinary focus groups consisting out of four different layers of the business; or that the product idea has been evaluated by hundred people in five different market segments at multiple locations (e.g. school classes or science cafes) in three different countries (e.g. to evaluate difference in interpretation between Chinese and Dutch people).

The first dimension is reflectiveness. This dimension focuses on what the company can do/know internally. It checks the impact by using tools, guidelines, codes of conduct, technology assessments or life cycle assessment, together with making sure the innovation is economically feasible. After the company is content about the innovation it goes to the next dimension.

The second dimension is inclusion, here the company shares their innovation with the world's actors (externally), using multi-stakeholder involvement, public debates, science cafes and whatever necessary to include the wider public. These actors will study the innovation and will search for possible negative consequences, afterwards they share their opinions with the company.

Then the company arrives in the dimension of responsiveness. In this dimension will be looked at the consequences considered internally and externally. On the basis of the interpretation of those findings, a decision will be made whether to alter the product, and go back to the internal dimension, or to move on to the next stage.

To assess whether the negative impacts are significant enough a company could hold an impact perception survey. The input of the survey can be all consequences/impacts, both positive and negative, found in the previous dimensions. To assess the importance of the impacts the survey can consist of a scale of 20, ranging from -10 till +10. The output will be the importance people attach to certain impacts and whether it is positive or negative. Then the company should look whether the negative impacts are acceptable.

For example, when every impact lower than -4 is considered unacceptable, then the product has to be altered on the points where this happened, before going through the first two dimensions again. Like a new technology that scores a -8 on a feature that bears the opportunity to unnoticeable film people. Then this particular issue should be addressed

(shine a light when the camera is on). Afterwards it has to go through the dimensions again to make sure the issue is solved to the satisfaction of the wider audience.

To be responsive, the results of the survey should be shared with the people who took the survey. A simple practice can be to thank them for their input and to share the effects that their input has on the future of the product (i.e. it will be altered, or it will be implemented in society).

If the company adapts the innovation, according to the output of the responsiveness dimension, the cycle repeats. But when the wider public do not envision any negative consequences the company can say that they anticipated. Used in this way anticipation is a state (stationary), derived from a process, instead of an actual dimension.

In the light of transparency and responsiveness, the process of going through the axes can (should) be made public. This can help buyers/users of the innovation in decision making, by giving them insight of the possible impacts of the product, the opinion of others about the product and the reasoning of the company why this product was ready for implementation. Doing so the company gives the buyer the possibility to asses for himself whether he considers the innovation to be responsible or not.

