



Agata Gurzawska

Responsible Innovation in Business

A framework and strategic proposal

Simon Stevin Series in the Ethics of Technology

Responsible Innovation in Business

A Framework and Strategic Proposal

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Agata Gurzawska

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Supervisor: prof. dr. P.A.E. Brey

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*“You never change things by fighting the existing reality.
To change something, build a new model that makes the existing model obsolete.”*

R. Buckminster Fuller

Table of Contents

List of papers	xiii
1. Introduction	1
1.1 Responsibility in the context of business	3
1.2 Responsibility in the context of innovation	6
1.2.1 Innovation	6
1.2.2 Responsible Innovation	8
1.3 Research and methodological approach	14
1.3.1 Research objectives and research questions	14
1.3.2 Methodological approach	17
1.4 Detailed outline of the thesis and methodological approach per chapter	19
1.5 Conclusion	24
References	26
2. Mainstreaming responsible innovation in business: a comparative systematic review of business ethics and innovation management literature	35
2.1 Introduction	36
2.2 Theoretical background	38
2.3 Methodology	41
2.3.1 Search criteria	42
2.3.2 Search strategy	44
2.3.3 Selection of studies	46
2.3.4 Data analysis	46
2.4 Data analysis and results: General content classification	47
2.4.1 Responsibility umbrella: business & innovation	47
2.4.2 Journals & timeline	50
2.4.3 Research methodologies, data analyses and theoretical lens	51
2.4.4 Geographical and industry setting	53
2.5 Data analysis and results: Thematic analysis of RI dimensions	56
2.5.1 Relationship between companies responsibility and innovation	56
2.5.2 Benefits of RI	59
2.5.3 Drivers of RI	64
2.5.4 Implementation of RI	66
2.6 Discussion and future research agenda	74
2.6.1 Perception of RI in business	75
2.6.2 Implementing RI in business	77
2.7 Conclusions	79
References	81
Annex	93

3. Responsible Innovation in Business: Perceptions, Evaluation Practices and Lessons Learnt	94
3.1 Introduction	96
3.2 Responsible Innovation in Business: Depicting the Field	97
3.2.1 Corporate Social Responsibility (CSR) and Corporate Sustainability (CS)	98
3.2.2 Responsible Innovation	99
3.2.3 Innovation Assessment for Responsibility and Ethics	101
3.3 Methodology	102
3.4 Results	105
3.4.1 Perception of Responsibility and Responsible Innovation (RI)	105
3.4.2 RI Evaluation and Control	112
3.4.3 Assessment	115
3.4.4 Guidance	117
3.4.5 Dissemination and Awareness Raising	119
3.5 Discussion	120
3.5.1 RI Concept	120
3.5.2 RI Evaluation and Control	122
3.5.3 Large Companies and Small and Medium-Sized Enterprises (SMEs)	125
3.5.4 Limitations of the Research and Future Work	126
3.6 Conclusions	126
References	129
Annex	137
4. Implementation of Responsible Research and Innovation (RRI) Practices in Industry: Providing the Right Incentives	143
4.1 Introduction	144
4.1.1 Methodology	145
4.2 Outlining the Field: RRI and CSR	146
4.3 Defining Incentives and Our Approach	149
4.4 Incentives for RRI in Industry	153
4.4.1 RRI Stakeholders	156
4.4.2 External Stakeholder Incentives	158
4.4.3 Internal Stakeholder Incentives	165
4.4.4 Governance	167
4.5 Factors of Effective Incentives	171
4.5.1 Size of a Company: SMEs vs. Large Corporations	171
4.5.2 Type of Industry and Ecosystem	172
4.6 Limitations of the Research	174
4.7 Conclusions	174
References	176
5. Strategic Responsible Innovation Management (StRIM) – A New Approach to Responsible Corporate Innovation Through Strategic CSR	189
5.1 Introduction	190
5.2 Innovation, CSR and their relation to business strategy	191

5.2.1 Innovation	191
5.2.2 Corporate Social Responsibility (CSR)	192
5.2.3 Strategy and strategic management	193
5.3 The link between Innovation and CSR	197
5.3.1 Conceptual perspective	198
5.3.2 Bi-directional link between CSR and Innovation	201
5.3.3 CSR, Innovation and value creation	206
5.3.4 Responsible innovation and stakeholder management	209
5.3.5 Challenges and limitations in connecting CSR and innovation	210
5.4 Strategic Responsible Innovation Management (StrIM)	211
5.4.1 Planning	214
5.4.2 Implementation	215
5.4.3 Evaluation and control	216
5.5 Conclusions	218
References	219
6. Towards Responsible and Sustainable Supply Chains: Innovation, Multi-stakeholder Approach and Governance	231
6.1 Introduction	232
6.2 Research Methodology	234
6.3 Theoretical background	236
6.4 CSM Challenges	239
6.5 Solutions for Responsible and Sustainable SCM: A Proposal	241
6.5.1 Innovation	241
6.5.2 Multi-stakeholder approach	248
6.5.3 Effective Governance and Supra-Agent Responsibility	250
6.5.4 Summary of the Proposed Solutions	255
6.6 Case study: Sedex	256
6.6.1 Innovation	257
6.6.2 Multi-Stakeholder Approach	257
6.6.3 Governance and Supra-Agency	258
6.7 Conclusions	261
References	263
7. Conclusion	277
7.1 Answers to research questions	278
7.2 Limitations and further research	288
References	291
Acknowledgments	293
Dutch Summary	295
English Summary	299
Simon Stevin (1548-1620)	307

List of papers

Chapter 2

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Chapter 3

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Chapter 4

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Chapter 5

Gurzawska, A. (2020) 'Strategic responsible innovation management (StRIM)', pp. 63-97 in Yaghmaei, E., & Poel, I. V. D. (2021). *Assessment of responsible innovation: Methods and practices* (p. 376). Taylor & Francis. 10.4324/9780429298998-6

Chapter 6

Gurzawska, A. (2020) 'Towards responsible and sustainable supply chains—innovation, multi-stakeholder approach and governance', in *Philosophy of Management*, 19, 267–295 (2020). <https://doi.org/10.1007/s40926-019-00114-z>

1. Introduction

Business is a key player in European research and innovation (R&I), because it is the main funder of European R&I developing novel technological solutions (Spulber, 2011). The primary sector where money is spent on research and development (R&D) is the business and enterprise sector, for instance, with 66% of all R&D expenditures in 2020 (Eurostat, 2021a). Unrestricted innovation promotion fosters both economic development and inventiveness. Real-world situations, however, pose valid questions about whether R&I can be allowed to function independently in the market without regulation and societal guidance (Gurzawska, 2021). Some headline stories include Volkswagen's emission scandal which related to installing the software device, or defeat software, within its vehicles, to circumvent emissions standards; misuse of data and potential implications for the US presidential elections in 2016 (and beyond) in the Facebook–Cambridge Analytica case, or the Pegasus surveillance spyware developed and sold by the Israel-based company NSO Group targeting human rights activists, journalists and dissidents. These examples show not only the powerful position of companies in the global political and economic system (Babic, Fichtner, Heemskerck, 2017), but also how technology is seeping into every part of human lives, be it energy, mobility, health, work, living, learning or entertainment, and ultimately how developers of technological innovations – companies – fundamentally change human existence and even humans' sense of self. Furthermore, global growing concerns over the grand challenges of our times (Lund Declaration, 2009) such as climate change, sustainable energy, deforestation, loss of biodiversity, as well as an ageing society and raising inequalities, pose a question on the role and responsibilities of companies in fulfilment of the United Nations' 17 proposed Sustainable Development Goals (SDGs) for 2030 and to what extent technological innovation provides ground-breaking solutions to address them.

In a fast-changing world increasingly dependent on technology and with business wielding enormous power, one may ask how to ensure that the impact of technology on humans and society will lead to improved technologies that are sustainable, ethically acceptable and socially desirable. What do our fundamental rights and values look like in the techno- and digital age? Who has the right to decide what the world should look like and how we want to live? And what role and responsibilities do companies have regarding their technological innovations?

The question of the responsibility of companies for their activities has a long tradition of more than 60 years (Carroll, 2008; Latapí Agudelo, 2019) and has attracted attention from a range of businesses and other stakeholders. It has been widely investigated in the fields of business management, business ethics, law and human rights under the terms of corporate social responsibility (CSR), corporate responsibility (CR), corporate sustainability (CS), responsible business, sustainable business, ethical business, corporate citizenship, environmental, social and governance (ESG) issues and many more. The question of responsibility in the context of innovation is also not new and has been discussed among several fields in connection to Technology Assessment (TA), Ethical, Legal and Societal Aspects (ELSA) and anticipatory governance (Burget, Bardone & Pedaste, 2017). However, since the European Union (EU) mainstreamed the term ‘responsible research and innovation’ (RRI) in programmes such as Horizon 2020 or Seventh framework programme of the European Community for research and technological development including demonstration activities (FP7), especially great effort has been devoted to the study of RRI and responsible innovation (RI) (Gonzales-Gemio, Cruz-Cázares & Parmentier, 2020).

Even though CSR and CS (and their various forms) and RI have been widely researched, these conceptions are to a great extent disconnected in the academic literature and business practice. Moreover, while they share some similarities, the concepts are rather different due to their origins and objectives. Firstly, RI is mostly a top-down approach created in the policy arena, where policy-makers promote a system enhancing ethical, responsible and sustainable R&I for publicly funded research (through, for example, European research funding such as Horizon 2020 or Horizon Europe) (Gurzawska, Mäkinen, & Brey, 2017; Gurzawska, 2021). Contrarily, CSR and CS are historically based in large part on bottom-up strategies, where CSR and CS policies serve as a self-regulating mechanism for business to ensure that it complies with both the letter as well as the spirit of the law, international human rights norms, and ethical standards (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015). Second, whereas the primary goal of RI is to bridge the gap between science and society, CSR and CS are often applicable to all business activities, including R&I, rather than being created particularly to have an impact on R&I (Gurzawska et al., 2015). Therefore, our knowledge about the relationship between CSR, CS and RI is still limited and remains relatively unexplored from the point of view of companies’ responsibility for their innovation activities. Consequently, we lack clarity about what companies are responsible for in terms of their technological innovation, why they

should innovate in a responsible, sustainable and ethical way and how they should do it. Because of the disconnected concepts of business responsibility towards society and the environment and responsibility in the context of technological innovation, we risk the vacuum of responsibility for technological innovations developed by industrial actors. With the arrival of more disruptive technologies and digital transformation, it is particularly important, and urgent, to have systemic solutions for integrating responsibility into the companies' technological innovation.

The focus of this thesis is therefore on responsible innovation (RI) in the business context. The objective of this research is to bridge two currently disconnected discourses, namely business responsibility and RI, and develop a conception of RI for companies based on existing conceptions of CSR, CS and RI. Such conception should provide theoretical underpinnings as well as practical strategies for implementing RI in companies. Therefore, the research question of this thesis is as follows:

What would be a theoretically sound conception and a viable strategy for Responsible Innovation in business that bridges existing approaches of CSR, CS and RI?

The overall research approach research question and sub-questions of this thesis are further discussed in section 1.3 of this introductory chapter. However, it is crucial to define concepts central to this research which are CSR, CS and RI in first place. Therefore, the outline of this introductory chapter is as follows:

In section 1.1, I introduce current discussions around the responsibility of companies looking at well-established concepts and practices in business management, business ethics and human rights and business, including corporate social responsibility (CSR) and corporate sustainability (CS). In Section 1.2, I look into responsibility in the context of innovation to get a closer picture of the notion of responsible innovation (RI). Next, in Section 1.3 I discuss my research and methodological approach to this thesis, followed by a detailed outline and methodological approach per chapter in Section 1.4.

1.1 Responsibility in the context of business

The notion of corporate responsibility, which goes beyond serving immediate shareholders and maximizing profits has a long history in the literature on business management and dates back to the 1950s and 1960s (Gurzawska, 2021). Companies are becoming more aware of their obligations, which go beyond serving their

immediate shareholders and increasing profits (Crane & Matten, 2016). Businesses engage with society, the environment, and customers in one or more countries while taking advantage of globalisation (Gurzawska, 2020).

Business responsibility has been conceptualised in various ways through the lens of ethics, law and management studies, including business ethics, corporate philanthropy, corporate citizenship, stakeholder management, corporate social performance, business and human rights and many more. However, in the literature and practice the most dominant concepts are corporate social responsibility (CSR) and corporate sustainability (CS) (Carroll & Shabana, 2010). According to Maignan and Ralston (2002), many businesses have implemented a CSR or CS policy or made explicit CSR or CS statements.

Regarding CSR, Carroll (1979), who defines CSR as "the economic, legal, ethical, and discretionary expectations that society has of organisations at a given point in time," (p. 500) provided the most well-known definition of CSR. Other definitions emphasize CSR's five dimensions, which are stakeholders, the environment, society, economy and voluntariness (Dahlsrud, 2008). According to Garriga and Melé (2004), CSR can be conceptually linked to four theories: instrumental, political, integrative, and ethical. Firstly, CSR when understood instrumentally is about a company's responsibility for wealth creation, where economic objectives are achieved through social activities (e.g. Friedman & Friedman, as cited in Garriga & Melé, 2004). Secondly, CSR can be understood as a responsibility in the political arena relating to a company's political power and relationship with society (political theories) (e.g. Matten & Crane, 2005; Scherer, Rasche, Palazzo, & Spicer, 2016; Scherer, 2018). Thirdly, a company's responsibility focuses on the integration of social demands and operating according to social values (integrative theories) (e.g. Carroll, 1979; Wood, 1991). Finally, social responsibility can refer to the ethical obligation to achieve a good society, reflected in such approaches as universal rights and sustainable development. Regardless of the perception of a company's responsibility nature as either economic, political, integrative or ethical, CSR concerns two aspects; the relationship between business and the larger society, and a company's activities in the area of environmental and social issues (Andersen & Skjoett-Larsen, 2009).

According to Basu and Palazzo (2008), there are three main types of business approaches to studying CSR: (1) stakeholder-driven (pressure from external stakeholders); (2) performance-driven (effectiveness of CSR actions in terms of their purpose by the organization and their impact on the outside world); and (3) motivation-driven (reasons for which organizations engage in CSR). As indicated by

the authors, CSR can be defined as “the process by which managers within an organisation think about, and discuss, their relationship with stakeholders as well as their roles in relation to the common good, along with the behavioural dispositions with respect to the fulfilment and achievement of those roles and relationships” (Basu & Palazzo, 2008). It is worth noting that CSR is a dynamic concept, which has evolved over decades (Visser, 2011; Trapp, 2012; Latapí Agudelo, Jóhannsdóttir & Davídsdóttir, 2019). Porter and Kramer (2011) urge companies to take a lead in bringing businesses and society back together, reconnecting company success with social progress. Porter and Kramer (2011) argue for shared value creation as a necessary step in the evolution of business defined as:

Policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates. Shared value creation focuses on identifying and expanding the connections between societal and economic progress (p. 66).

As emphasised by Trapp (2012), recently CSR makes “an effort to include complex, global issues in a corporate CSR profile”, including poverty alleviation and access to clean water. She points out new roles and responsibilities that companies are taking to generate shared value. In this line, Visser (2011), argues that CSR is shifting to a new era of CSR that he calls ‘CSR 2.0’ or ‘Corporate Sustainability and Responsibility’, where companies “collaboratively find innovative ways tackle our global challenges and be rewarded in the marketplace as a result” (Visser, 2011, p. 9). CSR is moving from a marketing tool to a holistic and “strategic framework with the objective of creating shared value” (Chandler, as cited in Latapí Agudelo, Jóhannsdóttir & Davídsdóttir, 2019).

A second well-known term in the context of responsible business is corporate sustainability (CS). CS derives from the concept of sustainable development defined in the Brundtland Report as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN General Assembly, 1987, para. IV). According to Montiel, Delgado-Ceballos, Ortiz-de-Mandojana, and Antolin-Lopez (2008), there are two ways that CS is typically defined: either as solely focusing on the environmental aspect of business, or in a broader meaning that incorporates environmental, economic, and social dimensions. CS and CSR are closely related, however, the distinction is not apparent. Thus some authors use both constructs interchangeably, others emphasise their distinct nature (Bansal & Song, 2017). For instance, for Voeglin, Scherer, Stahl and Hawn (2022) ‘sustainability’ is “the system-level goal of preserving society and protecting the

environment for the benefit of future generations” (p. 4), and ‘CSR’ refers to business practices designed to achieve this goal.

Though there are many ways to conceptualise CSR and CS, in general they refer to responsibility, thus the duties and obligations or the driving forces and opportunities that companies have to contribute to society and the environment (Gurzawska et al., 2015; Gurzawska, 2021). Due to the fact that social responsibility and sustainability may go hand in hand with economic progress and create "shared value" (Porter & Kramer, 2011), there has been an increase in interest in the business case for CSR and CS during the past 20 years (Carroll & Shabana, 2010). Economic benefits provided by CSR, such as improved market, financial, and business access; improved intangible assets, reputation, and community relations; and decreased risk of regulatory sanctions, may encourage businesses to make structural changes, such as implementing novel procedures and advancing their technology (Gugler & Chi, 2009). As a result, the perception and scope of business responsibility have also evolved from purely altruistic actions to what is known as strategic CSR, where a company's responsibility and sustainability are integrated into the core of the business model and central to value creation (Chandler, as cited in Crane, Palazzo, Spence, & Matten, 2014; Lantos, 2001; Baron, 2001). They derive from organisational sensemaking and dwell as an intrinsic part of a company's character (Basu & Palazzo, 2008).

1.2 Responsibility in the context of innovation

1.2.1 Innovation

Responsibility in the context of innovation refers to responsibility for scientific and technological advancements. The concept of innovation is multi-dimensional. Various definitions of innovation exist, however, generally innovation is deeply rooted in the socio-economic theory and definition of innovation proposed by the economist Joseph Schumpeter (1883-1950) (Jarmai, Tharani & Nwafor, 2020). According to Schumpeter, anyone seeking profits must innovate because innovation is considered an essential driver of competitiveness and economic dynamics (Śledzik, 2013). Schumpeter also popularised the concept of ‘creative destruction’ according to which innovation causes a free market economy to evolve leading to greater economic efficiency, where existing economic activity is destroyed by “innovations that create new ways of producing goods or services or entirely new industries” (OECD, 2018, p. 45).

According to the OECD report, we may distinguish between four types of innovation that cover a broad variety of business activity: product innovations, process innovations, organisational innovations and marketing innovations (OECD, 2005). Innovation may have a technological nature, such as product and process, and non-technological, such as organisational and marketing innovation (Geldes, Felzensztein & Palacios-Fenech, 2017; Garcia Alvarez-Coque, Mas-Verdú, & Roig-Tierno, 2017). This research focuses on technological innovation. As stated in the OECD report a technological product and process innovation are defined as follows:

A technological product innovation is the implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these (p. 9).

A more recent definition of innovation by OECD (2018) is simplified and distinguishes between two types of innovation, namely product innovation and business process innovation (or their combination), that are significantly different from prior products (goods or services) or processes. It is also crucial to emphasise that “innovation is more than a new idea or an invention” (OECD, 2018, p. 44); it also demands implementation, either by active use or by making the innovation available to other parties, businesses, people, or organisations (OECD, 2018).