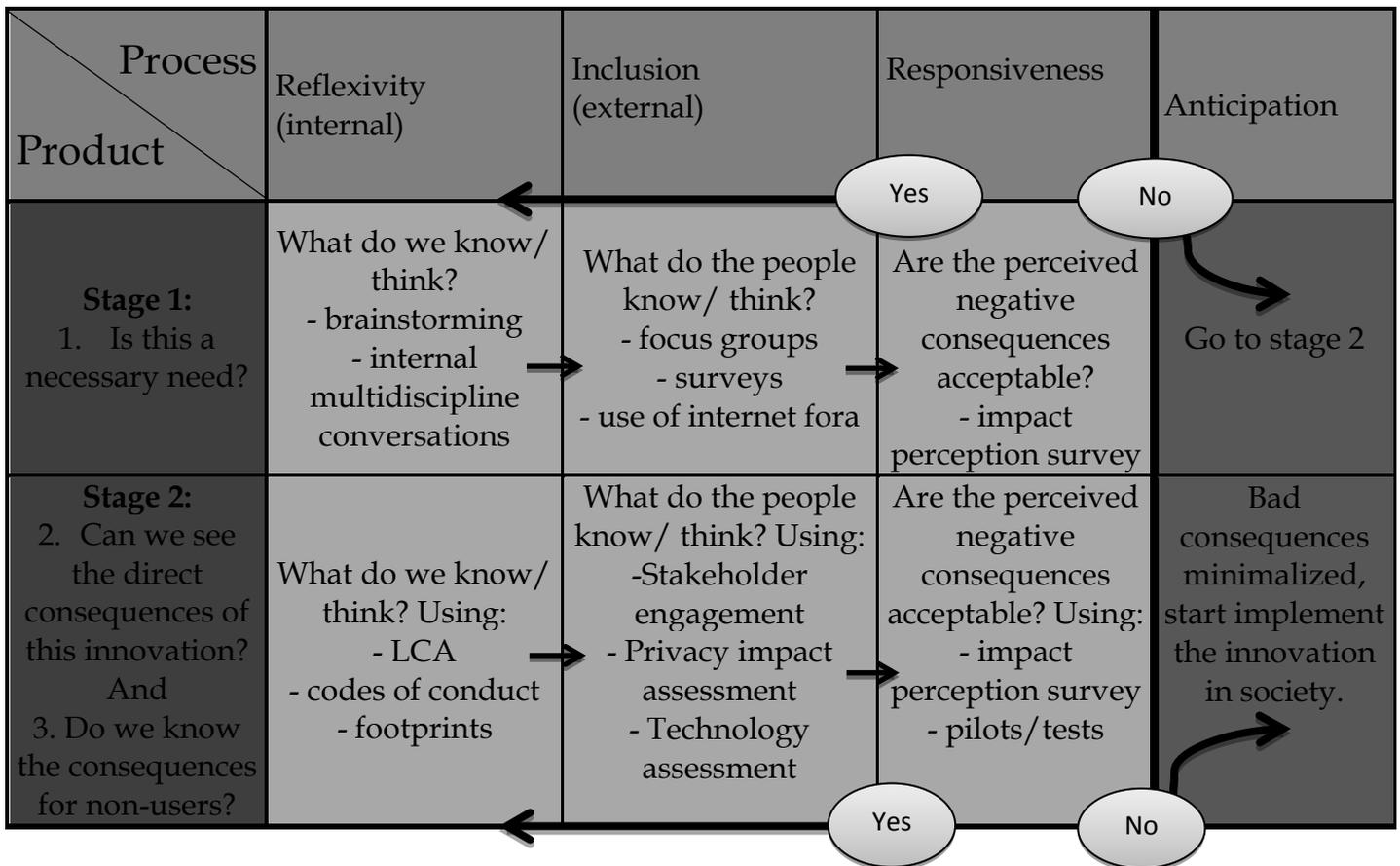


Table 1: contribution of the author: a combination of the four dimensions of Stilgoe et al. (2013) with the three axes of Pavie and Carthy (2013) and Von Schombergs two interrelated dimensions.

Table 1 helps seeing responsible innovation as a process. And although the process helps solving questions, some questions it does not answer, like: when is it allowed to have bad consequences? Because in some cases the benefit might outweigh the negative impacts. Or, when is the difference between the companies' perception and that of the people small

enough, to go to the next stage (i.e. who decides that -4 is acceptable)? Or when do we have to conclude that an innovation should not be implemented at all? The answers to these questions belong to the innovator or the approver of the innovation. Cooper (1990) calls these people gatekeepers; this is a group of multidisciplinary and multifunctional (and mostly) senior managers, who must make the choice about preceding the innovation or to go through a stage again.

According to Pavie (2012), the innovator (or stage keeper) should have two qualities, first they should be able to question the capacity of a responsible innovation (the outcome of going through the two stages) and secondly, they should have the ability to slow down the innovation in order to bring it in line with the economic, social and societal sphere in which it will be implemented. Of course, the innovator can use the table as an informative tool, to back-up his decision.

4.4 How to become a responsible organization

Just one responsible innovation, using its characteristics, does not make the whole organization responsible. If companies do this they can be considered to engage in 'responsibility-washing' (Pavie et al., 2014). To avoid this to happen the whole organization needs to change, which can be done using the five stages of Pavie et al. (2014). These stages do not need to be addressed in sequential order, but are put in this way for the purpose of understanding. The five stages consist of the following:

1. Comply with the law: ensure the organization gets accurate and up-to-date legal information.
2. Anticipate future legal requirements: in this stage the firm should develop more effective foresight by using horizon scanning and risk analysis techniques.
3. Think the value chain as an ecosystem: in this stage it is necessary to build a value chain where all of the actors and organizations involved are oriented towards responsibility.
4. Develop responsible products and services: this fourth stage aims at creating, designing, developing and launching responsible products onto the market while monitoring and managing the impacts of these products on social, economic and environmental criteria throughout the life cycle.

There are five stages through which this whole developing process can be measured these are the idea, feasibility, capability, launch and post-launch stage.

5. Lead the change: in this last stage, the company should take a leadership role in its industry, this can be achieved by three optional activities namely, communicate and educate to responsibility, create standards, or by developing responsible business models.

By applying these stages rigorously a company ensures that the corporate image does not get tainted by 'responsibility-washing,' while guaranteeing that the firm's responsible innovation strategy remains centered on generating innovation, growth and performance (Pavie et al., 2014).

4.5 Issues regarding RRI

The concept of RRI is relatively new, and although the European Commission might want to implement it as the new type of 'business-as-usual' (European commission, 2013), there are not much studies of how the concept can be used in practice. Let alone the impact it will have. This is because of a lack of structured coordination of existing research programs, inadequate levels of responsible innovation research and the weak linkages between research

and the actual market (Pavie et al., 2014). This thesis adds a template of how the concept can be used in practice, chapter 4.3, but table 1 is not used in practice and therefore needs proper testing first (there are more issues regarding the usage of table 1, but these are deliberated in the discussion part below).

Another issue is that researchers (also for companies) might think they already act responsible, because they adhere to experimental reproducibility, laboratory health and safety, data protection and obtaining informed consent. While this does not consider reflecting on the actual research they provide (Eden et al., 2013). This does not happen, because most of the researchers have never been asked to think through the potential challenging effects of their research (Eden et al., 2013).

The size and structure of the company can also be a barrier to implement responsibility in a company. Big companies are most of the time more hierarchical and bureaucratic than smaller or medium sized enterprises. When then RRI needs to be implemented it will take more time in large companies, since they are less flexible and adaptable (Halme and Korpela, 2013). Small and medium enterprises on the other hand can lack resources needed for the process and are therefore more eager to introduce the product faster to the market than might be considered responsible (Halme and Korpela, 2013; Pavie et al. 2014).

Besides, not all companies have the ability to fully integrate all types of responsibility in their business, because they lack resources. Budgets have been given, goals have to be realized and there is no prospect that the product will make it through a sequel of assessments. Then it is up to someone within the company to make the call whether to quit or implement the new product. This brings us to another, more worrying, issue which is the opportunity to simply ignore responsibility. Companies can know the possible negative consequences of a new innovation, but implement it anyhow because of expected profits.

But there are also issues regarding the whole concept. Is it manageable? Not too far-fetched? Or maybe even naïve to strive for a responsible organization? Questioning responsibility, Blok and Lemmens (2014) state that there are three reasons why the concept needs a radical transformation. These reasons arise from the input, throughput and output of the responsible innovation process. The input refers to stakeholder engagement; they argue that power imbalances and different goals and motives between stakeholders can lead to conflicts and can be seen as bottlenecks for responsible innovation, which in turn suppresses social and ethical aspects. Besides, stakeholder dialogue can be limited, due to framing, power imbalances, influencing (by other stakeholders to select a certain direction), and the social construction of the stakeholders' values and interests (Blok, 2014). The throughput refers to transparency, interaction and mutual responsiveness. The claim for transparency, according to Blok and Lemmens (2014), is naïve, because (prior) knowledge can be a main source of competitive advantage. Besides, they need asymmetric information in order to justify claims, and with them gaining funds, that are else not given. Mutual responsiveness should be questioned, because it actually enhances the question of who is responsible. The output of responsible innovation can also be questioned. Stakeholder engagement, as argued, does not per se make an innovation more responsible. And even with a responsible process the outcome can still not be foreseen (Blok and Lemmens, 2014).

About stakeholder engagement; Sutcliffe (2011) questions if people actually want to be included; of course people want a voice, but not necessarily in everything. It is therefore important, according to Sutcliffe (2011), to question who you involve of the public and maybe even more important: in which part of the process will these people get involved. Besides, not every stakeholder group can be included (Cornwall, 2008) and to not make them experience having a 'lack of voice' (Blok, 2014) explicit efforts have to be made to include them (Cornwall, 2008). But when a wide range of people does get included their

participation would remain 'shallow' (Cornwall, 2008), therefore Cornwall (2008, p.8) suggests the following:

"It is not uncommon to read in reports, or hear in policy statements, that there has been, or should be, 'full participation' and 'participation by all stakeholders'. There is a certain normative attachment to this that departs from what might, in reality, be called for in particular circumstances. A 'deep' and 'wide' participatory process might be the ideal, in abstract, but in practice it can prove either virtually impossible to achieve or so cumbersome and time-consuming that everyone begins to lose interest. In this regard, it makes more sense to think in terms of optimum participation: getting the balance between depth and inclusion right for the purpose at hand."

In this perspective, organizations do not have to engage all stakeholders, but still need to be considered when a certain amount of stakeholders can be considered enough.

5. What are opportunities for RRI to be embedded in business models for sustainability?

This chapter examines the opportunities and relations between the two concepts of sustainable business models and responsible research and innovation. This will be done using the business model canvas of Osterwalder and Pigneur (2009). The opportunities for combining the two concepts in the model are first examined in paragraph 4.1. Paragraph 5.2 looks whether it is possible to link the two concepts in a different way with each other, while holding on to the context of business model innovation.

5.1 Using the BM-canvas/nine building blocks

The business model canvas consists of nine building blocks, which all will be covered one by one below. The meaning of every block, as mentioned by Osterwalder (2004) is given, and then which value is added with sustainability. Finally there is examined whether the concept of responsibility can also add value for businesses. At the end, an overview of the findings are given in table 2.

5.1.1 Value proposition

The value proposition is an overall view of a company's bundle of products and services that are of value to the customer (Osterwalder, 2004).

Sustainability: The value proposition has the advantage that it can balance the economic, social and environmental impact of the company (Boons et al., 2013). This can be achieved using the 'value mapping tool' of Bocken et al. (2013). Using this tool in the beginning stage as an idea generator, will stimulate sustainable business modeling. The value mapping tool consists of four stages, which are subsequently: value captured, value destroyed, value missed and value opportunities. When the product is discussed in an early stage (most preferably the design stage) regarding their impacts on environmental and social issues, the company can create value in a sustainable manner.

Responsibility: When going through the four stages of value mapping, also responsibility can be considered. Responsibility can be included by coming up with ways how to involve the wider public in the process. When doing this, the company should think when to involve whom (Sutcliffe, 2011). Outsiders have the possibility to give input early in the process, which can be used by the company to figure out if the need is really necessary to address. Ways of integrating stakeholders can be by using science cafes, or surveys. Later on, when the design of the product is finished, more people should be involved to see whether the innovation will have unseen negative consequences once it is introduced to the market. This can be done using privacy impact assessments, technology assessments and other forms of stakeholder engagement.