The key aspect of innovation is that it is an integrated process with numerous steps rather than a single action, concept, or creation of a new device (Conway & Steward, 2009; Trott, 2008). Innovation comes from many different sources and is influenced by a wide range of factors, such as new laws, technical standards, cooperative partners, and prospective financing possibilities (Dodgson, Gann, & Phillips, 2013). Generally, we can distinguish two main sources of innovation: market pull and technology push (Bennett & Cooper, 1981). Consumer needs and the exploration of untapped markets or a neglected area of an existing market are the sources of market-pulled innovation (Baker, 2014; Whittington, 2001), whereas scientists and engineers are the sources of technology-push innovation, which results in new scientific discoveries or the development of new technologies (Bennett & Cooper, 1981).

Innovation occurs in all sectors, including private, public, non-profit organisations, and households and individuals for instance through the Internet, 3-D printing and crowdfunding platforms. However, this study focuses on innovation in the business sector as the main driving force of innovation. In the business context, innovation is

crucial for a company's long-term survival and profitability since it allows a company to respond to the dynamically shifting consumer demands (Hauser, Tellis, & Griffin, 2006). Therefore, more than half of the companies in the EU report innovation activity (Eurostat, 2021b). While innovation can result in commercial and financial success (Fassin, 2000), policymakers, academics, and the general public are now more aware of the need for innovation to be carried out responsibly and ethically and to produce sustainable results. Among the most frequently mentioned developments in the business setting that reflect this transformation are the ideas of sustainable innovation, environmental innovation, eco-innovation, open innovation, and social innovation.

1.2.2 Responsible Innovation

Policy-makers and academics have introduced the concept of responsible research and innovation (RRI) to encourage research and innovation that is ethically acceptable and socially desirable, where the science outcomes are aligned with the needs and values of the society (Sutcliffe, 2011; European Commission, 2012; von Schomberg, 2013; Stilgoe, Owen & Macnaghten, 2013). The goal is “to encourage societal actors to work together during the whole R&I process to better align R&I and its outcomes with the values, needs and expectations of society” (European Commission, 2020b, p. 18). According to Grunwald (2011), RRI is rooted in applied ethics, technology assessment (TA) and science, technology and society studies (STS) research, and brings them together into “integrative approaches to shaping technology and innovation” (p. 9). Furthermore, as indicated by van den Hoven (2022), RRI combines the social sciences, engineering and applied sciences, and the humanities in a comprehensive, coherent, and consilient manner to accommodate study on the ethical, legal, and social dimensions of technology (van den Hoven, 2022).

From the policy-making perspective, RRI has been particularly used by the European Commission (EC) to denote part of its R&I strategy aiming to induce a system enhancing ethical, responsible and sustainable R&I for publicly funded research. It can be dated back to the EC's White Paper on governance (European Commission, 2001) which expressed a desire to strengthen ties between democratic institutions and European citizens (Owen, von Schomberg & Macnaghten, 2021). As explained by Owen et. al (2021), the EC's focus on RRI has emerged as a result of various factors, including (1) the emergence of techno-scientific fields with great economic and social potential and equally great uncertainties, such as nanoscience and nanotechnology (Shelley-Egan, Bowman, & Robinson, 2018; Rip, 2014),

synthetic biology, geoen지니어ing (Sutcliffe, 2011) and information and communication technology (ICT), especially artificial intelligence (AI); (2) increasing societal distrust towards politics and institutions (including scientific institutions). According to Owen et al. (2021), this inspired people to stress the significance of values in technological design and innovation (van den Hoven, 2013; Brey, 2012); democratise research by involving the public in deliberations (Wilsdon & Willis 2004), enhancing the social sciences' influence on technological governance (Macnaghten, Kearnes, & Wynne, 2005), and lastly, redefine the role responsibilities of scientists (Douglas, 2003). Officially embedded in the *Rome Declaration on Responsible Research and Innovation in Europe* (European Commission, 2014), RRI is compatible with the EC's objective to "better engage society in research and innovation processes, enabling easier access to scientific results, favouring better uptake of the gender and ethics dimensions in research and innovation content, and spreading good practices in formal and informal science education" (European Commission, 2020b, p. 18). RRI was particularly embodied by the EU R&I funding programme, such as the Science With and For Society programme (SwafS) in the Horizon2020 (H2020) framework programme (European Commission 2020b). Since the Rome Declaration, the EC has funded 47 RRI projects,¹ including projects currently running and which have already concluded (TeRRItoria, 2020). EU-funded RRI projects (e.g. RRI in nanotechnology, <http://www.nano2all.eu/>; RRI in marine and maritime, GRIPP, <https://gripp.eu/>), have encouraged more stakeholder participation, improved ethical consideration, improved foresight of social and environmental implications of R&I, and improved consideration of other societal concerns including gender in R&I and open science (Gauttier, Søraker, Arora, Brey, & Mäkinen, 2017). It is crucial to emphasise that RRI was initially developed for publicly funded research, and later projects focused on RI in the industry (e.g. Responsible Industry, PRISMA, COMPASS), however, the impact of RRI on business is relatively low and the integration of RI in business is still in its infancy (Van de Poel et al., 2017; Ribeiro et al., 2018). Thus, questions arise about the future directions of RRI, the mainstreaming of RRI, citizen science, co-creation, and public engagement (European Commission, 2020b; van den Hoven, 2022). The research presented in this thesis also received funding from the EC and therefore draws on lessons learnt and the author's experiences in two EU-funded projects related to RRI, namely SATORI (Stakeholders Acting Together on the ethical impact assessment of Research and

¹ By the end of H2020, excluding Horizon Europe (HE).

Innovation) under grant agreement No. 612231 (<http://satoriproject.eu/the-project>), and Responsible Industry (Responsible Research and Innovation in Business and Industry in the Domain of ICT for, Health, Demographic Change and Wellbeing) under grant agreement No. 609817 (<http://www.responsible-industry.eu>).

RRI has been introduced by the EC through the Directorate-General for Research and Innovation (2013) in their Report of the Expert Group on the State of Art of Responsible Research and Innovation, defined as:

Responsible Research and Innovation refers to the comprehensive approach of proceeding in research and innovation in ways that allow all stakeholders that are involved in the processes of research and innovation at an early stage (A) to obtain relevant knowledge on the consequences of the outcomes of their actions and on the range of options open to them and (B) to effectively evaluate both outcomes and options in terms of societal needs and moral values and (C) to use these considerations (under A and B) as functional requirements for design and development of new research, products and services. The RRI approach has to be a key part of the research and innovation process and should be established as a collective, inclusive and system-wide approach (p. 55–56).

As argued by van den Hoven (2022), the aim was to introduce “a comprehensive, coherent and consilient program” (p. 134) in order to “achieve consilience and collaboration of scholars and civil society around the hard and very complex societal challenges that require explicit moral choices and moral justifications given reasonable disagreement, multiple values and perspectives of direct and indirect stakeholders” (p. 135). According to the official EU policy interpretation of RRI (European Commission, 2012), RRI has six dimensions or ‘pillars’, i.e. RRI is research and innovation that: (1) incorporates public engagement and participation of societal actors in research; (2) incorporates ethical principles so as to ensure the compatibility of research and innovation processes with fundamental values; (3) promotes science literacy and science education; (4) promotes gender equality; (5) promotes open access to scientific knowledge; and (6) is guided by transparent, accountable, and coherent multi-stakeholder governance (European Commission, 2012). RRI is deeply rooted in “the principles on which the EU is founded, i.e. the respect of human dignity, freedom, democracy, equality, the rule of law and the respect of human rights, including the rights of persons belonging to minorities” (European Commission, 2014, p. 1). It is also worth noting, that research on RRI shows that not only Europe but each region of the world is advancing its agendas relating to socially responsible R&I (RRING, 2021). Studies show strong levels of support for the principles underpinning RRI (as defined in the European context) at the global level, as well as other terms for

referring to social responsibility in R&I, however, the specific way this translates into practice varies dramatically (RRING, 2021).

From the academic perspective, the two most cited definitions of RRI are provided by René von Schomberg (2013) and Stilgoe, Owen, & Macnaghten (2013). Von Schomberg defines RRI as:

A transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society) (p. 19).

Von Schomberg also emphasises the significance of the stakeholders' role in the RRI process, and thus RRI "should be understood as a strategy of stakeholders to become mutually responsive to each other, anticipating research and innovation outcomes aimed at the 'grand challenges' of our time, for which they share responsibility" (von Schomberg, 2013). Stilgoe et al. (2013) definition of responsible innovation is anchored in democratisation and good governance of science and innovation. In their perception, RI means "taking care of the future through collective stewardship of science and innovation in the present" (p. 1570). Their framework for RI involves four integrated dimensions of RI, namely anticipation, reflexivity, inclusion and responsiveness. Although von Schomberg's (2013) and Stilgoe's et al. (2013) definitions of RRI are the most well-known, there are a variety of definitions of RRI, and the concept of RRI is also operationalised in various ways (Burget, Bardone, & Pedaste, 2017). There are two types of RRI dimensions: those that tend to reoccur in diverse interpretations of the concept and those that are more distinctive.

The academic literature on RRI is less concerned with the particular policy objectives indicated in the EU definition and more concerned with characteristics of R&I that are thought to make it more responsible. Among the frequently mentioned traits are responsiveness (the ability to modify practices, and systems to adapt to changing circumstances and new insights), anticipation (early assessment of benefits and risks in R&I so that informed decisions can be made), reflexivity (reflecting on values and beliefs during R&I), and inclusion (also known as engagement or involvement of society) (Stilgoe, Owen, & Macnaghten, 2013; Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014). These characteristics can be included under the engagement, ethics, and governance dimensions in particular since they seem to be congruent with the EU definition. Owen et al. (2012) identify three distinct features of the RRI discourse, namely (1) an emphasis on the demographic governance focused around the impacts of science labelled as 'science for society', (2) a focus on

responsiveness of R&I to society through integrating reflection, anticipation, and inclusive deliberation in the R&I process ('science with society'), and (3) reformulation of responsibility in the context of innovation to a social ascription, which is future-oriented, uncertain, complex and requires collective endeavour (Owen et al. 2012, p. 757). In this research, I mainly draw from the most influential and to some extent converging conceptions of RRI, namely the EU's conception of RRI, von Schomberg (2013) and Stilgoe et al. (2013), nevertheless, I also appreciate and support many other academic conceptions of RRI (see e.g. Burget, Bardone, & Pedaste, 2017).

Despite the enormous popularity of the RRI concept among (particularly European) policy-makers and academics, studies suggest that so far companies generally do not recognise the RRI concept (Gurzawska et. al, 2015; Lubberink, Blok, van Ophem & Omta, 2017; Stahl et al., 2017). However, this does not necessarily imply that businesses innovate irresponsibly. The application of RRI in the corporate setting faces a variety of problems. RRI is being developed by many funding bodies and science policy makers (e.g., European Commission) and academia (Zwart, Landeweerd & van Rooij, 2014; Burget, Bardone, & Pedaste, 2017). However, Lubberink et al. (2017) contend that commercially driven innovation focuses on the economic impact, so the interests of academic researchers and policy-makers may differ from those of innovators in the business context. Some aspects of RRI such as the promotion of science literacy or open access to scientific knowledge and research results may have goals that are at odds with those of the industry (Søraker & Brey, 2014; Gurzawska, Mäkinen, & Brey, 2017). Even more of a challenge is the question of companies' motivation for engaging in RRI (Blok, Hoffmans, & Wubben, 2015; Scholten & Blok, 2015). The discussion around the implementation of RRI in the business context has started connecting RRI with the more widely known concepts of CSR and CS. As a result, in the business context specifically, the simpler term 'responsible innovation' (RI) is often used interchangeably with the abbreviation 'RRI' (Jarmai, 2020); and this is the term that I refer to in this thesis. A growing body of literature provides insights about the implementation of RI in business, including RI principles (Iatridis & Schroeder, 2016); as well as incentives, drivers and barriers of RI (Chatfield, Borsella, Mantovani, Porcari, & Stahl, 2017; Gurzawska et al., 2017; Auer & Jarmai, 2018).

Besides RRI, there are alternative conceptions for RI that may be used in business that include responsibility and ethics, such as value-sensitive design that accounts for human values in a principled and systematic manner throughout the design process (e.g. Friedman, Kahn, & Borning, 2002; Friedman, Hendry, & Borning, 2017), user-

centred design focused on a process of design where end-users influence how a design takes shape (e.g. Kling, 1977; Norman & Draper, 1986), universal design and design for all advocating for designing environment, everyday objects, services, culture and information considering human diversity, social inclusion and equality (e.g. European Institute for Design and Disability, 2004) privacy by design according to which privacy must be integrated in a holistic way into technologies, operations, and information architectures (e.g. Cavoukian, 2009, 2012). Furthermore, we have seen a growth in literature and cross-sectoral interactions over the past 20 years, intentionally incorporating societal and environmental objectives into innovation. As a result, there are several RI-related concepts that address various aspects of responsibility in the context of innovation (Ribeiro, Smith, & Millar, 2017). The most often discussed and used types of innovation by businesses are social, environmental, ecological, and eco-innovation. Social innovation focuses on addressing pressing social needs and improving human and environmental well-being (Choi and Majumdar, 2014). Environmental, ecological and eco-innovation emphasise the importance of the reduction of environmental impact (OECD, 2009). In terms of sustainable innovation, according to Adams, Jeanrenaud, Bessant, Denyer, and Overy (2016), there are many different conceptualisations of sustainable innovation as well as a variety of labels that are applied to it, such as CSR, green, eco- or ecological innovation, or social environmental management. However, in the context of business, Adams et al. (2016) define it as “making intentional changes to an organization's philosophy and values, as well as to its products, processes or practices to serve the specific purpose of creating and realising social and environmental value in addition to economic returns” (p. 181).

Despite this variety of RI-related concepts, we lack a systematic knowledge and understanding of responsible innovation in business, from a normative and procedural perspective. For the purposes of this research, I derive from the fields of RRI, business ethics, CS and CSR. Regarding RRI, I mainly draw from the most influential and converging conceptions of RRI, namely the EU's conception of RRI, von Schomberg (2013) and Stilgoe et al. (2013). These three conceptions provide a comprehensive, coherent and consilient normative framework bringing together rich and diverse but also scattered work on the ethical, legal and societal aspects of technology combining the social sciences in a very broad sense, the engineering and applied sciences, and the humanities (van den Hoven, 2022). I use those conceptions of RRI, predominantly developed for publicly funded research, however, I do not critically apply them but rather investigate what conception is needed for RI in business from a normative and procedural perspective. For industry, the EU's conception may be more

straightforward to incorporate, particularly the elements of assessment of potential consequences of innovation and functional requirements for the design and development of new research, products and services. Von Schomberg's (2013) focus on stakeholder engagement in the RRI process and shared responsibility for addressing grand challenges seems to be in line with the newest developments in business responsibility, specifically shared value and strategic CSR. While Stilgoe's et al. (2013) dimensions of RI may seem abstract to the industry, they resonate with some of the strategic concepts in business management such as strategic management. To address specificities of the industry sector, I also use conceptions of business responsibility (CSR, CS etc.) to build on already existing approaches to business responsibility avoiding "re-inventing the wheel", however, I enrich them with the innovation context.

Although there are differences in the concepts and definitions used to describe corporate responsibility, this research uses the term 'responsible innovation in business' as an umbrella term for any innovation centred around various forms of business responsibility for their innovation activity, including sustainability, societal, ethical, human rights and environmental aspects. This responsibility involves both the outcomes of innovation as well as its process. As this study utilises it, RI is a strategic concept that imposes several demands on how R&I is organised (Arnaldi, Gorgoni, & Pariotti, 2016). A stronger understanding of scattered and often overlapping terminology can ultimately advance the integration of different disciplines. Therefore, for the purposes of this research, responsible innovation encompasses relevant elements of RRI, CSR, CS, social innovation, environmental and eco-innovation, sustainable innovation, by-design approaches and other RI-related concepts that centre around various forms of responsibility in the context of business.

1.3. Research and methodological approach

1.3.1 Research objectives and research questions

The topic of the researcher presented in this thesis is responsible innovation (RI) in business. Companies are the main contributors and developers of technological innovation, generating an enormous impact on people's lives. While the concept of RI aims to support the development of technologies that are ethically acceptable and socially desirable, there is a relatively low recognition of this concept among companies, as well as a lack of clarity of how well-established business responsibility

practices of companies, such as CSR and CS, relate to the innovation context. The research objective is to develop a strategic approach to the problem of the responsibility of companies for their technological innovation.

The research question is:

What would be a theoretically sound conception and a viable strategy for responsible innovation in business that bridges existing approaches of CSR, CS and RI?

This question is answered in a series of steps. As stated, the main challenge taken on in this dissertation is the problem of a lack of responsibility of companies for their technological innovation, which can be placed in the context of the ongoing discussions around the nature of responsibility of companies towards society and the environment. A proliferation of new concepts in addition to a myriad of already existing ones, ambiguous definitions and constructs may prevent companies from identifying their responsibility for their technological innovation, translating and implementing RI goals for their companies. For this reason, it is crucial to understand how RI in business is defined.

The first sub-questions is therefore:

(Q1) What are the different RI conceptions and approaches in the business context proposed by academics or used by companies?

To answer this question, I analyse which different responsibility concepts and approaches are distinguished in the business ethics and innovation management literature and to what extent they are convergent or different from the policy-making and academic understanding of RI. In addition to a theoretical perspective, when aiming for successful uptake and integration of RI in the industry the empirical perspective and actual practices of companies are key elements of the analysis. Therefore, this research builds its constructive element on the empirical realm. If there is a relation between the responsibility of companies towards society and the environment and the responsibility of companies for their technological innovation, it is crucial to understand to what extent the concept of RI has been mainstreamed in the business world or whether it is a marginal to companies concept artificially and temporarily promoted particularly by the European policy-makers however broadly unknown among companies.

The next step is to look for, and further develop, an understanding of what constitutes responsible innovation in business. RI intends to facilitate the social shaping of innovation and emphasises that innovation should be assessed and evaluated with the goal of influencing innovation processes to make them more responsible, ethical and sustainable. Successful implementation of RI requires anticipating potential ethical, societal and environmental opportunities and challenges, as well as envisioning the impacts of the innovation process and outcomes. Evaluation and control are an inevitable element of companies' strategies together with planning and implementation (White & Bruton, 2010), however, we need to consider whether to what extent and how companies assess their innovation processes and outcomes aiming at enhancing responsibility. Therefore, the second subsection is as follows:

(Q2) How do companies evaluate their innovation practices by considering responsibility, ethics and sustainability?

This research aims to contribute to a solution to the problem of the responsibility of companies for their technological innovation. The aim involves both a justificatory and constructive element. Regarding the justification element, the question is not why companies should be responsible for their technological innovations (which has been extensively investigated in the literature, e.g. Pettit, 2007), but we need to understand the business logic as to why companies would innovate in a responsible, ethical and sustainable way. In this thesis, I explore the motivation of companies to engage in RI. This yields the following sub-question:

(Q3) What are the most effective ways to incentivise companies to innovate in a responsible, ethical and sustainable way?

Heading towards the implementation of RI in business, it is crucial to investigate how and where RI should be placed in the business functions, and how it is related to other business activities such as innovation management, CSR and CS, as well as strategy. Consequently, to ensure a successful implementation of RI in business, we need a model that would indicate steps and areas of RI integration in the business operations and functions. Thus, the next research sub-question is:

(Q4) How can companies integrate RI into their business functions and operations?