5.1.2 Target customer (segments)

The target customer is a segment of customers that a company wants to offer value to (Osterwalder, 2004).

Sustainability: The business can choose to be sustainable as a competitive advantage, aiming at a segment that finds green products important and therefore want to pay more for it. But even when the target customer does not care about sustainability, the company can benefit from becoming sustainable. According to Haanaes et al. (2011) the top priorities when businesses want to become sustainable is to focus on reducing energy spills and eliminating waste. Aiming for this, the company can reduce costs in the production and strive for a higher profit margin, or spend the money on satisfying the customer. Another good option

for companies can be the use of rental or lease structures which provide a constant cash flow (Bocken et al., 2014) instead of one-time sales (e.g. a lightning company can sell light instead of light bulbs). A company or home-owner will probably not quickly change the company that sells light, and for its own convenience probably make a long term contract. But when the customer has to take care of his own light bulbs, it will buy them at the nearest and cheapest place (which might be the competitor). Besides, companies that provide light will be more eager to make longer lasting light bulbs, since it will save costs when light does not need lots of reparation, which in turn is more sustainable.

Responsibility: The concept of responsibility can create value in the mind of the customer, by the label of a 'responsible brand'. When responsibility becomes more important, the value of such brands will increase as well. Then customers might prefer it, such as they do with sustainable or biological products now, and the label of a 'responsible brand' can become a competitive advantage. But the target customer has no top priority for responsibility, because the company has to consider the impact it has on both the customer and the non-customer (Stilgoe et al., 2013), since both have the power to portray a product negatively (e.g. competitors in war can use negative impacts in order to increase their own market share).

5.1.3 Distribution channel

A distribution channel is a mean to get in touch with the customer (Osterwalder, 2004).

Sustainability: The distribution of products can be more sustainable in multiple ways (e.g. producing local so the products have to travel less, using less polluting trucks, or by creating more efficient routes. There are also some companies that will have to innovate their business model to become sustainable. This can be achieved by new technology, according to the first stream of technological innovation of Boons and Lüdeke-Freund (2013). In the distribution channel, the aforementioned 3d-printer is such a new technology with this potential. Some products that are currently bought in shops, like screws, cups, forks etc. will be able to be printed in the future. Companies that are currently making these products have the opportunity to sell, instead of the product, the blueprint of the product, so people will be able to make (i.e. print) the product themselves. Acting too late on this possible way of reaching the customer can have massive consequences for companies and time pressure is one of the reasons responsibility is not always considered as much as should (Pavie et al. 2014).

Responsibility: According to chapter 4.3; the concept of responsibility is process focused. Reaching to the customer in a responsible manner can be achieved by informing the customer, as well as the non-customer. This demands to become transparent (Von Schomberg, 2011), to the extent where companies will not lose competitive advantage (an issue regarding RRI according to Blok and Lemmens, 2014). To become transparent the company can choose to make the innovation process (Table 1) public. This means making the results of the technology- and privacy assessments public, in order for people to evaluate the process themselves.

5.1.4 (Customer) Relationship

This block describes the kind of link the company establishes between itself and the customer (Osterwalder, 2004). The idea of this block is how to attract customers and retain them throughout the life cycle, since the better the relationship, the more someone will buy, and the more money it will create for the company (Osterwalder, 2004).

Sustainability and responsibility: Both concepts can be used to attract and retain customers, since they can stimulate the overall brand awareness (Haanaes et al., 2011). Both the concepts

of sustainability and responsibility may appeal to the customer, which makes them want to buy the product.

Responsibility: Responsibility can create value by interacting with both the customer and the non-customer. Being responsive to the customer might make them feel more involved, which can make them more loyal. Being responsive to non-customers might bring the company in touch with possible-customers who would normally never come in the scope of the company.

Interaction does not only mean using surveys to see whether the product has a chance to succeed, but also real interaction, e.g. science cafes, open days, member meetings. Interaction can also be used to give a clearer view to the company about what customers expect from them. Discussing the product with public and customers can enforce the knowledge of why people buy or not buy their products, which can be used as input for the marketing department.

Another way to implement responsibility is by use of contracts. The business model can change from selling a product to selling a service (light instead of light bulbs), this enhances the relationship between the company and the customer. The relationship will strengthen because the customer need to be held satisfied continuously, which demands a well-functioning product all the time.

5.1.5 Value configuration (key activities and resources)

This block describes the arrangements of activities and recourses necessary to create value for the customer (Osterwalder, 2004).

Sustainability: In both concepts the environmental and the social impact of the product are important factors. The issue of environment can be addressed by designing the product in such a way it does not harm, or where possible even contributes to the environmental challenges the world copes with. For example, a company can become inspired by the cradle to cradle approach, from Braungart and McDonough (2002) (explained in chapter 3.2.1). Companies can also reduce their environmental impact, by letting the people have the opportunity to work at home, or producing and selling locally (safes fuel).

Social sustainability can be achieved by; hiring local people, using fair/ethical-trade products, involving local businesses in the business processes (like local transport companies, or using local products), or by creating value to the town you settle in (for example by supporting local activities).

Important for the company is to keep looking at the larger system the company is working in (Boons et al., 2013). See the activities of the company within the construct of the distribution channel and the partnerships. Not only make your own activities sustainable, but make the larger system sustainable.

Responsibility: Responsibility can add value to sustainability by the use of table 1. Table 1, aims to become anticipated on future negative impacts, with use of reflectiveness, inclusiveness and responsiveness. Key activities should be the implementation of table 1 into the business. This can be achieved by creating a critical work environment where reflecting is business-as-usual, or by making it easier for people to give their opinion about the product, or by finding ways to include people in the product making process (e.g. lays: maak-de-smaak).

Including more people in the process has the added benefit that the best ideas usually come from outside the company (Mitchell and Coles, 2004b). This is because people from outside the company are not restricted by the same paradigms as the people inside the company.

Important to consider is to which extend this is possible. The company might want to talk for days with all kind of stakeholders, but if the innovation comes from a small company with only several employees this might not be possible. Therefore a selection needs to be made

who to involve when and for how long. When the product, and with it the company, grows in sales, continuous conversations with stakeholders makes sure the product will keep reflected upon. This is necessary, because a product might lack negative impacts on small scale, but might create it when the product gained market share (e.g. protocol for social media).

5.1.6 Capability

This block represents the capability to execute a repeatable pattern of actions that is necessary to create value for the customer (Osterwalder, 2004).

Sustainability: In the frame of sustainability, one can think of just-in-time delivery, or built-to-order productions. Both concepts lower the costs by reducing unnecessary transport, storage and building costs. This lowers the price and adds value for the customer (the customer can buy the same with less, so the money is relatively worth more).

Responsibility:

To become responsible the business has to interact with the customer. A common way to achieve this is by use of 'invited spaces'. Invited spaces are places where stakeholders can participate, but are mostly structured and owned by the provider (Cornwall, 2008). Changing this is hard to achieve. A better environment for people to give their voice is one created by themselves (e.g. networks or social movements, communities, councils and fora) (Cornwall, 2008). Responsible capabilities can be to have/gain access to a wide range of spaces created by people themselves, and the knowhow to make proper use of these spaces. Reflexivity can also become a capability. A company can achieve this by training people in being open and critical about the product they produce and by having a business environment where this critique is stimulated rather than demotivated.

5.1.7 Partnership (key partners)

This block represents a voluntary initiated cooperative agreement between two or more companies in order to create value for the customers (Osterwalder, 2004).

Sustainability: In order to address sustainability in the whole chain, companies can use sustainable supply chain management. Important is that the company cannot simply shift the burden to another company in the chain, but has to do as much as possible themselves (Boons and Lüdeke-Freund, 2013; Haanaes et al., 2011). An example that benefits both companies could be efficient packaging. Less packaging means that more can be shipped in the same truck, less storage space is needed, less unpacking needs to be done, which all is in favor of overall costs for both companies.

Responsibility: Inclusiveness can be the added value of responsibility regarding partnerships. Being inclusive, widening up the level of transparency towards your primary partners asks for a higher level of trust and commitment. Trust and good relations between companies can save both companies money, e.g. the more deals made with a company, the easier and faster this deal will be closed. Also, having the same supplier can guarantee a degree of quality, steady flow of delivery, or even reduced costs (promised re-purchases). Including key partners in the innovation process can have the benefit that partners can add knowledge to the product. A supplier, for example, knows its product best, therefore he also might know how to use it in the most efficient/effective way, which can be different than the initial idea of the company. And, as with customers, partners have their own mindset. Therefore they might spot weaknesses in the design, or unseen negative future impacts.

5.1.8 Cost structure

This block is the representation in money of all the means employed in the business model (Osterwalder, 2004).

Sustainability and responsibility: both concepts face difficulties with pricing certain intangible benefits, but when a good pricing mechanism can be created it can add value for the company (Haanaes et al., 2011). Intangible benefits are benefits that can be hard to translate in actual cash. Like: education rate among employees, brand reputation, attractiveness of the company, good relationships between employees, or a pleasant neighborhood where the office is settled.

Responsibility: responsibility will not create value in this block, but will increase costs. Besides the added costs of the process of becoming responsible, the company can also take costs when the product is implemented. The product will be implemented on the premises to the customer that it is responsible and therefore lack unanticipated consequences. When these occur, regardless of the cause, the company should take responsibility by taking action. This can be reimbursement, but also fixing the product, or even a total recall.

5.1.9 Revenue model

This block describes the way a company makes money through a variety of revenue flows (Osterwalder, 2004).