Companies operate in and interact with, society and the environment and serve customers in one or more countries, enjoying the perks of globalization through e.g. their supply chains. RI in business is inherently tied to responsible supply chains and sustainable supply chains, which require technological, political and ethical solutions involving the development of sound, multi-stakeholder business and governance models. Therefore, the fourth sub-question emerges:

(Q5) How could RI be integrated into companies' global operations?

The thesis is organised as follows. Following the introductory chapter. Chapters 2-6 are dedicated to the five sub-questions respectively. In Chapter 7, I return to the research objective and questions and reflect on the research methodology. Conclusions concerning the outcomes are formulated, as well as recommendations for researchers, businesses, innovation managers and CSR and CS officers in RI practice and points for further research.

1.3.2 Methodological approach

This research is multidisciplinary and applied in nature. The concept of RI in the business context spans several scientific disciplines and overlaps conceptually with various other concepts (e.g. Stahl, 2013; Lubberink et. al., 2017; Gonzales-Gemio et al., 2020; Gurzawska, 2020). As discussed in Section 1.2, RI derives from applied ethics, technology assessment (TA) and science, technology and society studies (STS) research (Grunwald, 2011). At least two of those, TA and STS are themselves multidisciplinary fields. I connect this concept with business responsibility and sustainability towards society and the environment through well-established concepts of CSR and CS and extensive research in this area spanning various theories and disciplines, such as business management, business ethics, law and human rights. In addition, this research has been linked to the topics, scope and methodological approaches of two EU-funded projects, discussed in Section 1.2, where I was part of multidisciplinary teams with different skills and backgrounds. To capture the complexity of the conception of RI in the business context, this thesis draws from certain multidisciplinary research such as RRI, business ethics, law and human rights, innovation management, applied ethics and research ethics. By taking a

multidisciplinary and applied approach, which is a progressive scholarly method, I bring different disciplines and diverse perspectives to illustrate and address the current and real problem of the responsibility of companies for their technological innovations, with a prioritised focus on solving it.

Furthermore, this research takes an exploratory approach, because research on the intersection of CSR, CS and RI is relatively new and so far there has not been much research on this topic. As part of the exploratory element, this thesis combines an investigation of the theoretical account of business responsibility and innovation and the relationship between the two, as well as an empirical investigation of the current perceptions and practices of RI among companies based on qualitative and quantitative methods.

Regarding the theoretical aspects, to develop a theoretically sound conception of RI in business it is crucial to investigate current conceptions of RI and to what extent they translate to the business context. Therefore, this research investigates two notions, i.e. the relatively new notion of responsibility for technological innovation and business responsibility that goes beyond immediate shareholders and making profits which has a long history and has been extensively researched and practised by companies. Accordingly, such a conception requires bridging existing approaches of CSR, CS and RI. To achieve this I examine the current state of the art of knowledge by reviewing literature in relevant disciplines, literature streams and journals, as this research aims to create a general model that utilises existing theories related to RI and its effects on business processes. To that end, I consulted literature using desk research combined with conceptual analysis.

Regarding the empirical aspect, this research addresses a real problem of the responsibility of companies for their technological innovation and, therefore, requires cross-checking the theoretical conceptions of RI with its actual application and implementation in the business context. Consequently, the empirical data in this research is indispensable for this research because RI steps into a well-developed area of business responsibility and commonly practised concepts, policies and approaches to CSR and CS. To ensure buy-in of RI in business and co-ownership of RI strategies, a viable strategy for RI in business should acknowledge and build on the current perceptions and practices of business in relation to RI, as well as perceived benefits and challenges. To gain a holistic view of the current perceptions and practices of RI, the methodology to retrieve empirical data uses various methods including interviews (with experts and practitioners across industry sectors, types of companies and a

company's functions), stakeholder dialogue and a workshop, the Delphi method, and case study.

Due to the methodological variety, most chapters have their own method section while the background and motivation for the overarching approach is explained above. Therefore, to expand the overall methodological approach of this thesis, a detailed methodological approach per chapter is further discussed in section 1.4.

1.4 Detailed outline of the thesis and methodological approach per chapter

The body of research presented in this thesis is made up of five chapters, which originally appeared or were submitted for publication as separate and independent papers.

To clarify the focus and objectives in each chapter and its contribution to the main line of argument, the consecutive chapters are summarised in the remainder of this section.

Chapter 2: Mainstreaming responsible innovation in business: A comparative analysis

Chapter 2 responds to sub-question 1 (Q1) regarding the different responsible innovation conceptions and approaches in the business context proposed by academics and used by companies. In this Chapter, I analyse the relationship between business responsibility and RI. Through a systematic literature review based on the PRISMA method (Page et. al, 2021) supported by additional materials, especially for the purposes of the thematic analysis of the data (Braun & Clarke, 2006), I explore which different responsibility concepts and approaches are distinguished in the business ethics (BE) and innovation management (IM) literature, and to what extent they are convergent or different from the policy-making and academic understanding of RI.

While various existing studies provide comprehensive state-of-the-art literature reviews on responsible innovation, including RI in the business context, this study takes a unique approach to summarise the state of knowledge on the relationship between a company's responsibility and innovation. It focuses on the integration of RI in the mainstream research on business responsibility and innovation, namely BE and IM have integrated the concept of RI and how they perceive RI. Based on the findings I propose an agenda for future research.

Chapter 3: Responsible Innovation in Business: Perceptions, Evaluation Practices and Lessons Learnt

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Chapter 3 addresses two sub-questions, namely Q1 regarding the conceptions and approaches in the business context used by companies; and Q2 about companies' evaluation practices of their innovation practices. This study contributes to knowledge about the implementation of responsible innovation in the business context by combining insights from CSR and CS, ethics and innovation management of new and emerging technologies. This empirical study is based on twenty-four interviews with companies and business experts conducted to understand how principles and practices of RI and evaluation of innovation vary for companies. The interviews illustrate companies' perceptions of RI, its role in their strategies and practices, and evaluation and control approaches and methods. In this chapter I investigate, first, how companies perceive and integrate the RI concept; and second, how companies evaluate their innovation practices by considering responsibility, ethics and sustainability.

Using the result of the study, I show that RI is perceived as part of a broader CSR and CS framework. This study indicates that three challenges need to be overcome to ensure the effective application of responsible innovation in the business context. First, the definitions of CSR, CS and RRI and the relationship between these concepts should be clarified. Second, established indicators of RI in the business context could help in overcoming the conceptual confusion and operationalising and measuring responsibility (societal, ethical, environmental etc.). Third, there is a need for methods that would help tech companies incorporate ethics, particularly for new and emerging technologies. Such methods could include ethical technology assessment (eTA), ethical impact assessment (eIA), anticipatory technology ethics (ATE), value-sensitive design (VSD), privacy for design, socially responsible design (SRD), eco-design, ethics by design etc.

Consequently, this chapter determines the extent to which similarities and differences exist in the use of frameworks and procedures by companies. I discuss the theoretical and practical implications of discrepancies in definitions of responsibility, sustainability and ethics, the language used, and differences between large corporations and SMEs. As a result, this chapter proposes new approaches to managing RI in the business context strategically and responsibly.

Chapter 4: Implementation of Responsible Research and Innovation (RRI) Practices in Industry: Providing the Right Incentives

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In Chapter 4, I address sub-question 3 (Q3) and investigate how the industry can be incentivised to engage in research and innovation following the approach of RI. In this Chapter, I propose a matrix of incentives that can be used to motivate and stimulate the adoption of RI in industry. The matrix is based on two layers of the analysis: incentives for the uptake of RI by industry and factors that can affect this process. The incentives are categorised into three categories: (1) external and internal stakeholder incentives; (2) instrumental and non-instrumental incentives; and (3) direct and indirect incentives, hence financial or non-financial incentives. To ensure the effective implementation of RI, I outline factors that can affect the successful incentives of RI in the industry. Moreover, this Chapter acknowledges the diversity of companies and therefore the matrix eschews the approach of 'one size fits all'.

This Chapter includes empirical investigations, literature review and synthesis, and the development of conceptual tools. To verify the effectiveness of RI incentives, we need a systematic method that incorporates an understanding of the nature of incentives and a system for characterising incentives. I developed a conceptual tool for categorising and analysing incentives: an incentives matrix. The system of characterising incentives that I developed assists me in organising, analysing and synthesising data. It also allows for the characterisations of conditions in which different types of incentives are likely to be effective. This study also uses system dynamics to produce a causal loop diagram (CLD) to visualise the main causal relationships concerning the adoption of RI in industry.

The definition of RI and empirical studies, in the form of discussions, interviews and workshops with Responsible Industry project partners, informed the guidelines for the literature review. To map a variety of potentially effective incentives, the paper derives from the results of the Responsible Industry (RI) Project. The Project used empirical studies, such as stakeholder dialogue, the Delphi method and a survey, to identify incentives that are typically effective.

Chapter 5: Strategic Responsible Innovation Management (StRIM) – A New Approach to Responsible Corporate Innovation Through Strategic CSR

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This Chapter addresses sub-question 4 (Q4) and provides a conceptual proposal for integrating RI into companies’ business functions and operations.

Surprisingly, we do not have a strategic and generic business model connecting innovation and CSR, through which innovation practices can create business value, and, positive societal and environmental change. The disconnectedness of these two aspects of corporate activities may lead to missed business opportunities, avoidable financial losses for a company in the long run, as well as negative economic, societal and environmental impacts. Therefore, the challenge is to innovate responsibly. An effective strategic approach to responsible corporate innovation would have sustainable outcomes for both business and society. Through this conceptual research, I argue that intertwining innovation and CSR may bring opportunities for both business and society. To bring sustainable economic, societal and environmental outcomes, companies should have a strategic approach to innovation and CSR management. An effective strategic approach to responsible corporate innovation would have sustainable outcomes for both business and society.

A specific contribution of this Chapter was to develop a better account of how companies may create economic and social value through integrating responsible innovation in their strategies. This study explains how the link between innovation and CSR may assist in improving a company’s competitiveness, value creation and stakeholder management. In this Chapter, I connect innovation and CSR and provide recommendations for ways, in which companies can develop strategies for responsible corporate innovation management. By identifying the key analytical factors (innovation management, responsible innovation, strategic CSR, CSR-driven innovation and innovation-driven CSR, multi-stakeholder approach) it is possible to recognise several strands or connections that help frame an understanding of the relationship between innovation and CSR. Both innovation and CSR should be perceived as strategic tools and goals.

I argue that the concept of CSR enriches the innovation process by emphasising the interdependence of business and society. At the same time, CSR activities are tightly linked to innovation functions that might ensure a competitive advantage and

therefore be more profitable than those oriented toward public relations, marketing and human resource management. I propose a new approach, called strategic responsible innovation management (StRIM), that is intertwined with companies' social responsibility. This approach is intended to redefine companies' perceptions of a 'successful innovation' by shifting the focus from a company's financial success to sustainable outcomes, for both business and society. A strategy is unique for an organisation, therefore, StRIM can help to develop strategies best suited to the company's continuous success. In this way, responsible innovation will create and generate revenue, not just minimise costs and risks. The conceptual framework developed in this Chapter may support companies to reflect on their relations with other parts of society. The conceptual framework serves as a first attempt to arrange patterns of organisational behaviour in responsible innovation strategising.

Chapter 6: Towards Responsible and Sustainable Supply Chains: Innovation, Multi-stakeholder Approach and Governance

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In this Chapter, I do not explicitly address the topic of RI in the industry but discuss the use of RI as part of a global activity of companies, namely supply chains. This Chapter addresses sub-question 5 (Q5) and examines how RI can be integrated into companies' global operations. Supply chains create a societal and environmental burden. Drastic actions are required to mitigate these effects. Supply chains should become responsible and sustainable (where responsibility and sustainability are understood in a broad sense) addressing economic, political, societal, legal, human rights, ethical and environmental concerns. This research shifts from the question of why companies should implement responsibility and sustainability into supply chains, to how they should do so effectively. This Chapter proposes three solutions for responsible and sustainable supply chain management (SCM). Firstly, supply chains have to be supported by R&I. Secondly, supply chains should be based on multi-stakeholder efforts of industry, governmental and non-governmental organisations. Thirdly, the responsibility should lie not only with an individual company and its employees but also with organisations of companies (supra-agency). As a result, responsible and sustainable supply chains require technological, political and ethical solutions involving the development of sound, multi-stakeholder business and governance models. These models should be based on the equal consideration of all

three dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and the legitimate requirements of the stakeholders of a supply chain.

From the methodological perspective, this Chapter incorporates a literature review and synthesis, empirical investigations, and the development of a conceptual tool. A preliminary literature review was conducted to identify trends, challenges, ethical implications and recent developments in SCM. To identify potential solutions for responsible and sustainable SCM, the Chapter derives its findings from the literature review and the empirical studies about responsible and sustainable supply chains conducted for the purposes of the SATORI Project. Two empirical methods were used, namely a stakeholder dialogue and a case study. This research extends the objective of identifying potential solutions by providing empirical validation based on a case study of Sedex. The theoretical account combined with the stakeholder dialogue allowed the identification of three solutions for challenges to responsible and sustainable SCM that companies face in practice.

This Chapter offers a unique normative proposal for connecting technological, political and ethical solutions (innovation, a multi-stakeholder approach, a supra-agent responsibility and governance) as the inevitable interdependent solutions for responsible and sustainable SCM.

1.5 Conclusion

This Chapter aims to provide an overview of the research presented in this thesis, the problem statement, the theoretical framework, its objectives, research questions and the structure of this thesis. I begin by illustrating the problem of the responsibility of companies for their technological innovations, explaining the risks of responsibility vacuum, limited recognition and application of RI among companies. In addition to this, the lack of clarity about what companies are responsible for in terms of their technological innovation, why they should innovate in a responsible, sustainable and ethical way and how they should do it. To further define my research approach, I introduce the theoretical underpinnings of this research by explaining two relevant notions; first, business responsibility particularly in relation to the concepts of CSR and CS; second, responsibility in the context of innovation linked to the concept of RRI developed by the policy-makers and academics to encourage R&I that is ethically acceptable and socially desirable. Based on the problem statement and theoretical framework, I present the objective and overall research question of this thesis, i.e. to

bridge two currently disconnected discourses, namely business responsibility and RI, and develop a conception of RI for companies based on existing conceptions of CSR, CS and RI. Such conception should provide theoretical underpinnings as well as practical strategies for implementing RI in companies. To respond to this broad question, I define five sub-questions that will help in answering the overall research questions. I also present the overall methodological approach of this research, which is based on multidisciplinary, applied and problem-oriented research, drawing from certain multidisciplinary research such as RRI, business ethics, law and human rights, innovation management, applied ethics and research ethics. Lastly, I introduce and summarise the individual Chapters of this thesis, connecting them to the defined sub-questions and presenting the methodological approach per Chapter.

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2. Mainstreaming responsible innovation in business: a comparative systematic review of business ethics and innovation management literature

Abstract:

With the arrival of more disruptive technologies, it is important and urgent to have systemic solutions to integrate responsibility into the companies' technological innovation. While various existing studies provide comprehensive state-of-the-art literature reviews on responsible innovation (RI), this study takes a unique approach and focuses on (1) the integration of RI in mainstream research on business responsibility and innovation, and (2) proposes a future research agenda. Specifically, this paper addresses the question of to what extent two major bodies of literature, namely business ethics (BE) and innovation management (IM) have integrated the concept of RI and how they perceive it, whether they are convergent or rather different from the policy-making and academic conceptions. The results show that RI in business is not entirely unknown, however mainly focuses on the outcome of innovation with a relatively limited discussion about systematically organising the process of innovation in a responsible, ethical and sustainable way. Moreover, the analysis reveals three main themes across the BE and IM literature streams, namely (1) the benefits of RI; (2) the drivers of RI; and (3) the implementation of RI. Finally, this study proposes an agenda for future research to better understand the theoretical and practical perspectives of RI in business.

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2.1. Introduction

Multiple stakeholders are driving companies to incorporate responsibility, human rights, and ethical and social values into their activities and contribute to sustainable development goals (SDGs). Social and environmental challenges also raise the question of to what extent technological innovation provides ground-breaking solutions to address them. The discussion of business responsibility, ethics and sustainability and the role of companies being part of the solution on the one hand, and innovation management and ethics of technology on the other hand, is not new. The extensive literature on corporate social responsibility (CSR) and corporate sustainability addresses the question of the companies' duties and obligations or motivation and opportunities towards society and the environment. However, as such companies' responsibility and business innovation have not yet been meaningfully connected to so-called responsible innovation (RI). Therefore, a review is missing in the academic literature that portrays how companies perceive their responsibility for innovation activities and to what extent this responsibility has been integrated into mainstream research on business ethics (BE) and innovation management (IM). This lack of integration may lead to missed competitive opportunities, negative economic, societal and environmental impacts, and the vacuum of responsibility for technological innovations developed by industrial actors. With the arrival of more disruptive technologies, it is particularly important and urgent to have systemic solutions to integrate responsibility into the companies' technological innovation.

The recently emerged concept of 'responsible innovation' (RI) specifically argues for incorporating responsibility into innovation processes and outcomes. It is also promoted as "a strategy of stakeholders to become mutually responsive to each other and anticipate research and innovation outcomes underpinning the 'grand challenges' of our time for which they share responsibility" (von Schomberg, 2013). In the last decade RI has attracted much attention in the academic literature and policy-making, with examples including an academic journal devoted to RI (Journal of Responsible Innovation), working groups (such as the Responsible Innovation Special Interest Group of the ISPIIM Conference), and the European Commission's "Horizon 2020" program for science funding announced in 2013 with RI at its centre and 47 research projects focused around this concept (TeRRItoria, 2020), which generated dozens of RI-related publications. Discussions around RI have also triggered an ambition to connect RI with business responsibility. Since the business sector is a major actor in

developing and funding innovation,¹ the interest in RI in the business context is well-placed. Yet despite a growing interest in RI among (particularly European) policy-makers and academics, studies suggest that the integration of RI in business is still in its infancy (Van de Poel et al., 2017; Ribeiro et al., 2018) and thus it has a limited reach in the business world (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015; Lubberink, Blok, van Ophem & Omta, 2017; Stahl et al., 2017).

To understand what has already been investigated, several researchers have reviewed extant literature on RI. Several publications have appeared in recent years documenting systematic literature review studies related to the general concept and practices of RI (Burget, Bardone, & Pedaste, 2017; Ribeiro, Smith, & Millar, 2017; Thapa, Iakovleva & Foss, 2019; Schuijff & Dijkstra, 2020) and in the context of business (Lubberink et. al., 2017; Gonzales-Gemio, Cruz-Cázares & Parmentier, 2020). Regarding RI in the business context, Gonzales-Gemio et al. (2020) developed a conceptual model for RI with a focus on small and medium-sized enterprises (SMEs) and RI's relationship with SME performance. Lubberink et. al. (2017) proposed a refined framework for RI in the business context with an overview of innovation practices and processes that can enhance the dimensions of RI: anticipation, reflexivity, inclusion, deliberation, responsiveness and knowledge management.

While various existing studies provide comprehensive state-of-the-art literature reviews on RI, including RI in the business context, this study takes a unique approach and focuses on (1) integration of RI in mainstream research on business responsibility and innovation, and (2) proposes a future research agenda.