Sustainability: To become sustainable, the business can choose to become a not-for-profit enterprise, in this way profit margins can be lowered, or fully used to achieve social or environmental goals. But this is not an option for all companies, since most companies exist for making money. Still, these companies could be sustainable and, according to the third stream of Boons and Lüdeke-Freund (2013), this can be achieved by an appropriate distribution of cost and benefits throughout actors involved in the model. Besides, some companies could benefit from sustainability due to governmental subsidies.

Responsibility: responsibility could add value by gaining revenue in a responsible way. This could be achieved by letting the people decide where the company should focus on, and make it possible for them to invest in the actual product (sort of crowd-funding) to gain revenues from it afterwards. Or by making sure the product has no unanticipated negative side effects, because it is fully responsible, and if it has the people will be refunded. This incentive could lure new customers to buy the product and creates awareness and revenues.

	BMfS	RRI
Value proposition	Create value with a social and environmental accepted product	Create value through - interaction and participation throughout the process, and by - making providing a product free of negative future impacts
Target customer	Sustainability could be used to attract certain customers, but the company should become sustainable, regardless of target customer priorities, since the market is going to demand it	Create brand value by being responsible, but keep in consideration other (non-) stakeholder opinions
Distribution channel	Create value by reaching customers in a sustainable way (Short channels, reduced emissions)	Create value by transparency about impacts and expectations of new product
(customer) Relationship	Create value by being sustainable	Create value by interaction with customers and non-customers
Value configuration	Create value through local involvement and environmental friendly designs	Create value through the implementation of table 1

Capability		(being reflective, inclusive and responsive)
	Create value by smart logistics and design (JIT, or built-to-order)	Create value, not just by including people, but actively engage in self-created-spaces Create value by a critical work environment where reflectiveness is common
Partnerships	Create value by making the whole chain sustainable (sustainable supply chain management)	Create value by being transparent towards key partners, make them engaged with the product to create win-win situations
Cost structure	Create value by installing pricing mechanisms for intangible benefits	Value lost, due to cost increase, because of responsibility
Revenue model	Create value by being not-for-profit	Create value by creating
	Create value by fair distribution of costs and benefits throughout the chain	revenues, because of responsibility image
	Create extra revenue through subsidies	

Table 2: overview of opportunities to implement SBM and RRI into the business model canvas

Table 2 shows the room in the different building blocks to integrate the concept of responsibility within a sustainable business model. Most of the added value will be gained by good collaboration, interaction and transparency between the different actors involved. Besides, being responsible itself can be added value to the company, as long as it is not misused (responsibility-washing).

5.2 Other way to integrate RRI in SBM

Chapter 4, which covers RRI, defends that a good process makes the product responsible. So instead of looking at various ways to implement RRI into different business model blocks, another way of implementing RRI into SBM can be by looking at the process of becoming sustainable and see if a company can combine this journey together with becoming responsible. This other way of integrating RRI in SBM consists of three steps. These steps are an integration of the literature about sustainability and responsibility, without using a combining tool (business model canvas).

The first step is to acknowledge that the company wants to become sustainable and to which degree (chapter 3.2.2). It is important to directly state that also responsibility will be a main driver in the innovation process. This moment the company has to commit that; (1) they will create a workplace environment where it is common to reflect on current business practices (reflectiveness), (2) they will enable people to engage in the upcoming product (inclusiveness) and respond to their input (responsiveness), (3) they will strengthen their relation with their main partners in order to make the chain and the product sustainable and responsible (e.g. no negative consequences with the material used), and (4) they will make the process and the product as transparent as possible.

Step 2 is deciding how sustainability and responsibility will be incorporated in the business. Sustainability can be incorporated with use of the archetypes of Bocken et al. (2014). The different archetypes should be studied, together with other sustainability features, and an implementation plan should be developed. Responsibility can be incorporated with use of table 1. The business already in step 1 committed to be reflective, inclusive, responsive and

transparent; in this step the business should focus on how they will comply with these promises. They can, for example, make a plan that will change the work environment, decide which channels will be used to engage the people in the future, or assess how the relationship with the key partners can be improved.

The last step is the implementation phase. Both concepts have, apart from each other, implementation stages which are deliberated in section 3.2.2 (for sustainability) and section 4.4 (for responsibility). Both implementation stages can be merged in order to create a way to implement sustainability and responsibility at once in the business (see figure 5).