Specifically, this paper addresses the question of to what extent two major bodies of literature, namely business ethics (BE) and innovation management (IM) have integrated the concept of responsible innovation and how they perceive RI, whether they are convergent or rather different from the policy-making and academic understanding of RI. To my knowledge, this is the first study to analyse the relationship between business responsibility, innovation management and RI from the perspective of mainstreaming RI. Furthermore, previous studies took as the starting point of the analysis the RI framework, which was developed mainly for policy-making. This study takes an explorative approach and through a thematic analysis, it seeks to learn how RI has been conceptualised and what are common themes; whether

¹ More than half of the companies in the EU report innovation activities (Eurostat, 2021) and the majority of total research and development (R&D) expenditure comes from the business sector (e.g. Eurostat, 2021).

RI has been integrated or remains a marginal concept artificially and temporarily promoted, particularly by the European policy-makers, however broadly unknown among the BE and IM scholars. The gaps can be filled by grouping recent research on RI in business into research themes. It will also explain the range of research on the RI in business, give future researchers a theoretical framework, and address practical questions by comprehending the existing research. Additionally, this study takes things a step further by examining the research methods used and providing an overview of research studies carried out in various geographical locations and the journals that published them. The findings of this research show that RI is not completely unknown in the mainstream BE and IM literature, however, it comes in different colours and shapes reflecting the diversity of businesses and innovation. This paper adds to a growing body of literature on RI in the business context and proposes a further research agenda that connects across the disciplines and highlights key areas that would benefit from further inquiry.

The paper is organised as follows. First, a theoretical background is outlined to address the diversity of approaches to responsible innovation in the BE and IM research. Second, the scope and methodology used to execute the literature searches are discussed. Third, the results of the literature review and analysis of these results are provided. Fourth, a structured discussion is presented in which the findings are critically assessed and further research agenda is proposed. Lastly, the conclusions summarise the main findings of this research.

2.2 Theoretical background

The concept of RI in the business context spans several scientific disciplines and overlaps conceptually with various other concepts (e.g. Stahl, 2013; Lubberink et. al., 2017; Gonzales-Gemio et al., 2020; Gurzawska, 2020).

First, RI relates to the question of companies' responsibility for their activities extensively investigated in the fields of business management, specifically business ethics, law and human rights under the terms of corporate social responsibility (CSR), corporate responsibility (CR), corporate sustainability (CS), and business sustainability, and many other. According to Andersen & Skjoett-Larsen (2009), CSR (and CR) concerns two aspects of companies' responsibility, namely the interaction between business and society, and a company's activities in the area of environmental and social issues. However, CSR is a dynamic concept and over decades has evolved (Visser, 2011; Trapp, 2012; Latapí Agudelo, Jóhannsdóttir & Davídsdóttir, 2019)

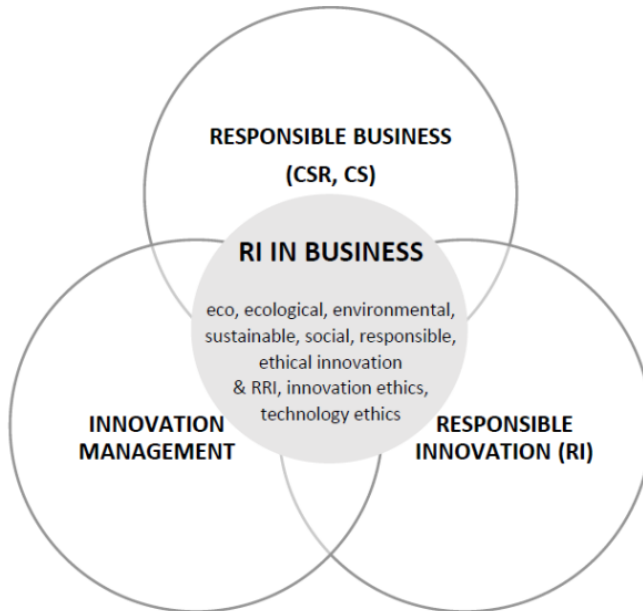
from merely philanthropic and marketing to a strategic and holistic approach, where companies' responsibility and sustainability lies at the core of the business model and is brought into central value creation (Baron, 2001; Lantos, 2001; Crane, Palazzo, Spence, & Matten, 2014; Chandler, as cited in Latapí Agudelo et al., 2019) dwelling as an intrinsic part of a company's character (Basu & Palazzo, 2008). CS derives from the concept of sustainable development defined in the Brundtland Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN General Assembly, 1987, para. IV). CS (and business sustainability) is generally defined in two ways, either as primarily focused on the environmental dimension of business; or in a broader sense including environmental, economic, and social dimensions (Montiel, Delgado-Ceballos, Ortiz-de-Mandojana, & Antolin-Lopez, 2008). CS and CSR are closely related, however, the distinction is not apparent. Thus some authors use both constructs interchangeably, others emphasise their distinct nature (Bansal & Song, 2017). For instance, for Voeglin, Scherer, Stahl & Hawn (2022) 'sustainability' is "the system-level goal of preserving society and protecting the environment for the benefit of future generations" (p. 4), and 'CSR' refers to business practices designed to achieve this goal.

Second, responsibility in the context of innovation broadly relates to innovation management which supports creating and introducing new ideas, processes, or products. According to Grunwald (2011), RI is rooted in applied ethics, technology assessment (TA) and science, technology and society studies (STS) research, and brings them together into "integrative approaches to shaping technology and innovation" (p. 9). Over the last 20 years, we have witnessed an expansion of literature and cross-sectoral exchanges, deliberately engineering societal and environmental responsibilities and objectives into innovation. As a result, several RI-related concepts exist that tackle various aspects of responsibility in the context of innovation (Ribeiro, Smith, & Millar, 2017). Social innovation, sustainable innovation, environmental, ecological and eco-innovation are among the most commonly discussed. Social innovation has been mainly developed by practitioners to "meet pressing social needs and to improve human and environmental well-being" (Choi & Majumdar, 2014). Environmental, ecological and eco-innovation emphasise the importance of the reduction of environmental impact (OECD, 2009). Regarding sustainable innovation, as emphasised by Adams, Jeanrenaud, Bessant, Denyer, and Overy (2016), a variety of conceptualisations of sustainable innovation exist; however, we lack a clear definition of sustainability. This confusion is reinforced by an array of labels applied

to sustainable innovation, such as CSR; green, eco- or ecological innovation; social environmental management; and responsible innovation (Adams et al. 2016). While some authors argue for a responsible approach and give equivalence to environmental, social and economic dimensions in sustainability (Hansen, Grosse-Dunker, & Reichwald, 2009; Longoni & Cagliano 2018), the majority of previous work focuses on ecological sustainability such as eco-innovation and environmental innovation (Carrillo-Hermosilla, Del Río, & Könnölä, 2010) and often overlook the social dimension (Adams et al. 2016). In addition, due to the roots in applied ethics, some references also include ethical innovation (e.g. ethical AI), innovation ethics, and technology ethics emphasising the integration of ethical principles and moral values into the innovation process (Brey, 2001, 2000; Manders-Huits & van den Hoven, 2009; Stahl, 2013). It should be also noted that for this study, research ethics is not considered as relevant as beyond medical research it is hardly used in the business context (Gurzawska, 2021).

Figure 2.1

Conceptual understating of RI in business and connection between RI, responsible business and innovation management



Considering this diversity of concepts and approaches to responsible business and responsible innovation, this research aims to bridge this debate and investigates how much attention has been paid to RI in two bodies of literature, i.e. business ethics (BE)

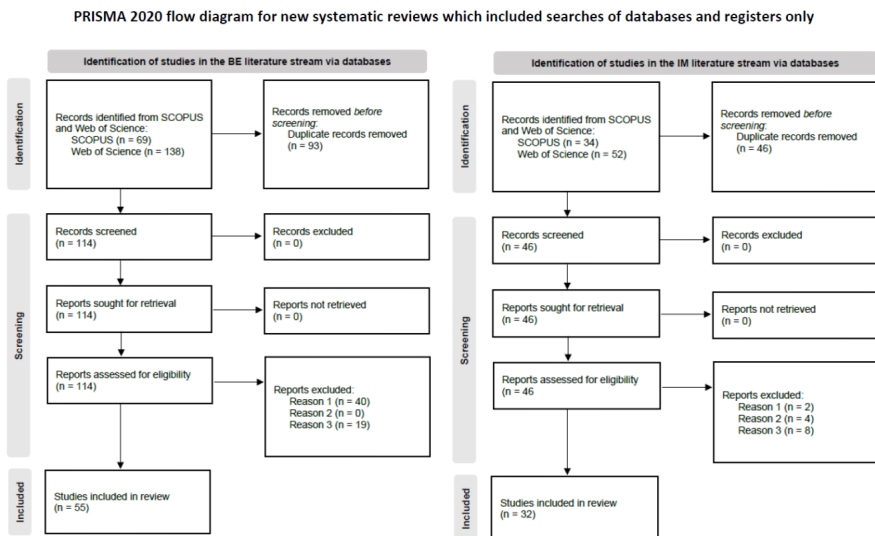
and innovation management (IM), and which concepts and perceptions are central in mainstream business- and innovation- related research. Figure 2.1 presents the conceptual understating of RI in business in this research and the connection between RI, responsible business and innovation management.

2.3 Methodology

A systematic review was conducted to collect and analyse data following the tenets of the PRISMA (*Preferred Reporting Items for Systematic reviews and Meta-Analyses*) approach (Page et al., 2021). This approach was chosen because it provides an evidence-based checklist of items aimed at helping researchers to report a wide array of systematic reviews and meta-analyses. The methodological approach was supported by additional materials (e.g. Higgins et al., 2022), especially for the thematic analysis of the data (Braun & Clarke, 2006). In the first phase of the study, a research protocol was developed specifying how data would be identified, analysed and reported to ensure replicability, reliability and transparency of the study. The second phase involved the identification of relevant studies based on the defined search criteria in two literature streams BE and IM. The last phase involved an in-depth analysis of the selected articles. Figure 2.2 presents the process of identification, screening and inclusion of studies in two literature streams BE and IM and its result.

Figure 2.2

The process of identification, screening and inclusion of studies in two literature streams BE and IM and its results (PRISMA 2020 flow diagram)



2.3.1 Search criteria

In the first identification step, the literature was gathered using the Web of Science and Scopus search engines, two of the largest databases for peer-reviewed journals. The systematic review was confined to English-language, peer-reviewed articles only published between January 2002 (several studies concluded that the RI discourse started around 2002, see e.g. Thapa, Iakovleva, & Foss, 2019; Randles, Tancoigne, & Joly, 2022)² and April 2022 (when this research started). The review was also limited to peer-reviewed articles published in the highest-rated journals in two literature streams, i.e. business ethics (BE) and innovation management (IM) (Chartered Association of Business Schools, 2018).³ Journals devoted specifically to RI (e.g. *Journal of Responsible Innovation* or *Journal of Responsible Technology*) were intentionally excluded from this study to focus on the mainstream literature in the BE and IM literature streams.

Table 2.1 presents the five-year intervals, from 2003 to 2022, that capture the growth of the RI field in the top BE and IM journals (Note: since the first relevant articles were published only in 2003, 2002 is not represented in the table).

² The European Commission's Framework Programme FP6 (2002–2006) marked by the creation of the Science-Society Directorate and the launch of the Science and Society programme with the ambition of creating greater public engagement with science and technology.

³ Selection of journals based on the ranking in Academic Journal Guide 2018 by the Chartered Association of Business Schools. This Guide was used matching the focus of this paper on the business context. This Guide provides information to scholars working across the diverse fields that constitute Business and Management on the range, subject matter and relative quality of journals in which business and management academics publish their research. Journals were selected from two literature streams as indicated in the Guide, i.e. Business Ethics (field in the Guide: 'General management, ethics, gender and social responsibility') and Innovation Management (field in the Guide: 'Innovation'). Only journals rated 4*, 4 and 3 were included for this study for each literature stream category. The full list of journals is included in the Guide.

Table 2.1*Distribution of articles per BE and IM journals in five-year intervals between 2003 and 2022*

Journal in BE and IM literature streams		2003- 2007	2008- 2012	2013- 2017	2018- 2022	TOTAL (per journal)
BE stream	Academy of Management Journal (<i>AMJ</i>)	0	0	0	0	0
	Academy of Management Review (<i>AMR</i>)	0	0	0	0	0
	Administrative Science Quarterly (<i>ASQ</i>)	0	0	0	0	0
	Journal of Management (<i>JM</i>)	0	0	0	0	0
	British Journal of Management (<i>BJM</i>)	0	0	0	1	1
	Business Ethics Quarterly (<i>BEQ</i>)	0	0	0	0	0
	Journal of Management Studies (<i>JMS</i>)	0	0	1	3	4
	Academy of Management Perspectives (<i>AMP</i>)	0	0	0	0	0
	Business and (&) Society (<i>BS</i>)	0	1	3	2	6
	California Management Review (<i>CMR</i>)	1	0	1	1	3
	European Management Review (<i>EMR</i>)	0	0	0	0	0
	Harvard Business Review (<i>HBR</i>)	1	0	0	0	1
	International Journal of Management Reviews (<i>IJMR</i>)	0	0	0	0	0
	Journal of Business Ethics (<i>JBE</i>)	2	8	10	8	28
	Journal of Business Research (<i>JBR</i>)	0	0	4	8	12
	Journal of Management Inquiry (<i>JMI</i>)	0	0	0	0	0
	MIT Sloan Management Review (<i>MIT SMR</i>)	0	0	0	0	0
Academy of Management Annals (<i>AMA</i>)	0	0	0	0	0	
Gender and Society (<i>GS</i>)	0	0	0	0	0	
Gender, Work and Organization (<i>GWO</i>)	0	0	0	0	0	
Total BE stream	4	9	19	23	55	
IM stream	Journal of Product Innovation Management (<i>JPLM</i>)	0	1	0	4	5
	Research Policy (<i>RP</i>)	1	4	5	4	14
	R & D Management (<i>R&DM</i>)	0	0	2	4	6
	Technovation	2	0	1	4	7
	Total IM stream	3	5	8	16	32

Note: The last interval is not fully representative, because the literature searches were conducted in May 2022. It could therefore be the case that more relevant sources were published after the literature searches in 2022 that are not taken into account in this overview.

2.3.2 Search strategy

Using a Boolean search, two researchers independently searched a combination of terms related to responsible business AND terms related to innovation management and RI in the title, abstract and keywords of articles. The search was conducted for each literature stream, i.e. BE and IM. The responsible business included the following four terms: "CSR", "corporate responsibility", "corporate sustainability", and "business sustainability". Innovation management and RI terms included the following 12 terms: "innovat*", "eco innovat*", "ecological innovat*", "environmental innovat*", "sustainable innovat*", "social innovat*", "responsible innovat*", "responsible research and innovation", "RRI", "innovation ethics", "technology ethics", "ethical innovat*". In total 48 combinations of terms were searched for each literature stream, BE and IM. Since the first round of searches for the IM literature stream did not show a satisfying number of results, additional two terms related to responsible business ("industry*", "business") were combined with the original list of terms related to innovation management and RI, adding 22 additional combinations of terms for the IM literature stream. Table 2.2 provides exemplary searches in SCOPUS and Web of Science for each literature stream.

Table 2.2

Examples of search queries including a combination of terms in SCOPUS and Web of Science in the BE literature stream and the IM literature stream

	BE stream (Note: searched per individual BE journal title)	IM stream
SCOPUS	(TITLE-ABS-KEY ("CSR") AND TITLE-ABS-KEY ("innovat*")) AND PUBYEAR > 2001 AND PUBYEAR < 2022 AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (EXACTSRCTITLE, "Academy of Management Journal"))	(TITLE-ABS-KEY ("CSR") AND TITLE-ABS-KEY ("innovat*")) AND PUBYEAR > 2001 AND PUBYEAR < 2022 AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (EXACTSRCTITLE, "Journal Of Product Innovation Management"))
Web of Science	TS=("CSR" AND "innovat*") AND SO = (ACADEMY OF MANAGEMENT JOURNAL OR ACADEMY OF MANAGEMENT REVIEW OR ADMINISTRATIVE SCIENCE QUARTERLY OR JOURNAL OF MANAGEMENT OR BRITISH JOURNAL OF MANAGEMENT OR BUSINESS ETHICS QUARTERLY OR JOURNAL OF MANAGEMENT STUDIES OR ACADEMY OF MANAGEMENT PERSPECTIVES OR BUSINESS SOCIETY OR CALIFORNIA MANAGEMENT REVIEW OR EUROPEAN MANAGEMENT REVIEW OR HARVARD BUSINESS REVIEW OR INTERNATIONAL JOURNAL OF MANAGEMENT REVIEWS OR JOURNAL OF BUSINESS ETHICS OR JOURNAL OF BUSINESS RESEARCH OR JOURNAL OF MANAGEMENT INQUIRY OR MIT SLOAN MANAGEMENT REVIEW OR ACADEMY OF MANAGEMENT ANNALS OR GENDER SOCIETY OR GENDER WORK "AND" ORGANIZATION)	TS=("CSR" AND "innovat*") AND SO = (JOURNAL OF PRODUCT INNOVATION MANAGEMENT OR RESEARCH POLICY OR R D MANAGEMENT OR TECHNOVATION)

This search resulted in 207 results in the BE stream (69 in SCOPUS and 138 in Web of Science) and 86 in the IM stream (34 in SCOPUS and 52 in Web of Science). After removing duplications, the number of sources was reduced for both literature streams, in BE to 114 and in IM to 46 unique useful sources.

2.3.3 Selection of studies

In the next step, the titles, abstracts and keywords of articles were screened independently by two researchers for their eligibility taking into consideration three exclusion criteria. Articles should be excluded if they are not:

1. Focused on topics related to technology-related innovation.
2. Focused on topics relevant to business context.
3. Focused on responsibility in the context of technology-related innovation and business context.

This analysis led to a further reduction of sources in the datasets, resulting in 87 sources in total with 55 sources in BE literature stream and 32 sources in the IM literature stream.

2.3.4 Data analysis

The data analysis of selected articles was conducted using thematic analysis as a qualitative method which enables researchers to thoroughly analyse and interpret emergent themes (Braun & Clarke, 2006). This approach helped to identify, examine and synthesise this theoretically, methodologically and thematically diverse research by categorising it into themes and thematic areas. After the initial scanning of the articles, a combination of two methods was used for in-depth data analysis, namely: (1) the general content classification system; and (2) the qualitative analysis software ATLAS.ti 22. The content classification system was used to get a high-level overview of included studies, e.g. general framework of responsible business and RI, type of research and theoretical framework, size and type of industry studied. The approach was adapted from previous studies and modified to the needs of this research (e.g. Carter & Easton, 2011; Quarshie, Salmi, & Leuschner, 2016). Tables 2.3 and 2.4 present the content classification system with results. In addition to the content classification system, each article was analysed using Atlas.ti 22 which enables users to analyse text in one place by ‘coding’, sorting and grouping by theme and topics. To analyse and code texts, a general codebook was developed, adapted to each literature stream using a mixed-methods approach (deductive and inductive).⁴ The codebook was derived following previous studies on RI, such as the framework proposed by Lubberink et al. (2017), and approaches to RI in business developed by Gurzawska

⁴ The codebook is available on request.

(2020, 2021) and Gurzawska, Mäkinen, and Brey (2017). The results of the data analysis are presented in section 2.4.

2.4. Data analysis and results: General content classification

This section provides a high-level analysis of the BE and IM literature, presenting the analysis of the overarching concepts for responsible business and responsible innovation; distribution of articles per literature stream, journals and timeline; research methodologies, data analyses and theoretical lens; and lastly geographical and industry setting.

2.4.1 Responsibility umbrella: business & innovation

The analysis of the articles shows clear differences between the BE and IM literature streams regarding their overarching concepts for responsible business and responsible innovation (Table 2.3).

Table 2.3

Overarching concepts of responsibility: business & innovation

	Entire dataset Percent from n=87	BE stream Percent from n=55	IM stream Percent from n=32
Overarching concept: Responsible business			
CSR	58.62	76.36	28.13
CS	21.84	14.55	34.38
CSR & CS (used together)	4.6	7.27	0
Environment management & related	8.05	1.82	18.75
Social entrepreneurship	3.45	0	9.38
General responsibility	2.3	0	6.25
Other	4.6	0	12.5
Overarching concept: Responsible Innovation			
Sustainable innovation	13.79	18.18	6.25
Eco-innovation & environment related	21.84	0	59.38
Social Innovation	10.35	9.09	12.5
Responsible innovation	10.35	10.91	9.38
General innovation	41.38	60	9.38
Other	2.3	1.82	3.13

Responsible business

Regarding the responsibility of companies, the BE stream is well defined and boils down to two main concepts, namely CSR and CS. The vast majority of the BE body of literature refers to the concept of CSR (more than 75% of all articles), followed by CS including sustainable community development (Arora & Ali Kazmi, 2012) and some articles using both concepts jointly (e.g. Lai, Lin, & Wang, 2015). Only one article regards environmental management (Sullivan, 2005), and often environmental aspects are discussed as part of the CS concept perceived in the BE stream as a broad framework for impacts on society and environment. The IM literature is much more diverse, and scholars capture the responsibility of companies differently than in the BE body of literature. This demonstrates a limited integration of the well-known business responsibility concepts in the IM literature and a limited connection between the innovation activities of companies with their responsibility (e.g. CSR, CS). Furthermore, the sustainability and environmental focus is visible in the IM stream, with more than half of the articles using CS and environmental management and other environment-related terms such as eco-firm (Antonioli, Mancinelli, & Mazzanti, 2013), climate change (Veugelers, 2012), green orientation (Zhang & Walton, 2017) and circular economy (de Arroyabe, Arranz, Schumann, & Arroyabe, 2021). In comparison to the BE stream, authors explicitly refer to environment and climate, while in the BE stream environmental aspects are integrated under the CS framework. The IM research discusses the responsibility of companies through broader concepts capturing companies' responsibility (Table 2.3: Other), such as social entrepreneurship focused on combining for-profit goals with generating a positive return to society (Nicolopoulou, Karataş-Özkan, Vas, & Nouman, 2017; Rayna & Striukova, 2019; Crupi, Liu, & Liu, 2022) responsible value creation (Lehoux et al., 2021), ethical agency (Pandza & Eliwood, 2013), corporate wrongdoing (Giuliani, 2018) or opposing dirty with clean industry (Kunapatarawong & Martínez-Ros, 2016).

Responsible innovation

Perception of RI is particularly interesting, as only nine articles in the entire dataset explicitly use the term 'responsible innovation': six articles in BE stream (including 'responsible product', Boulouta & Pitelis, 2014), and three in the IM stream. Overall, the majority of BE research refers to general innovation, mainly as part of the discussion around the relationship between innovation and companies' responsibility (CSR, CS, etc.) looking at such aspects as innovation capability (e.g. Barin Cruz,

Boehe, & Ogasavara, 2015) and continuous innovation (Husted, Allen, & Kock, 2015). This may suggest a limited recognition of the relationship between companies' broader responsibility and their innovation activities. Some BE scholars use the concepts of sustainable innovation (e.g. Shin, Ellinger, Nolan, DeCoster, & Lane, 2018), as well as social innovation (e.g. Hanke & Stark, 2009), and more specific aspects of innovation like supply chain innovation (Isaksson, Johansson, & Fischer, 2010). Again, the focus on the environmental aspects of innovation is highly reflected in the IM body of literature with nearly 60% of the articles referring to environment-related innovation (eco, environmental, green, clean) and some examples of sustainable innovation (e.g. Juntunen, Halme, Korsunova, & Rajala, 2019). In addition, several IM articles consider social innovation (e.g. Kohler & Chesbrough, 2019) and other types of innovation, such as open innovation (De Silva & Wright, 2019). Furthermore, researchers in both streams of the literature approach RI from the perspective of how innovation and technology can contribute to the responsibility of companies and ultimately lead to addressing grand societal challenges (e.g. Mirvis & Googins, 2018; Carberry, Bharati, Levy, & Chaudhury, 2019; Il Park & Xiao, 2021; Mazzucchelli, Gurioli, Graziano, Quacquarelli, & Aouina-Mejri, 2021).

To better understand the perception of RI in both literature streams, it is worth analysing definitions and contexts used by the scholars that explicitly refer to RI. Most of the research on RI was published in the last five years, with two exceptions of research related to nanotechnology representing the roots of the RI concept (Groves, Frater, Lee, & Stokes, 2011; Pandza & Eliwood, 2013). It is worth noting that while some of those nine articles refer to previous work on RI (e.g. von Schomberg, 2013; Stilgoe et al., 2013), scholars in both research streams take the liberty to define their understanding and approaches to RI in the business context.

Overall, RI in the business context is heavily focused on the outcome of innovation, namely products, process and services, and their impact on society and the environment and how they contribute to addressing grand societal challenges (BE stream: Groves et al., 2011; Voegtlin & Scherer, 2017; Segrestin, Hatchuel, and Levillain, 2021; Voegtlin et al., 2022; Waldron, Navis, Karam, & Markman, 2022; IM stream: Pandza & Eliwood, 2013). RI in business is about innovation that does not harm people and the planet, but at the same time, it moves a step forward to “do good” and thus contribute to sustainable development and addressing grand societal challenges, stimulating product development that meets essential social needs (Groves et al. 2011; Voegtlin & Scherer, 2017).

In the IM stream, Pandza & Eliwood (2013) perceive RI as a process of institutionalisation of responsibility where a variety of agents engage in the process of producing new principles and values to define the range of technology innovation. Giuliani (2018) does not define RI, yet she discusses it by pointing out to lack of systematic and strategic approach to companies' responsibility for their innovations. She further argues that RI in business is not about "ensuring that companies do more of the 'good' things – from green technologies to donating to communities negatively affected by their own operations" (p. 1580), but rather completely different ways of addressing societal challenges.

Furthermore, Voegtlin and Scherer (2017) argue that RI should be based on considerate and forward-looking responsibility and thus "it is more important for actors to develop a capacity for self-regulation and for proactive action than to rely solely on hard-law regulations" (p. 231). It is because business responsibility is based on the prevention of harm traditionally promoted through compliance, binding legal rules and potential sanctions. However due to the globalisation of business, the speed and future-oriented nature of innovation it is challenging to hold this principle in the context of innovation. Those concerns are shared by authors discussing RI in the context of nanomaterials and nanotechnology and potential unintended consequences that may become irreversible (Groves et al., 2011; Pandza & Eliwood, 2013). In addition, Lehoux et al. (2021) argue that RI requires companies to put a responsible value proposition at the centre of their business model by combining economic, social, and environmental value creation. As a result, RI in business requires new forms of governance redistributing responsibility within and without the organisation at the company level (Groves et al., 2011; Voegtlin et al. 2022).

While acknowledging RI's advancements, academics in both bodies of literature stress that the connection between corporate social responsibility and innovation management is still poorly understood in both the relevant literature and in practice. Therefore, scholars call for further research, better theories and more empirical work on RI in the business context (Voegtlin & Scherer, 2017; Giuliani, 2018; Lehoux et al. 2021).

2.4.2 Journals & timeline

The distribution of 87 articles included in this study, per literature stream, journal and the five-year interval is presented in Table 2.1. Of these articles, 63.23% were published in the BE stream and 36.78% in the IM stream. Despite a large number of journals included in the BE stream, the majority of articles were published in two

journals (*JBE*, *JBR*) and account for nearly 73% of the BE articles. In the IM stream, 43.75% of articles in IM were published in *RP*, 21.9% in *Technovation*, 18.75% in *R&DM* and 15.63% in *JPIM*. The distribution among the journals is more balanced than in the BE stream, which could be explained by the fact that only four journals fulfilled the inclusion criteria as top-rated, and thus were included in the study. The time distribution of the articles in both literature streams shows the evolution of RI in industry, with very few publications between 2003 and 2007 and a slight increase between 2008 and 2012. The peak in publications can be observed between 2008 and 2012, specifically for the BE stream, which could be related to a growing interest in CSR and CS in general. For the IM it is particularly after 2018 when the growth in the number of publications is visible with 50% of the IM articles published in the last 5 years. This increase may be due to a general increase in research on various aspects of RI promoted by the EC, from RRI to sustainability and environmental considerations (e.g. ‘Horizon 2020’). This concurs well with a general timeline of RI evolution, particularly in the European context, and also confirms previous findings (e.g. Rip, 2018; Gonzales-Gemio et al., 2020).

2.4.3 Research methodologies, data analyses and theoretical lens

From the research approach point of view, the majority of articles in both streams were empirical as presented in Table 2.4. The results demonstrate that research methodologies and data analysis in both streams were highly quantitative based on the analysis of archival studies and existing datasets using inferential and descriptive statistics. Qualitative research was mainly based on case studies and interview studies (especially in the IM stream), as well as surveys. Theoretical and conceptual papers were more represented in the BE stream than in the IM stream (e.g. Porter & Kramer, 2006; Maxfield, 2008; Hanke & Stark, 2009; Isaksson et al., 2010; Alt & Craig, 2016; Voegtlin & Scherer, 2017; Segrestin et al., 2021; Voegtlin et al. 2022). While the literature reviews are absent in the BE stream, the IM stream has some examples focused particularly on environmental innovation (del Brio & Junquera, 2003; Watson, Wilson, Smart & Macdonald, 2018). Mixed methods and other methods play a marginal role in both streams.

Table 2.4*Research approaches, methodologies and theories*

	Entire dataset Percent from n=87	BE stream Percent from n=55	IM stream Percent from n=32
Research approach			
Theoretical & conceptual	12.64	14.55	9.38
Empirical	87.36	85.45	90.63
Research methodology			
Case studies and interview studies	24.14	20	31.25
Surveys	13.79	14.55	12.5
Theoretical & conceptual	10.34	14.55	3.13
Literature reviews	2.3	0	6.25
Archival studies/datasets etc.	42.53	41.82	43.75
Other	3.45	3.64	3.13
Mixed	3.45	5.46	0
Data analysis			
Theoretical & Conceptual	11.49	14.55	6.25
Qualitative analysis	24.14	21.82	28.13
Quantitative analysis	60.92	61.82	59.38
Other	3.45	1.82	6.25
Theoretical lens			
No major use	62.07	54.55	75
Corporate citizenship	2.3	3.64	0
Stakeholder theory	2.3	3.64	0
Network/social network theory	1.15	1.82	0
Capability Approach	0	0	0
RBV and NRVB	9.2	10.9	6.25
Dynamic capabilities view	2.3	1.82	3.13
Institutional theory	2.3	1.82	3.13
Other	11.49	12.73	9.38
Multiple theories	6.9	9.09	3.13

Regarding the theoretical framework, interestingly a major similarity between the literature streams was no major use of any theoretical framework (or they do not explicitly state the framework) with more than 55% of articles in the BE stream and 75% in the IM stream. This may indicate a lack of recognition of theoretical underpinnings between responsible business and innovation management research. The reason for this may be the fact that the majority of the papers are empirical in nature exploring relationships between companies' responsibility and innovation, and

drivers of RI with the limited theoretical background on the topic. In both streams, articles with a theoretical framework mainly use the resource-based view (RBV) and natural RBV (NRBV). Following the RBV approach, in the BE stream authors investigate RI as a resource or capability. For instance, according to Voegtlin & Scherer (2017) investing in responsibility can create a “sustainable competitive advantage for businesses by enabling them to develop firm-specific social or environmental capabilities that competitors cannot imitate easily” (p. 231). In the IM stream, some authors use the NRBV variant to explore competitive advantage based on the firm’s relationship to the natural environment (Zhang & Walton, 2017; Andersén, 2021). In the BE stream, additional theoretical lenses included social movement (Alt & Craig, 2016; Waldron, et al., 2022); knowledge-based view (KBV) (Bendell & Nesij Huvaj, 2020; Murcia, 2020); political CSR (Voegtlin & Scherer, 2017; Voegtlin et al. 2022), complementarity theory (Dey, Malesios, De, Chowdhury, & Abdelaziz, 2020), stewardship theory (Domínguez-Escrig, Mallén-Broch, Lapiedra-Alcamí, & Chiva-Gómez, 2019), economic theory (Maxfield, 2008), business strategy theory (Yuan, Lu, Tian, & Yu, 2020), and social role theory (Liu, Lei, & Buttner, 2020). In the IM stream, additional theories used by authors were KBV (Fu, Boehe & Orlitzky, 2020), complementarity (de Guimarães, Severo, Jabbour, de Sousa Jabbour, & Rosa, 2021) and virtue ethics (Pandza & Ellwood, 2013).

2.4.4 Geographical and industry setting

Table 2.5 reveals an interesting finding regarding the geographical representation in the dataset. The BE stream research often concentrates on countries outside of Europe (41%), including the US (e.g. Shin, et al., 2018), Brazil (e.g. Flanagan & Whiteman, 2007), India (e.g. Upadhaya, Munir, Blount, & Su, 2018), and individual papers focus on Australia, China, Japan, Sub-Saharan Africa, Taiwan and Thailand. In contrast, half of the articles in the IM stream focus on Europe (e.g. Antonioli, et al., 2013), but similarly to the BE stream some of the articles are US-centred (Pujari, 2006; Zhang, Gensler, & Garcia, 2011) as well as Brazil (de Guimarães et al., 2021) and India (Ramani & Mukherjee, 2014). Additional countries also cover New Zealand (Zhang & Walton, 2017) and China (Crupi, et al., 2022). The evidence from this study suggests that research on business responsibility in the context of innovation is not limited to Europe and the EC’s funding.

This study also shows a difference between the literature streams as regards the size of companies. While the BE stream focuses more on large companies (such as corporations), the IM pays more attention to SMEs. For the BE articles, this may be

explained by the roots of CSR and CS in the corporate context, with a relatively limited application among SMEs. SMEs tend to be less innovative than large businesses (OECD, 2018). However, since a great part of the IM articles have the European context, this may be accounted for the EC's interest in SME research and support especially that SMEs represent 99% of all businesses in the EU (European Commission, n.d.). At the same time, the IM articles predominantly (more than 53%) investigate large companies and SMEs together or they do not specify their focus. In the BE stream, more often authors do not specify which type of companies they analyse (more than 36%). In both literature streams, the most common industry setting was multisector research, which could be linked to the use of existing datasets in a great majority of papers. A surprising finding was that such innovative sectors as health and pharmaceuticals and ICT, which also raise major ethical and human rights challenges, received limited or no attention. It should be however noted, that these sectors were part of multisector research, nevertheless not investigated individually. The analysis also identified other industry sectors that were not pre-defined by this study, namely manufacturing (e.g. in BE stream II Park & Xiao, 2021; in IM stream de Marchi, 2012; Borghesi, Cainelli, & Mazzanti, 2015) and chemical (e.g. in IM Nameroff, Garant, & Albert, 2004). Furthermore, articles that investigate the nanotechnology sector were found in both streams (in BE stream Groves et al., 2011; Gauthier & Genet, 2014; and in the IM stream Pandza & Ellwood, 2013). This could be linked to the fact that nanotechnology can be seen as the lead domain for discourse and activities on RI (Barben, Fisher, Selin, & Guston, 2008; Rip, 2018; Shelley-Egan, Bowman, & Robinson, 2018).

Table 2.5*Industry and geographical setting*

	Entire dataset Percent from n=87	BE stream Percent from n=55	IM stream Percent from n=32
World region			
Europe	33.33	23.63	50
Non-European	33.33	41	18.75
	(US 16.09, Brazil 4.6, India 3.45, China 2.3, Australia 1.15, Japan 1.15, Sub- Saharan Africa 1.15, Taiwan 1.15, Thailand 1.15, New Zealand 1.15,)	(US 21.82, Brazil 5.46, India 3.64, Sub-Saharan Africa 1.82, Australia 1.82, China 1.82, Japan 1.82, Taiwan 1.82, Thailand 1.82)	(US 6.25, Brazil 3.13, China 3.13, India 3.13, New Zealand 3.13)
Various	20.69	20	21.88
NA	12.64	14.55	9.38
NA	28.74	36.36	15.63
Company type			
Corp	22.99	34.55	3.13
SMEs	14.94	7.27	28.13
Various	33.33	21.82	53.13
Industry setting			
Single sector, of which:			
Agriculture	1.15	0	3.13
Food and beverage	1.15	1.82	0
Transportation and logistics	1.15	1.82	0
Financial	2.3	3.64	0
ICT	0	0	0
Health & Pharmaceuticals	2.3	1.82	3.13
Other	22.99	16.36	34.38
	(Manufacturing 8.05, Nanotech 3.45, Chemical 2.3, Automotive 2.3, Export 2.3, Mining 1.15, Paper 1.15, Tourism 1.15, HR 1.15)	(Export 3.64, Manufacturing 3.64, Nanotech 3.64, Automotive 1.82, HR 1.82, Mining 1.82)	(Manufacturing 15.63, Chemical 6.25, Automotive 3.13, Nanotech 3.13, Paper 3.13, Tourism 3.13)
Multiple sectors	56.32	58.18	53.16
NA/NS	12.64	16.36	6.25

2.5 Data analysis and results: Thematic analysis of RI dimensions

The thematic analysis of the articles in both streams revealed four main themes, namely (1) the relationship between companies' responsibility and innovation; (2) the value and benefits of RI; (3) the drivers of RI; and (4) how RI should be implemented in companies. The themes are discussed in detail in the following sections.

2.5.1 Relationship between companies responsibility and innovation

The first important research area dealt with the relationship between companies' responsibility and innovation. Three common angles were: (1) possible synergies between responsible business (CSR, CS) and innovation; (2) how innovation may enhance the responsibility of companies; (3) how companies' responsibility and concerns for grand societal challenges and sustainable development may stimulate innovation. The BE research is more diverse and investigates all aspects, the IM body of literature is much more focused on innovation and how it can provide solutions to societal and environmental concerns.