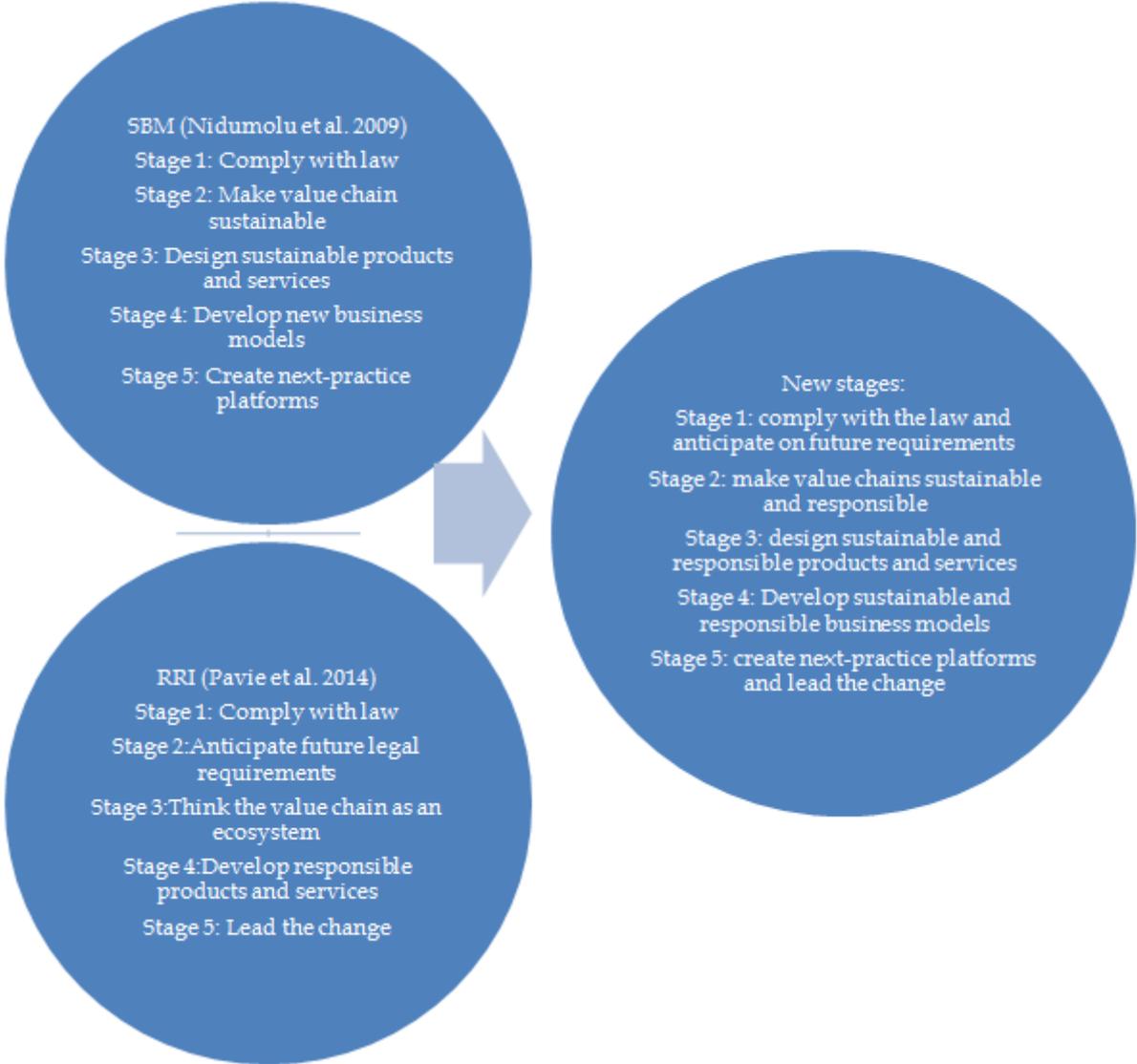


Figure 5: old and new stages of implementing SBM and RRI

The aim of the five stages is to create a responsible as well as a sustainable business model (or, responsible business model for sustainability).

Stage 1: comply with the law and anticipate on future requirements. In order to create future competitive advantages, a company should conform to the most stringent law. Conforming to the most stringent law can save money, because enterprises do not have to manage component sourcing, production, and logistics separately (Nidumolu et al., 2009). In order to anticipate, the company should take future legislation in consideration, since new legislation will be the new boundaries of future products. Future legislation can be spotted by the use of horizon scanning and risk analysis techniques (Pavie et al., 2014).

Stage 2: make value chains sustainable and responsible. To make the value chain sustainable, the company has to consider the current work- and business environment. Sustainability can be created in the supply chain, the returned products and in the workplace (Nidumolu et al. 2009). The supply chain can be improved by using more eco-efficient transport, or less packaging. In the workplace it can be encouraged to work more from home, which saves travel time, travel cost and energy use (Nidumolu et al., 2009). In order to create a responsible value chain Pavie et al. (2014) state that all actors in the value chain should be oriented towards responsibility, but this seems far-fetched, since a single company can have several hundred suppliers. Therefore, and in line with the business model building blocks, the company should aim for a good relationship with key partners. The benefits of key partners, see paragraph 5.1.7, can positively affect the responsible innovation process and can encourage the partner to become responsible as well.

Besides, all (key) partners will have to benefit from the new product (Amit and Zott, 2010), so their involvement will be enhanced.