Regarding synergies between companies' responsibility and innovation, research in both streams refers to and builds on the work of McWilliams and Siegel (2000) who showed that "R&D investment and CSR are likely to be highly correlated because both are associated with product and process innovation" (p. 608), extended particularly by Padgett (2010). The BE research (e.g. Padgett & Galan, 2010; Rodgers, Choy, & Guiral Andrés, 2013; Blanco, Guillamón-Saorín, & Guiral, 2013; Barin et al., 2015; Ueki, Jeenanunta, Machikita, & Tsuji, 2016; Bocquet, Le Bas, Mothe, & Poussing, 2017; Mishra, 2017; Rothenberg, Hull, & Tang, 2017; Broadstock, Matousek, Meyer, & Tzeremes, 2020) empirically investigate this link by adding granularity and taking into consideration various mediating factors. For instance, the findings of Upadhaya et al. (2018) suggest that the adoption of CSR is not directly correlated with differentiation strategy; rather, the correlation is mediated by the organisational culture. Garel and Petit-Romec (2020) show a strong empirical link between employee-related CSR and the investment, success, and value of innovative activities; and in addition a mediating role of employee-related CSR for the relationship between long-term investor ownership and long-term investments as proxied by R&D expenditures and corporate innovation. Hanke & Stark (2009) find that a corporate culture based on social responsibility can lead to sustainable internal and external learning processes and ultimately lead to innovation. The empirical results of Ueki et al. (2016) support the association between CSR and innovation,

however, the authors emphasise that skilled employees are key elements of this relationship. Stakeholder involvement, business opportunities resulting from societal and environmental concerns, and attempts to build work environments that are more innovation-friendly are three factors that contribute to the positive association between CSR and innovation (Sánchez & Benito-Hernández, 2015). In other words, innovation activities should be aligned with CSR in such a way that companies can attend to stakeholder demands while making efficient use of organisational knowledge, resources, and capabilities (Fu et al., 2020). The link between business responsibility and innovation seems to be bi-directional (Husted et al., 2015; Lehoux et al., 2021). On the one hand, companies may produce and bring to the market more responsible technologies enhancing their social responsibility and sustainability; on the other hand, they respond to societal challenges, and economic, social and environmental value creation by providing innovative solutions to those challenges.

Regarding the second question, how CSR can affect innovation, the BE research empirically shows that CSR practices are essential to the development of RI, and thus companies need to actively engage and leverage CSR practices to develop and enhance the effectiveness of their RI (Bendell & Nesij Huvaj, 2020; Achi, Adeola, & Achi, 2022). For instance, Bocquet et al. (2017) empirically demonstrate that businesses that have fully incorporated CSR into their business strategies outperform others in terms of economic performance and innovation, but only when CSR strategies are proactive as opposed to reactive. Following this line, the analysis by Maxfield (2008) suggests that CSR activities tightly linked to innovation might be more economically beneficial than those oriented toward public relations, marketing, human resource management etc. Thus, researchers emphasise the importance of connecting CS/CSR and RI to companies' core business, culture, and leadership (Lampikoski, Westerlund, Rajala, & Möller, 2014). The BE researchers examine how different forms of CSR engagement affect innovation, e.g. through the rate of new product introductions (Murcia, 2020). Scholars also find that specific aspects of CSR, such as engagement with different stakeholders through a variety of pathways improve innovation (Bendell & Nesij Huvaj, 2020) or being part of the network of companies and other stakeholders can lead to innovation through cooperation and competition, especially for SMEs (von Weltzien Høivik & Shankar, 2011).

In terms of the influence of innovation on CSR, the BE body of literature focuses on the innovation capabilities of companies as the major factor influencing their responsibility. Empirical research shows, for instance, that innovation capability positively influences CS (Lai et al., 2015) because it can help companies to deploy

their resources to advance strategies in the field of human rights, labour, the environment, and anti-corruption (Ayuso, Roca, Arevalo, & Aravind, 2016). Furthermore, scholars dive deeper into the logic and timing of innovation finding that e.g. companies benefit by strategically investing more in CSR companies post-innovation to develop valuable reputational resources and reduce capital constraints (Mishra, 2017). Furthermore, innovation plays a mediating role in the connection between companies' CSR and their performance, namely economic (Blanco et al., 2013; Rodgers et al., 2013) and social (Wagner, 2010; Groves et al., 2011; Shahzad, Mousa, & Sharfman, 2016; Dey et al. 2020; Vishwanathan, van Oosterhout, Heugens, Duran, & Van Essen, 2020); or more specifically between CSR and differentiation strategy (Barin Cruz et al., 2015; Updahaya et al., 2018). It is because companies pursuing innovation-oriented strategies are more likely to benefit from CSR and are more tolerant of the risk and uncertainty involved with such engagement (Yuan et al., 2020).

The great majority of the IM literature discusses the third aspect of the relationship between innovation and companies' responsibility from the perspective of how innovation may contribute to addressing grand societal challenges and enhancing companies' responsibility. According to the IM literature, innovation is increasingly anticipated to solve social and environmental issues as well as economic goals, taking into account the needs of all stakeholders (BE e.g. Mirvis, Herrera, Googins, & Albareda, 2016; in IM e.g. Nicolopoulou et al., 2017). The IM research claims that climate change, poverty, sustainability, health and security serve as inspiration and drivers of technological innovation e.g. new products, services, and business models, and thus those challenges should be treated as business opportunities (e.g. De Marchi, 2012; Veugelers, 2012; Pandza & Ellwood, 2013; Juntunen et al., 2019). Scholars recognise that the goals of sustainable development and business success are no longer an either/or proposition, and thus we observe the acceptance of making the business case of RI (Nameroff et al., 2004; Pujari, 2006). At the same time, companies themselves heavily contribute to the creation and intensification of social and environmental challenges through modes of production and consumption (Epicoco, 2016; Giuliani, 2018). Empirical research in the IM stream confirms this link and provides evidence for a positive direct effect of innovation on CSR, namely new process development or process improvements aiming to reduce energy, waste, or emissions, and providing healthier or safer working conditions (Fu et al., 2020). Interestingly, the empirical studies show businesses can still benefit from CSR even if they do not innovate out of a concern for CSR returns and do not assess the CSR

potential (Ramani & Mukherjee, 2014). Similarly to the BE stream, authors also investigate the relationship between RI and companies' performance (e.g. Zhang & Walton, 2017).

The theme of synergies between companies' responsibility and innovation is closely linked to the next two themes, namely the benefits of RI and drivers of IR discusses in the next sections.

2.5.2 Benefits of RI

Overall, a large part of the articles in both streams steps into a broader discussion about WHY companies should act responsibly. Researchers examine the value of RI investigating what benefits responsibility may bring to companies, society and the environment. Those benefits can be divided into two categories, i.e. (1) internal benefits for the company, including improved performance, competitive advantage, strengthening reputation, improvement of products and processes, cost reduction, value creation, employee engagement, recruitment quality, an enhanced network of stakeholders, risk reduction, growth of the company, customer satisfaction and lower turnover of employees; and (2) external benefits to society and the environment, such as addressing grand societal challenges, bringing value to stakeholders, communities and country, as well as enhancing human rights and ethical and moral values. While generally, both literature streams are congruent, there are slight differences regarding the importance they give to those various benefits. The overview with corresponding literature is presented in *Annex*. It should be noted, however, that this distinction is not sharp and both types of benefits are interdependent and fluid. Both BE and IM streams pay attention to the question of balancing societal and environmental needs with business objectives. The most discussed benefits are presented in the following subsections, namely performance, competitive advantage and grand societal challenges.

Performance (financial, social and sustainable)

The most important research area dealing with RI's value is the discussion around the relationship between companies' responsibility and performance, where performance can be understood as either financial or social. The great majority of articles in the BE stream refer to the argument of a positive association between financial and social performance, however as highlighted by Achi et al. (2022), Vishwanathan et al. (2020), Bocquet et al. (2017) and Blanco et al. (2013), the literature is rather inconclusive about the explanation for this association. The main argument is that this relation is

rather complex and requires finer-grained research looking at various aspects of responsibility and context (Vishwanathan et al., 2020). Therefore, some scholars incorporate innovation as a potential omitted variable looking at the causality effect, moderating or mediating effect of innovation. As explained by Husted et al. (2015) the direction of the causality seems to be two-way. On the one hand, companies' social and environmental goals spur product and process innovation as well as the growth of valuable resources and capabilities. In other words, companies with a responsibility orientation are likely to promote innovative solutions to solve grand societal and environmental challenges (Voegtlin and Scherer, 2017). On the other hand, the ability to create new products and services for the market is more likely to use that same capability in other context, such as its positioning concerning changing social expectations and issues in ways that will help the business generate profits. Furthermore, innovation may lead to more efficient processes, which can then lead to a reduction in energy use and pollution. This link can be traced back to a couple of crucial publications, mainly by McWilliams and Siegel (2000) and Pavelin and Porter (2007) (e.g. Padgett & Galan, 2010; Blanco et al., 2013; Rodgers et al., 2013; Barin Cruz et al., 2015; Bocquet et al., 2017; Mishra, 2017; Rothenberg et al., 2017; Broadstock et al., 2020). McWilliams and Siegel (2000) empirically demonstrated that CSR is positively correlated with innovative activities "because both are associated with product and process innovation" (p. 608). However, as the authors emphasize, investing in CSR and innovation induces improved long-term performance instead of short-term profit maximization. Pavelin and Porter (2007) empirically investigated the influence of innovation on the relationship between corporate strategy and social issues arguing that to improve their social performance companies need new technologies to adapt production processes and product design. Scholars contribute to this discussion with empirical evidence that companies' engagement in CSR activities stimulates the development of their innovation capacity, which has an impact on performance levels (Mishra, 2017; Voegtlin & Scherer, 2017; Broadstock et al., 2020; Vishwanathan et al., 2020). They demonstrate how innovation plays a mediating role in the relationship between CSR and performance (Rothenberg et al., 2017; Rodgers et al., 2013; Achi et al., 2022); and that higher performance can be achieved through adopting CSR practices through appropriate environmental and social measures along with RI (Dey et al., 2020). This discourse fits in a broader idea of connecting companies' responsibility with a business strategy framework, according to which that can improve corporate competitiveness and economic and financial

performance, known as a Business Case for CSR (Sánchez & Benito-Hernández, 2015; Shin et al., 2018).

In the IM stream, the sustainability and environmental focus is evident. Scholars specifically investigate what factors influence market performance. They emphasize that performance has been focused on financial success, however, there is a need to draw market share away from traditional products, make a positive societal impact and focus on sustainability performance, which is based on all three bottom line items (economic, environmental and social) (Juntunen, 2019). Therefore, companies should aim for superior performance over competitors, with new products designed to be economically, socially and environmentally sustainable (de Guimarães et al., 2021). Articles in the IM stream empirically investigate how sustainable and environmental innovation provides a differentiation advantage that will affect companies' performance (Pujari, 2006; Zhang & Walton, 2017; Andersén, 2021). For instance, Pujari (2006) argues that the “impact of greener products can be considered successful only when these are able to replace environmentally harmful products at the marketplace” (p. 83). In addition to product differentiation, new process development or process improvements aiming at energy, emission or waste reduction, and providing healthier or safer working conditions constitute a further approach to creating synergy between innovation and CSR (Fu et al., 2020). For instance, through creating new resources and skills (De Marchi, 2012; Ramani & Mukherjee, 2014; Zhang & Walton, 2017). Furthermore, Bammens and Hünermund (2020) emphasise that an exclusive focus on immediate financial returns promotes cherry-picking instead of more comprehensive pro-environmental approaches, and many companies appear to go green even in the absence of direct financial rewards.

Competitive advantage

The second benefit commonly discussed in both streams was a competitive advantage. In the BE stream, the theoretical underpinning of this argument is an article by Porter and Kramer (2006), arguing that CSR can be an innovation and a source of opportunity, and thus can bring competitive advantage. According to the authors, in the value chain and product offering, there are numerous opportunities to pioneer innovations that will benefit society and a company's competitiveness (Porter & Kramer, 2006). Following this logic, the competitive advantage comes from a differentiation strategy, which involves the creation and development of new products or services with social and environmental attributes, thus providing better services to customers than competitors (Upadhaya et al., 2018; Liu et al., 2020). Upadhaya et al.

(2018), Voegtlin & Scherer (2017) and Boehe & Cruz (2010) refer to a competitive advantage building on successful product differentiation (McWilliams and Siegel 2000). Padgett and Galan (2010) emphasize the fact that both CSR and innovation are based on companies' ability to possess intangible resources, such as knowledge (Murcia, 2020) or reputation (Mishra, 2017), which they link to companies' competitive advantage. However, as emphasized by Barin Cruz (2015) although individual products may be considered responsible, "the differentiation position of the entire firm does not necessarily benefit from product-related CSR because the firm's differentiation position may lag behind or precede its product differentiation position" (p. 727). Similarly, in the IM stream, e.g. Antonioli et al. (2013) argue that companies need to fully integrate environmental innovation in their innovation strategies to transform from 'green washing' or 'ancillary' strategies into a key strategic aspect redefining their competitive advantages. Andersén (2021), empirically investigates a complex link between RI, profitability and competitive advantage showing that green product innovation can help firms to strengthen or to develop a differentiation advantage and this ultimately can lead to enhanced firm performance. Ramani & Mukherjee (2014) highlight previous research on competitive advantage and strategic CSR investment, claiming that "investment in innovation that creates value for society by addressing its needs or challenges like food insecurity or environmental degradation (...) makes the firm more competitive or creates new markets for the firm in the long run" (p. 298).

Societal challenges

The role of the companies in addressing 'grand societal challenges' such as poverty, climate change, human rights, and other social and economic development issues is greatly recognised in both streams of the literature, where companies are 'part of the solution' (in BE e.g. von Weltzien Høivik & Shankar, 2011; Arora & Ali Kazmi, 2012; Gauthier & Genet, 2014; Alt & Craig, 2016; Segrestin et al., 2021; in IM e.g. Antonioli et al., 2013; Pandza & Ellwood, 2013; Lehoux et al., 2021). The IM stream articles provide empirical findings in this regard (Ramani & Mukherjee, 2014; Crupi et al, 2022). Ramani and Mukherjee (2014), empirically prove that companies can make a difference by creating radical innovations that improve the lives of the poor and whenever social welfare is marketed, CSR returns soar as well. For instance, the recent COVID-19 pandemic pushed society but also companies to develop innovative solutions in terms of products (e.g., to cover the shortage of masks) and processes (e.g., new tests for the virus tracking) (Crupi et al., 2022). In the BE stream, a bi-directional

link is observed, where grand societal problems may drive (technological) innovation (BE e.g. von Weltzien Heivik, 2011; Sánchez & Benito-Hernández, 2015; IM e.g. Pandza, 2013; Juntunen, 2019), for instance, by tapping into markets which are not covered by the government such as health-care system, green energy, telecom and GPS systems (von Weltzien Høivik & Shankar, 2011). Furthermore, companies may use RI tools, such as social innovation, to enhance their markets and supply chains and reach socially-conscious and green consumers, and explore markets at the base of the pyramid (BoP) (Mirvis et al., 2016). The IM research highlights that companies increasingly employ RI tools such as open social innovation (Rayna & Striukova, 2019), digital social innovation and crowdsourcing to find innovative solutions to socio-technical challenges and social problems while creating value for society and business (e.g. OpenIDEO) (Kohler & Chesbrough, 2019).

However, the pressing ‘grand challenges’ require more than technological solutions (Kohler & Chesbrough, 2019), and thus RI offers a holistic approach. Therefore, BE stream authors emphasise that such challenges require systemic solutions, and while companies play a key role, such challenges require cooperation within companies (e.g., across business functions) (Munten, Vanhamme, Maon, Swaen, & Lindgreen, 2021) and engagement of the entire sustainable development community (Arora & Ali Kazmi, 2012; Munten et al., 2021). RI is an important means of addressing societal challenges and reaching Sustainable Development Goals (SDGs) (Voegtlin & Scherer, 2017; Voegtlin et al., 2022). Authors argue that RI serves as a framework for evaluating innovations for their “potential harmful consequences, on one hand, and their potential positive contribution to societal challenges, on the other” (Voegtlin et al., 2022, p. 2), which however requires governance mechanisms that facilitate RI innovations (Voegtlin & Scherer, 2017).

Barriers to RI

While scholars in both streams investigate the benefits and positive impact of RI, the discourse advocating for investing in responsibility in the context of innovation also acknowledges challenges and discusses arguments against investment in RI. The BE research identifies barriers related to the leadership of the company such as the company’s dependency on the attitude of the entrepreneur, especially among micro companies (Sánchez & Benito-Hernández, 2015), uninspiring purpose and vision which might be caused by a lack of strong storytellers and visionaries, lack of trust and the fear of losing control (Lampikoski et al., 2014). Furthermore, RI might be discouraged by the lack of financial and human resources as well as lack of endurance,

networking and learning to engage with external stakeholders which generally enhance companies' social and environmental performance, however, may also expose a company to trade secrets and make it vulnerable to competition (Lampikoski et al., 2014). One of the major obstacles relates to generating added societal and ecological value but also economic ambitions (Sullivan, 2005; Munten et al., 2021). Furthermore, scholars also highlight unequal access to the benefits created by RI and difficulty in differentiation from competitors (Munten et al., 2021) because of e.g. a myriad of labels making it difficult for companies to choose and consumers to know which labels to trust (Lampikoski et al., 2014). In the IM stream, a similar challenge of balancing societal, environmental and economic value creation was identified (Antonioli et al., 2013; Ramani & Mukherjee, 2014; Lehoux et al., 2021), including lack of resources or data to fully report and communicate the economic, social and/or environmental value in use of their innovation (Lehoux et al., 2021).

2.5.3 Drivers of RI

While generally, both streams address similar topics (to a great extent), one distinct and significant topic has emerged in the IM literature, namely drivers of RI. This topic is hardly reflected in the BE stream, besides Voegtlin and Scherer (2017) and Gauthier and Genet (2014). Drivers or incentives could be perceived as a specific type of RI's benefits. Nevertheless, the IM articles use this specific term 'drivers' in the context of a motivating force and a stimulus to incite action, where incentives are not an objective, per se; they are a tool to achieve strategic goals and objectives (Gurzawska et al., 2017). The IM articles discuss drivers of RI which could be divided into two groups depending on where the determinants of RI can be looked for in the internal and external dimensions of organisations, thus: (1) internal or private incentives, and (2) external or public incentives (Nameroff et al., 2004; De Marchi, 2012; Borghesi et al., 2015; Kunapatarawong & Martínez-Ros, 2016; García-Granero, Piedra-Munoz, & Galdeano-Gómez, 2020; Stojčić, 2021). Examples of the first group include the organisation's capabilities and companies' awareness, and the latter group includes customer requirements and public and governmental incentives (e.g. policies and regulations both hard and soft laws, taxes, subsidies and procurement of eco-innovations). Ramani & Mukherjee (2014) calls for any CSR-related incentives embedded in industrial or science and technology policies to promote the possibility for CSR investment in innovation, especially for bottom-of-the-pyramid (BoP) communities, in addition to the traditional philanthropy and local community development investment. Since the IM stream is heavily focused on RI in the

environmental context, several articles explore drivers for companies to engage in environment-related innovation. Empirical findings by Stojčić (2021) demonstrate that both private (in their study demand incentives and reputational concerns) and public incentives have positive effects on the introduction of environment-related innovations. Yet the author finds that companies introduce innovations with benefits for end-users only if they are accompanied by private benefits (Stojčić, 2021). Therefore, according to their study, a mix of public and private incentives increases the likelihood of introducing environmental improvements with positive social impacts. Similarly, Del Brío & Junquera (2003) in their literature review find that specifically for SMEs, environmental motives are not sufficient for strategic changes; only environmental regulations and markets combined with other external forces, stimulate adequate environmental approaches.

Among public or external drivers, particular attention has been devoted to regulation and the way it might trigger innovation. As discussed by Kunapatarawong and Martínez-Ros (2016), technology-push and market-pull factors may not provide enough incentives. The cost of green innovation is borne by companies, and thus if markets do not punish companies for their harmful environmental impacts, green innovators will have little chance to compete with non-green companies. Therefore, the environmental regulatory framework becomes one of the crucial driving forces of RI. Most contributions confirm this claim, where regulation plays a crucial role. Stojčić (2021), Borghesi et al. (2015), Kesidou and Demirel (2012), and Popp, Hafner, and Johnstone (2011) and empirically show that current and future environmental regulation is a major driver for environment-related innovation and highlight the importance of well-designed, long-term and time-consistent policies that promote e.g. cleaner technologies and energy efficiency. Kesidou and Demirel (2012) find that businesses respond to strict environmental legislation with higher levels of innovation, which has an impact on environment-related innovation. In addition, Kesidou and Demirel (2012) show empirically that demand factors such as customer demand and CSR are important initiators of environment-related innovations, nevertheless, they are not sufficient and need to be supported by correctly aligned regulatory frameworks. However, their findings also suggest that environmental regulations are especially important in encouraging less innovative companies to participate in environment-related innovation activities.

In addition to environmental regulation, Rayna and Striukova (2019) claim that also in the context of social innovation, policies that facilitate open innovation among startups help increase their chances of survival. At the same time, Zhang et al. (2011)

note that pushing environment-related innovations to the market without consumer demand, so when consumers do not want to buy these innovative products may be a losing strategy, for instance in the alternative fuel vehicles sector. In line with this argument, survey-based research by Veugelers (2012) shows that while companies are generally responsive to regulations and policies, the demand-pull from customers and voluntary codes of conduct or voluntary sector agreements seem to be crucial for introducing environment-related innovations. Therefore, if governments want to incentivise the development and adoption of environment-related innovations, their regulations and policies need to be time consistent, credible and designed to affect the expectations of the market (Veugelers, 2012).

The diversity of findings could be explained by the research of Popp et al. (2011), who empirically investigate incentives for environment-related innovation in the paper sector and find that both regulation and consumer pressure influence the rate and nature of innovation. However, they also show that different drivers work best depending on the phase of innovation. According to their study, the first wave of innovation responds to consumer pressure and results in the first round of innovation demonstrating the technical feasibility of environment-related solutions (in the paper: reduction of chlorine use in the paper manufacturing process). This has led to regulation followed by both increased innovation and increased adoption of environment-related technologies. In addition, the authors found that in the case of the paper, although product labelling is unquestionably important for consumers, the formalised labelling schemes do not appear well-suited for stimulating additional innovation about specificities of environment-related innovation in the context of the paper. As argued by the authors, the understanding of links between drivers of innovation in the paper could be extended to other contexts, such as genetically modified food in European markets (Popp et al., 2011). Research by Lehoux et al. (2021) enhances those findings, by arguing that “social and environmental value creation does not simply stem from individual motivations or a heightened sense of entrepreneurial responsibility” (Lehoux et al., 2021, p. 569). Thus, drivers in the form of managerial and financial support should be adapted to companies’ “respective value proposition and capacities to produce responsible innovations or contribute to responsible value chains and value networks” (Lehoux et al., 2021, p. 569).

2.5.4 Implementation of RI

The last but extensive topic that has emerged in both streams of the literature is the question of how RI should be and how it is implemented in companies. Both streams

of the literature explore various aspects of how companies put RI into action and reflect on the current practices of companies. Typically, these studies either discuss internal aspects of the company (internal environment), such as organisational culture and employee engagement, leadership and knowledge management, and external aspects of the company (external environment) such as stakeholder engagement, discussed below. Furthermore, it is evident that both streams of literature search for connecting RI to the company's strategy.

Internal environment

RI involves integrating responsibility criteria (e.g. environmental, social, etc.) into the internal environment of a company, including processes such as strategy development, product development, marketing, and performance management across a company's functions (Watson et al., 2018). However, a responsible approach to innovation and doing business require changes in behaviour and organisational as well as technological innovations (Isaksson et al., 2010), involving employee engagement, leadership and knowledge management.

Organisational culture and employee engagement

BE literature emphasizes the important role of organisational culture (Dossa & Kaeufer, 2014; Lai et al., 2015; Upadhaya et al., 2018), particularly in terms of innovation and respect for people, as a crucial element for integrating CSR into business strategy, which in turn may help create value for shareholders as well as stakeholders (Upadhaya et al., 2018). Several articles also explore the role of gender diversity and its relation to innovation (e.g. Arora & Ali Kazmi, 2012; Liu et al., 2020). CSR related to employee relations (e.g. job satisfaction, a healthy and safe workplace, diversity and equal opportunities, respect for human rights) may serve as an important talent management tool stimulating employees' engagement in innovative projects and e.g. contribute to higher rates of new product innovation (Murcia, 2020). There is a strong link between employee-related CSR and the investment, success, and value of innovative activities thanks to e.g. better risk assessment of long-term projects such as innovation (Mishra, 2017; Garel & Petit-Romec, 2020).

Empirical findings show that innovative and responsible companies are those hiring or fostering socially responsible employees and creating safer working environments (Ueki et al., 2016; Murcia, 2020). In addition, skilled employees are fundamental for stimulating innovation and other customer-oriented achievements with CSR activities (Ueki et al., 2016). Therefore, companies need to invest in skill

development training enriching employees' understanding of the importance of fulfilling CSR for multiple stakeholders (Ueki et al., 2016; Domínguez-Escrig et al., 2019), increasing participation in decision-making, and motivating autonomous employee efforts (Rothenberg et al., 2017). At the same time, strategies of change-makers and employee engagement in RI should be diversified and adapted to cherish the creativity process and avoid routinization, ranging from resourcing to creative thinking to teaming and multi-party collaboration to project management (Mirvis & Googins, 2018). In the context of social innovation, companies explore the engagement of employees as change agents (also known as social intrapreneurs) (Alt & Craig, 2016) in internal innovation labs and contests, collaboration with social entrepreneurs, pro bono programs, enterprise-wide social innovation (Mirvis & Googins, 2018). Delmas & Pekovic (2018) find that job strain has both negative and positive effects on RI, however, employees' pay satisfaction is an important source of sustainable innovation through its buffering effect on job strain, because employees who are satisfied with their pay may endure more work-related strain to facilitate the development of innovation improvement. However, R&D talent cannot directly influence corporate innovation capability; but leadership and organisational cultures are critical factors to facilitate corporate innovation capability and stimulate strategic CSR effectively (Lai et al., 2015).

The IM literature is less focused on the organisation culture and employee engagement of the company. However, some articles on environment-related innovation highlight the importance of the corporate culture, acquiring more environmentally friendly human capital in promoting more sustainable work habits that enhance RI (García-Granero et al., 2020) and employee engagement (Watson et al., 2018). On the other side, as emphasised by Giuliani (2018) deviant practices may become normalised and incorporated into organisational routines which may become a structural problem.

Leadership

In addition to organisational culture and employee engagement, the BE literature emphasises the crucial role of leadership in implementing RI and stimulating corporate social and environmental behaviours (Lampikoski et al., 2014; Bendell & Nesij Huvaj, 2020). Leaders aware of the grand societal challenges and engaged in the societal impact of their organisations contribute to creating a positive organisational culture among team members and stimulating RI. Responsible leadership enhances companies' financial and non-financial performance (Domínguez-Escrig, 2019). As

emphasised in the IM literature, leadership encourages organisational activity that is values-based and incorporates a social agenda for innovation (Nicolopoulou et al., 2017), and has a pivotal role in making sustainability efforts legitimate and influences key decisions (Juntunen et al., 2019). Successful implementation of RI requires leaders to change their management, a combination of behaviour change and organisational as well as technological innovations allowing long-term and far-reaching changes (Isaksson et al., 2010). Interestingly, SMEs and family-owned companies are better positioned to stimulate RI than large companies, because they are more sensitive to reputational considerations (Bammens & Hünermund, 2020). However, there is a need for further research about how leaders utilize and transfer their social and environmental knowledge to support investment in innovation across their organisations through procedures that drive the company's social behaviour and use this experience for implementing associated responsible behaviour (Bendell & Nesij Huvaj, 2020). This should also include acknowledging the importance of failures (Lampikoski et al., 2014).

The BE scholars also emphasise the need for diversity in leadership. Liu et al. (2020) investigate how the presence of women in the male-dominated boardroom may enhance firm performance and find that innovation-intensive companies must recruit more female directors to the boardroom. At the same time, the authors emphasize two critical conditions for making it successful, first female directors should possess power, and second companies need to have the motivation to embrace CSR driven e.g. by corporate strategy such as innovation.

Knowledge management

The internal culture of the company which is based on social responsibility can lead to sustainable internal and external learning processes (Hanke & Stark, 2009). For instance, employees engaged in CSR/CS projects have the opportunity to transfer and reflect on their experiences in their daily business routines (Hanke & Stark, 2009). These learning processes are driven by participation and empowerment and are a result of corporate culture and human resource development regarding social competencies (Hanke & Stark, 2009). Therefore learning, knowledge management and knowledge sharing are significant factors for implementing RI as highlighted by BE scholars (e.g. Lai et al., 2015; Mirvis et al., 2016; Murcia, 2020) and IM literature (e.g. Fu et al., 2020; Crupi et al., 2022).

According to Crupi et al. (2022), in order to respond to external problems and satisfy changing market demands, agile organisations apply prior knowledge while

also adding new learning patterns from current experiences. At the same time, as shown in environment-related innovation, to reach its environmental objectives, a company has to engage in organisational unlearning and renewal of capabilities and improves a company's ability to innovate (Lampikoski et al., 2014). Tenacious social and environmental problems often require a holistic and more effective approach and thus new ways of learning to involve a transformational change in both technical and organisational aspects (Lin, 2019). Companies do not have an established playbook for RI and must learn and share knowledge with their partners and stakeholders to produce successful innovations to generate broader value and enhance environmental and social performance (Mirvis et al., 2016; Munten et al., 2021).

The research results show that the most innovative companies are likely to combine management methods while pursuing sustainable product development, the combination of practices and management methods can lead the way towards firms developing unique competitive advantage, especially for SMEs (de Guimarães et al., 2021). Implementation of RI requires holistic solutions and a holistic knowledge that reside in various functional areas of a company, from the explicit technical knowledge of the departments that regularly undertake innovative activities or CSR and CS specialists (e.g. sustainability officer or head of corporate compliance), to the less obvious sources of knowledge, such as marketing, supply chain management, investor and public relations, or human resources (Bendell & Nesij Huvaj, 2020).

External environment

Regarding the external environment within which the organisation operates, collaboration and interaction with external stakeholders play a crucial role in implementing RI.

As emphasised by the BE scholars, RI emerges out of interactions, both conflictual and collaborative, including interactions with government officials, contractors, external rating and auditing firms, other field-level actors, activists and grassroots organisations within the wider social political, and cultural context in which all are embedded (e.g. BE stream Flanagan & Whiteman, 2007; Carberry et al., 2019; Bendell & Nesij Huvaj, 2020; IM stream Pujari, 2006). Engagement with different stakeholders improves innovation, for instance through enhanced learning capabilities and creating synergies, which then lead to greater innovation outcomes via increased investment in innovation (Lampikoski et al., 2014; Bendell & Nesij Huvaj, 2020).

The IM research highlights the 'networked nature of value creation', and thus RI requires responsible third parties (e.g. suppliers), more evenly 'networked'

responsibility, and a collaborative value-sharing strategy rather than a competitive strategy (Lehoux et al., 2021). Stakeholder engagement implies social networking and expanding companies' governance structures to create new contacts and connections with crucial players who have useful resources or skills (Crupi et al., 2022). The IM empirical research shows that stakeholders with different perspectives, expertise and resources, use their different entrepreneurial skills to co-create both social and business value (De Silva & Wright, 2019). Interestingly, because of their systemic, credible, and complicated characteristics, collaboration is more intense when it comes to environment-related innovation, and this entails more interdependencies with external partners (De Marchi, 2012). This argument could be also extended to other types of RI innovation. However, only meaningful stakeholder engagement can lead to the achievement of high-performance innovation (Juntunen et al., 2019). Stakeholders often challenge internal thinking in the company, and therefore to truly integrate them into the company's RI practices, the presence of top management or multiple members of the innovating organisation and their direct exposure to stakeholder voices helps in absorbing the views and conceptions of stakeholders (Juntunen et al., 2019). Furthermore, RI is context-specific (Boehe & Cruz, 2010; Arora & Ali Kazmi, 2012), thus when implementing RI companies need to focus on specific market segments and countries and tailor their strategies and approaches (Boehe & Cruz, 2010; Ramani & Mukherjee, 2014).

One type of stakeholder engagement is multi-stakeholder collaboration, such as government-business partnerships (or public-private). The BE scholars highlight that multi-stakeholder collaboration encourages innovative and knowledge-creation activities through mutual learning because various government, business, and civil society partners are better able to share resources and risks associated with RI (e.g. Lin, 2019). In multi-stakeholder collaboration, partners move away from a transactional and tactical relationship, which deepens the relationships and makes their work more innovative (Mirvis et al., 2016). Partners are also more likely to engage in structured, planned, mutual knowledge exchange and co-create innovations (Mirvis et al., 2016). However, companies should be strategic in terms of their stakeholder engagement and collaborate with those stakeholders that are best suited to the organisation's strategic goals and constraints (Lampikoski et al., 2014). As highlighted by the IM literature companies must decide how many and which stakeholders to include in the creation of new products, as well as at what time and who to assign the duty of engaging stakeholders (Juntunen et al., 2019). Therefore, the impact of stakeholder engagement in RI depends on the quality of engagement

(Juntunen et al., 2019). At the same time, BE research calls for a more holistic approach to stakeholder engagement with a broad network of stakeholders and highlights the impact of tensions caused by power asymmetries and conflicting interests on societal outcomes (Munten et al., 2021).

While implementing RI through stakeholder engagement, it is crucial to make a distinction between large companies and SMEs. While large companies often adopt the consolidated and formalised approach to stakeholder engagement, SMEs use a more informal approach and instead of managing a wide network of stakeholders they focus on a range of stakeholders (Groves et al., 2011).

Strategy

Both streams of the literature discuss RI in the context of business strategy and management approaches on the one hand related to CSR and CS, and on the other broader innovation management.

The BE literature explores the connection of RI to strategic CSR linking CSR and innovation with the creation of synergetic effects and generating greater innovation and growth (e.g. Boehe & Cruz, 2010; Barin Cruz et al., 2015; Lai et al., 2015; Bocquet et al., 2017; Mishra, 2017). Several articles build on the concept of strategic CSR, as explained by Porter & Kramer (2006):

the prevailing approaches to CSR are so fragmented and so disconnected from business and strategy as to obscure many of the greatest opportunities for companies to benefit society. If, instead, corporations were to analyse their prospects for social responsibility using the same frameworks that guide their core business choices, they would discover that CSR can be much more than a cost, a constraint, or a charitable deed—it can be a source of opportunity, innovation, and competitive advantage (p. 80).

Initially coined by Baron (2001) and developed further by McWilliams and Siegel (2000), strategic CSR moves beyond avoiding harm to building focused, proactive, and integrated social initiatives selective initiatives, with the social and business impact that are large and distinctive. Strategic CSR involves both the external and internal environment of the company integrated with its core strategies (Porter & Kramer, 2006). Strategic CSR seeks to create competitive advantages and economic value by positioning the company, its products and its processes as socially and environmentally responsible in the minds of clients and other stakeholders (e.g. Boehe & Cruz, 2010; Boulouta & Pitelis, 2014; Husted et al., 2015; Barin Cruz, 2015; Bocquet et al., 2017); through e.g. a total quality management approach and active stakeholder management (Boehe, 2010), enhancing its reputation, mitigating firm-

specific risk, and/or improving innovation (Vishwanathan, 2020). Strategic CSR is about going beyond compliance and taking part in activities that can promote social and environmental objectives while attempting to maximize value for companies via stakeholder management and by adhering to their business strategy (Boehe & Cruz, 2010; Barin Cruz, 2015). However, Voegtlin et al. (2022) challenge strategic approaches to CSR in connection to innovation, as they are difficult to pursue in volatile, turbulent, and fast-changing environments, such as those related to innovation, and new and emerging technologies. In addition, they claim that strategic CSR focuses on eliminating the negative effects on company performance instead of addressing the root causes of grand societal challenges and developing positive effects of business on society (Voegtlin, 2022).

Scholars connect companies' responsibility and innovation through a CSR-driven innovation or strategic CSR innovation approach (Bocquet et al., 2017). Empirical findings in both streams of the literature suggest that companies' responsibility is not merely a philanthropic activity of 'doing good', but it has a strategic aspect and value reducing the tension between profit motives and the imperatives of sustainable community development (e.g. Arora & Ali Kazmi, 2012; Ramani & Mukherjee, 2014; Zhang & Walton, 2017; Fu et al., 2020; Yuan et al., 2020). Companies pursuing innovation-oriented strategies are more likely to effectively integrate CSR and CS into their business strategy, take advantage of their CSR and CS approach, and are more resilient to uncertainty and the risk associated with such engagement (Upadhaya et al., 2018; Yuan et al., 2020). Furthermore, studies show that innovative companies should not push responsibility for responsibility's sake, but work through it by making it a business opportunity (Padgett & Galan, 2010; Lampikoski, et al. 2014). For instance, in the context of environment-related innovation, Antonioli et al. (2013) argue that full integration of business responsibility in companies' innovation strategies is possible and needed to evolve RI from 'green washing' or 'ancillary' strategies into a key issue in companies' redefinition of competitive advantages.

Therefore, much depends on the extent to which companies' responsibility is fully integrated into the strategy and innovation culture of an organisation and whether a company has a coherent strategic program (Mirvis & Googins, 2018). Implementation of RI requires a strategic approach linked to organisational capabilities, which involves purposive recombination of resources, proactive search for opportunities in discovering solutions to grand societal challenges, and interaction with the external environment to tackle the constraints on action (Pandza & Ellwood, 2013). Businesses who completely incorporate CSR or CS into their business strategies outperform their

competitors in terms of innovation and economic performance, and they also gain from value creation (Bocquet et al., 2017) confirming the hypothesis put forward by Porter and Kramer (2006). It is because they manage costs more effectively, better determine CSR activities that might be necessary to meet stakeholder expectations, and ultimately they fully benefit from the differentiation strategy linked to companies' responsibility (Boehe & Cruz, 2010; Padgett & Galan, 2010). The differentiation strategy can involve both company-level and product-level, where companies and products are differentiated by their CSR-related features Barrn Cruz et al., 2015).

At the same time, the BE research highlights that it is crucial to recognise the diversity of RI, CSR and CS and adapt strategies accordingly, e.g. environment-related innovations have diverse logics calling for different managerial activities that serve distinct goals in meeting a company's environmental challenges (Lampikoski et al., 2014). As noted by Fu et al. (2020), we should change our perception of companies' responsibility, that they are either responsible or irresponsible; rather they can be both at the same time (Fu et al., 2020). Empirical findings of the IM research show various strategies for implementing RI depending on the type of company (Crupi et al., 2022) and the type of CSR (Fu, et al., 2020). Furthermore, RI is a long-term investment (Lampkoski et al., 2014), however shorter-term competitive requirements and market-related pressures can undermine the development of long-term systemic and strategic approaches to achieve truly responsible and sustainable outcomes (Munten et al., 2021). At this point, empirical findings show that the strategic approach to RI is in its infancy. For instance, the case studies research by Ramani & Mukherjee (2014) shows that maximization of CSR returns was not taken into account in companies' innovation creation or diffusion strategy. Even in the case of environment-related innovation, which is arguably the most developed type of RI, the share of eco-companies and integration of environment-related innovation in their strategies is still limited even in advanced countries that are seeking new competitive tools (Antonioli et al., 2013).