Stage 3: design sustainable and responsible products and services. Design sustainable products means to design products that not only benefit the company but are also good for the environment and the society (Boons et al., 2013). To design sustainable products, companies need to understand consumer concerns and carefully examine product life-cycles. They have to learn to combine marketing skills with their expertise in scaling up raw materials, suppliers and distribution (Nidumolu et al., 2009). In step 2, the company made plans to implement features of responsibility in the innovation process. Now, during the design stages, actual implementation takes place and the company will have to run through the 2 separate phases, in order to create a responsible product.

Besides table 1, does the post-launch stage need to be considered. A company cannot anticipate everything and therefore it is necessary to re-assess the product after it is launched (e.g. data security can become outdated and will need upgrading after a while).

Stage 4: Develop sustainable and responsible business models. To develop sustainable business models, the archetypes of Bocken et al. (2014) are studied in step 2. This is the step where the plan, consisting of different types of sustainability, should be implemented. To develop a sustainable and responsible business model, the company can look at the different building blocks as discussed in chapter 5.1.

Stage 5: create next-practice platforms and lead the change. Innovation is never done. Business models need to keep changing to stay competitive (Mitchel and Coles, 2003). Therefore it is important to ask, what is next? What can we still improve? This is easier when it is done in collaboration, like the DSGC, where a main aim is to learn from each other.

Nidumolu et al. (2009) state that paradigms need to change in order to develop new innovations that lead to the next practices. Pavie et al. (2014), argue that this can be achieved using communication and education, creating standards and the new business models. The aim of communication and education should be to make responsibility aware for the market as a whole. A company can create standards by providing solutions to the currently unknown, e.g. make it public when impacts are assessed negatively ('wrong impacts'), in order to prevent other companies to make a similar product facing the same negative impacts. The responsible business model itself could also be a standard/example for other companies to become responsible as well.

6. Conclusion and discussion

Both concepts of business models for sustainability and responsible research and innovation have been discussed in light of the perception of contemporary authors. The literary review in chapters 2, 3 and 4 have given an overview of the concepts in order to make it possible to answer the main research question: **‘What are the opportunities for responsible innovation to be implemented in sustainable business models (for innovation)?’**

6.1 Conclusion

The main aim of this thesis was to answer the following question: ‘What are the opportunities for responsible innovation to be implemented in sustainable business models (for innovation)?’

The question is answered with three contributions to science. First is table 1 developed. This table opens the opportunity for businesses to implement the concept of responsible innovation into their business. The opportunity to embed the concept in a company was already possible before, but without boundaries (stages) and no guidelines (when using which dimension) this could be confusing. The practical approach of table 1, contributes to the two ways to integrate RRI in BMfS given in this thesis. The first approach, and second contribution of this thesis to science, is to integrate both concepts in the business model building blocks. Table 2 is created to give a practical overview how the two concepts can both add value to a company, using the business model building blocks. The final contribution to science is that both responsibility and sustainability can be goals that can simultaneously be achieved. The process of becoming sustainable can become the process to become both sustainable and responsible. This process is deliberately described in chapter 5.2.

6.2 Discussion

This thesis contributes to science in several ways; the first is the authors’ perspective on responsible research and innovation. This perspective is widely discussed in chapter 4.3 and is made visible in table 1. This perspective, however, is not tested in practice and therefore is the value undetermined. Further research should be conducted in order to establish the value of the proposed addition to the concept and to set boundaries regarding implementation. It is, for example, possible that after several adaptations of the product the wider public is still not content about the perceived impacts. But the company does not have the means to change the whole product again and again. Therefore guidelines need to be conducted, when to implement, to what extent, or in what time-duration, in order for small businesses to bring a responsible product to the market.

Secondly, this thesis provides a way to implement the concept of responsibility in the company with use of the building blocks. The problem is that there is no clear answer about when the concepts are integrated enough, like: when a company makes certain blocks responsible does that make the company responsible? And when responsibility is addressed enough in order to say that a company is responsible? These kinds of questions are not easy and ask for more practical research in order to be answered.

The third contribution of this thesis is a way to implement responsibility in a company using the process of becoming sustainable. Also here more research needs to be conducted about whether it is even feasible for organizations to go through the all steps and if that actually will make them more responsible (theory might say so, but practice can differ).

The order and when to use which approach to make businesses responsible is yet indecisive, but it makes sense to use the second approach when the business also wants to innovate in a sustainable manner, and to use the first approach when this is already done. Still there will

always be some overlap (e.g. in step 3, stage 4, of the second approach a company can make use of the first approach to make the business more responsible).

There are some limitations to this study, the biggest limitation is that the whole thesis is based on theories and the solution of how the two concepts can be combined is therefore not per se viable in practice. Therefore practical studies need to be conducted to see whether companies can build responsible business models for sustainability. This is important, because it is harder to change in practice than this thesis might imply, since barriers for implementing the different concept are mentioned, but not highlighted. Organizations, for example, are bound to corporate structures, contracts with suppliers, organizational routines and habits, the willingness of the employees to change (due to earlier re-organizations), which all need to be considered/addressed when the business model needs to be innovated.

Contemporary articles are used to make sure the explanations of the concepts are as up-to-date as possible and to make this thesis meaningful for future research in this field.

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