2.6 Discussion and future research agenda

Based on the presented findings, this study proposes an agenda for future research that connects the two disciplines and beyond. The proposal builds on the current knowledge about the conception and practices of RI in industry and identifies areas that we should understand better from theoretical and practical perspectives. While some recommendations are new directions for integrating previously distinct, and

occasionally broader, discussions from the BE, IM, and RI research, others are incremental contributions that help close gaps in prior research.

2.6.1 Perception of RI in business

The gap between the conceptual foundations on which researchers from two literature streams base their work is a key problem from a theoretical standpoint. Despite growing interest in RI, the RI conception in business is still in a sensitive phase of theory building and remains a rather niche topic in the mainstream BE and IM literature.

The analysis shows that there is a real concern that market-driven technological innovation may lead to outcomes that are contrary to sustainable development and the welfare of future generations (e.g. Ramani & Mukherjee, 2014). Therefore, the conception of RI in the business context heavily focuses on the outcome of innovation, namely products, processes and services, and their impact on society and the environment and how they contribute to sustainable development and addressing grand societal challenges. RI in business is about innovation that does not harm people and the planet, but at the same time it moves a step forward to “do good”. RI is about companies redefining the purpose of the technologies they develop. At the same time, it is also argued that the pressing grand challenges require more than technological solutions (Kohler & Chesbrough, 2019). Therefore, RI is an opportunity to enrich both business responsibility and innovation management with a mission, objectives and mechanisms such as anticipation, reflection, inclusion, mutual responsiveness of societal actors and innovators, ethical acceptability, sustainability and societal desirability of the innovation process and its marketable products (Stilgoe, et al., 2013; von Schomberg, 2013).

It should not be assumed that RI is a completely new concept for business and innovation. This research reveals topics discussed in the mainstream BE and IM literature, namely (1) the relationship between companies’ responsibility and innovation, including possible synergies between responsible business (CSR, CS) and innovation, specifically a bi-directional link between them; (2) benefits of RI, such as improved performance, competitive advantage, but also finding solutions to grand societal challenges; and (3) drivers of RI, including policies and regulations both hard and soft law, taxes, subsidies and procurement of eco-innovations. Nevertheless, what is striking is that the term ‘responsible innovation’ and its of-cited features (such as anticipation, reflection, inclusion, and mutual responsiveness) are not commonly used in the mainstream literature, neither in BE nor IM research. Even if the authors refer

to RI and relevant RI literature, they create their definitions of RI, which not always are convergent with the conceptions of RI developed by scholars or policy-makers. RI is understood and defined in many different ways, from sustainable innovation, environment-related innovation, and social innovation to open innovation and more. Furthermore, in terms of defining the responsibility of companies for their innovation activities, BE scholars mainly focus on the CSR and CS framework, but the IM literature shies away from using well-known business responsibility concepts (e.g. CSR, CS) and use general terms such as ‘doing good’ without specifying what it entails. In addition, the IM authors are much more focused on the environmental aspects of innovation than the BE authors, for whom RI is often a package of social and environmental impacts. While this division is logical in some ways, due to differences in research focus, it may however lead to obstacles in mainstreaming RI in business.

The relationship between business responsibility and innovation management is still not very well understood in the relevant literature nor implemented in practice. Therefore, future research should address this gap. Particularly, further theoretical and conceptual research is needed to translate and unify the language of RI with the languages of business and innovation, and to specify business responsibilities and functions, including CSR and CS, innovation and R&D, as well as overall business management. What is concerning, this division makes it challenging for scholars from the research fields of BE, IM and RI to truly join the same debate, and build upon each other’s work. Possible ways to enhance greater synergy and dialogue in the research area would be for scholars to use the same terminology and for research efforts to increasingly take place under the same umbrella concepts. One example of such collaboration could be the contribution of BE scholars in enriching our understanding of the responsibility of companies from the perspective of ethics and morals as well as legal and human rights within the realm of technological innovation.

This study also points out other implications regarding theory use that warrants discussion. To a large degree, studies in both literature streams seem to lack theoretical lenses or rely on vaguely formulated frameworks, suggesting that future research would benefit from more carefully crafted and applied theoretical grounding. For instance, such theories as RBV or stakeholder theory may offer a useful contribution to connecting elements of the BE theory with RI. Furthermore, the research on RI is multidisciplinary in nature, it relates to business and innovation management but also places companies in a broader context of R&I systems linking companies with other actors such as research funding organisations, universities, and governments.

Therefore, theories from other research domains such as technology assessment (TA) and science, technology and society studies (STS) research have yet untapped potential for analysing relationships or interdependencies within organisations or among multiple actors in wider R&I eco-system and governance.

2.6.2 Implementing RI in business

The results of this study reveal various aspects of how companies put RI in action and reflect on current practices of companies, namely internal aspects of the company (internal environment), such as organisational culture and employee engagement, leadership and knowledge management, and external aspects of the company (external environment) such as stakeholder engagement. Nevertheless, the majority of research in the mainstream literature focuses on connecting innovation with responsibility and sustainability. In comparison to the RI-specified research, there is relatively limited discussion about systematically organising the process of innovation in a responsible, ethical and sustainable way.

There is a growing recognition in the mainstream literature that RI touches upon various business functions within a company, including top management, CSR and CS officers, R&D departments but also individual employees, and the external environment outside of the company as part of a company's stakeholder engagement. However, this research also shows that the mainstream BE and IM research lacks a better understanding of how RI should be implemented by companies. Therefore, the future research agenda needs to include theoretical and empirical research about the systematic organisation of the process of innovation in a responsible, ethical and sustainable way. The following research questions can be raised: how RI principles and values should be translated into specific solutions, e.g. technical requirements; at which stage of innovation development they should be implemented; who should be translating and implementing them and what methods and approaches should be used. This study advocates for further research linking RI with a strategic approach within a company that connects its different functions, units and departments, management teams and individual employees, but also resources and capabilities that form the company, supported by strong leadership from executives creating a positive organisational culture among team members and stimulating RI (see e.g. Gurzawska, 2020).

As part of the future research agenda, further investigation is also needed to explore effectiveness of different methods, tools and approaches to RI that companies put in place (or should be putting in place) to manage their technological innovation

in responsible, ethical and sustainable way which could include: developing and implementing ethics and legal protocols; organising the responsibility-by-design approaches (e.g. privacy-by-design, ethics-by-design, human centered or human rights-by-design), conducting technology and impact assessments that link to traditional impact assessments (e.g. social impact assessment, SIA; human rights impact assessment, HRIA; ethics impact assessment or environmental impact assessment, EIA); organising innovation projects as multi-disciplinary teams engaging engineers, CSR/CS officers but also social scientists, ethicists, human rights lawyers, gender and diversity experts; organising meaningful stakeholder engagement about complex issues with broader public.

While high-tech companies become a target of media, political and society's attention in terms of their impact on society, findings of this study show that high-tech sectors such as ICT or health and pharmaceuticals, which also raise major ethical and human rights challenges, received limited or no attention in the mainstream literature. This study does not exclude that such research already exists, nevertheless since this research focuses on mainstreaming RI, it suggests that such research should be part of the mainstream BE and IM literature. Consequently, future research should investigate whether and to what extent domain-specific literature discusses RI in business, e.g. RI in the context of the legal responsibility of companies for their technological innovations; or whether and how companies in specific sectors related to new and emerging technologies perceive and practice RI (e.g. when developing AI-based tools supporting law enforcement in investigating and prevention of crime, or doctors in early detection of cancer).

Furthermore, while RI is perceived as anchored to European policy processes and values (see e.g. Stilgoe et al., 2013), this study suggests that research on business responsibility in the context of innovation is not limited to Europe and the EC's funding. Technological development and businesses have a global reach, and they are not bound by national borders. Future research should further investigate global and regional perceptions and practices of RI, connecting the responsibility of businesses with their innovation activities.

Finally, another aspect that requires further investigation as part of the future research agenda is the question of methodologies used by analysed articles to investigate the implementation of RI in business. The majority of included studies in both streams were empirical, but they show the lack of diversity in research methods. To a great extent, they are based on archival studies using existing datasets (e.g. company rankings, reports, etc.). Greater diversity in research methods would enrich

research on the RI in business, especially with studies around the “business case” for RI. Such methods could include e.g. case study research, focus group, or action research (see e.g. Freeman & Greenwood, 2020; Ritala, Schneider, & Michailova, 2020).

2.7 Conclusions

The extensive literature on corporate social responsibility (CSR) and corporate sustainability addresses the question of the responsibilities and opportunities that businesses have towards society and the environment. However, as such companies’ responsibility and business innovation have not yet been meaningfully connected to responsible innovation (RI). This study analyses the relationship between business responsibility, innovation management and RI from the perspective of mainstreaming RI. First, it provides a review that portrays how companies perceive their responsibility for innovation activities and to what extent this responsibility has been integrated into mainstream research on business ethics (BE) and innovation management (IM). Second, it proposes a future research agenda.

This study has provided an in-depth examination of the state of scientific inquiry into RI in business in two fields of mainstream research, namely, BE and IM. Through an extensive review and comparison of literature published in BE and IM journals from 2001 to 2022, this research contrasted the RI conceptions, research approaches and topics investigated by scholars. Based on those findings, this study also proposes an agenda for future research.

The results show that RI in business is not entirely unknown. Nevertheless, the term ‘responsible innovation’ and its of-cited features (such as anticipation, reflection, inclusion, and mutual responsiveness) are not commonly used in the mainstream literature, neither in BE nor IM research. Even if the authors refer to RI and relevant RI literature, they create their definitions of RI, which not always are convergent with the conceptions of RI developed by scholars or policy-makers. RI is understood and defined in many different ways, from sustainable innovation, environment-related innovation, and social innovation to open innovation, but also through companies ‘doing good’. Furthermore, the RI conception in business is focused on the outcome of innovation, namely products, process and services, and their impact on society and the environment and how they contribute to sustainable development and addressing grand societal challenges.

In addition, the analysis reveals three main themes in the RI in business research across the BE and IM literature streams, namely (1) benefits of RI; (2) drivers of RI; and (3) implementation of RI. Regarding the benefits of RI in business, the research focuses on the question of why companies should act responsibly and why it is valuable for them. Those benefits can be divided into two categories, i.e. internal benefits for the company (e.g. improved performance, competitive advantage, strengthening reputation, improvement of products and processes, cost reduction); and (2) external benefits to society and the environment (e.g. addressing grand societal challenges). In terms of drivers of RI, a distinct topic for the IM literature, a stimulus to incite action could come from the company itself (e.g. organisation's capabilities and companies' awareness) or outside of it (customer requirements and public and governmental incentives, policies and regulations). The last theme relates to the implementation of RI in business. Typically, the BE and IM scholars either discuss internal aspects of the company (internal environment), such as organisational culture and employee engagement, leadership and knowledge management, and external aspects of the company (external environment) such as stakeholder engagement, discussed below. Furthermore, it is evident that both streams of the literature search for connecting RI to the company's strategy. Nevertheless, there is relatively limited discussion about systematically organising the process of innovation in a responsible, ethical and sustainable way.

Consequently, this study offers a future research agenda for mainstreaming RI and connecting RI, BE and IM research, including open research gaps and new paths that could be pursued by researchers in the future. Those gaps and future research involve questions related to two aspects (1) the conception of RI in business, and (2) the implementation of RI by businesses. Regarding the conception of RI, further theoretical and conceptual research is needed to translate and unify the language of RI with the languages of business and innovation, and to specify business responsibilities and functions, including CSR and CS, innovation and R&D, as well as overall business management. Regarding the implementation of RI, future research should focus on translating RI into specific solutions as well as effective methods, tools and approaches to implementing RI.

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Annex

	Balancing societal and environmental needs with business			Benefits external to company		
	BE	IM	BE	IM	IM	
Performance: economic, social, sustainable	Achi et al., 2022; Bocquet et al., 2017; Boche & Cruz, 2010; Broadstock et al., 2020; Carberry et al., 2019; Dey et al., 2020; Dominguez-Escrig et al., 2019; Husted & Allen, 2015; Mishra, 2017; Munten et al., 2021; Padgett & Galan, 2010; Rodgers et al., 2013; Rothenberg et al., 2017; Shalhad et al., 2016; Shin et al., 2018; Ueki et al., 2016; Vishwanathan et al., 2020; Voegtlin & Scherer, 2017; Wagner, 2010	Andersen, 2021; Antoniodi et al., 2013; Bammens & Hinermann, 2020; de Guimarães et al., 2021; Jununen et al., 2019; Kunapatarawong & Martínez-Ros, 2016; Pujari, 2006; Zhang & Walton, 2017	Achi et al., 2022; Ali & Craig, 2016; Arora & Ali Kazmi, 2012; Lin, 2021; Montiel et al., 2021; Munten et al., 2021; Padgett & Galan, 2010; Porter & Kramer, 2006; Shin et al., 2018; Voegtlin & Scherer, 2017; Upadhyaya et al., 2018	de Arroyabe et al., 2021; De Silva & Wright, 2019; García-Granero et al., 2020; Lehoucq et al., 2021; Nicolopoulos et al., 2017; Pujari, 2006; Watson et al., 2018; Zhang & Walton, 2017	Alt & Craig, 2016; Arora & Ali Kazmi, 2012; Gauthier & Genet, 2014; Mirvis et al., 2016; Munten et al., 2021; Sánchez & Benito-Hernández, 2015; Sregestan et al., 2021; Voegtlin & Scherer, 2017; Voegtlin et al., 2022; von Weltzien Hoivik & Shankar, 2011	Antoniodi et al., 2013; Crupi et al., 2022; Kohler & Chesbrough, 2019; Lehoucq et al., 2021; Pandza & Ellwood, 2013; Ramani & Mukherjee, 2014; Rayna & Strulikova, 2019;
Competitive advantage	Barrin Cruz et al., 2015; Boche & Cruz, 2010; Bokouta & Pielke, 2014; Broadstock et al., 2020; Gauthier & Ganet, 2014; Padgett & Galan, 2010; Liu et al., 2020; Mishra, 2017; Murcia, 2020; Perrini, 2006; Porter & Kramer, 2006; Shalhad et al., 2016; Upadhyaya et al., 2018; Voegtlin & Scherer, 2017; Voegtlin et al., 2022;	García-Granero et al., 2020; Andersén, 2021; Antoniodi et al., 2013; De Marchi, 2012; de Guimarães et al., 2021; Nameroff et al., 2004	Mazzeuchelli et al., 2021; Mirvis & Googins, 2018	Bammens & Hinermann, 2020; García-Granero, 2020; Nicolopoulos et al., 2017; Ramani & Mukherjee, 2014	Rammens & Hinermann, 2020; García-Granero, 2020; Nicolopoulos et al., 2017; Ramani & Mukherjee, 2014	
Reputation	Avuso et al., 2016; Barrin Cruz et al., 2015; Boulouta & Ptelis, 2014; Dey et al., 2020; Lampikowski et al., 2014; Liu et al., 2020; Mazzeuchelli et al., 2021; Mishra, 2017; Padgett & Galan, 2010; Shin et al., 2018; Barrin Cruz et al., 2015; Mishra, 2017; Padgett & Galan, 2010; Sánchez, P. E., & Benito-Hernández, 2015; Shalhad et al., 2016; Shin et al., 2018	Bammens & Hinermann, 2020; Borghesi et al., 2015; Kunapatarawong & Martínez-Ros, 2016; Ramani & Mukherjee, 2014; de Arroyabe et al., 2021; de Guimarães et al., 2020; Jununen et al., 2019; Popp et al., 2011	Alt & Craig, 2016; Arora & Ali Kazmi, 2012; Flanagan & Whiteman, 2007; Porter & Kramer, 2006	De Marchi, 2012; De Silva & Wright, 2019	De Marchi, 2012; De Silva & Wright, 2019	
Product	Boutouta & Ptelis, 2014; Galan, 2010; Sánchez, P. E., & Benito-Hernández, 2015; Shalhad et al., 2016; Shin et al., 2018	de Arroyabe et al., 2021; de Guimarães et al., 2020; Jununen et al., 2019; Popp et al., 2011	Achi et al., 2022; Gauthier & Genet, 2014; Lampikowski et al., 2014;	Casellani, Marini, Montresori, & Zandè, 2022; de Arroyabe et al., 2021; Eptecoco, 2016; García-Granero et al., 2020; Kunapatarawong & Martínez-Ros, 2016; Veuglers, 2012; Watson et al., 2018	Casellani, Marini, Montresori, & Zandè, 2022; de Arroyabe et al., 2021; Eptecoco, 2016; García-Granero et al., 2020; Kunapatarawong & Martínez-Ros, 2016; Veuglers, 2012; Watson et al., 2018	
Cost reduction	Dey et al., 2020; Husted & Allen, 2015; Lampikowski et al., 2014; Mishra, 2017; Padgett & Galan, 2010; Sánchez & Benito-Hernández, 2015; Shalhad et al., 2016;	Andersen, 2021; Borghesi et al., 2015; Fu et al., 2020; Kesidou & Demirel, 2012; Nameroff et al., 2004	Arora & Ali Kazmi, 2012			

	Benefits internal to company		Balancing societal and environmental needs with business		Benefits external to company	
	BE	IM	BE	IM	BE	IM
Value creation	Vishwanathan et al., 2020; Voegtlin & Scherer, 2017; Broadstock et al., 2020; Husted & Allen, 2015; Isaksson et al., 2010; Lai et al., 2015; Munten et al., 2021; Porter & Kramer, 2006; Shin et al., 2018	De Silva & Wright, 2019; Fu et al., 2020; Lehoux et al., 2021; Nicolopoulou et al., 2017			Boulouta & Pitelis, 2014	Castellani et al., 2022
Recruitment quality	Ayuso et al., 2016; Garel & Petit-Romec, 2020; Lampikoski et al., 2014; Murcia, 2020; Sánchez & Benito-Hernández, 2015					
Enhancing network of stakeholders	Ayuso et al., 2016; Lai et al., 2015; Mirvis et al., 2016; Mishra, 2017; Padgett & Galan, 2010; Sánchez & Benito-Hernández, 2015; Voegtlin & Scherer, 2017; Vishwanathan et al., 2020	Nicolopoulou et al., 2017; De Silva & Wright, 2019; De Marchi, 2012			Achi et al., 2022; Arora & Ali Kazmi, 2012	
Employee engagement	Achi et al., 2022; Delmas & Pekovic, 2018; Garel & Petit-Romec, 2020; Liu et al., 2020; Murcia, 2020; Sánchez & Benito-Hernández, 2015					
Risk reduction	Mirvis & Googins, 2018; Dey et al., 2020; Gauthier & Genet, 2014; Groves et al., 2011; Lin, 2019; Voegtlin & Scherer, 2017					
Growth of a company Process	Bocquet et al., 2017; Mishra, 2017	Epico, 2016				
Customer satisfaction & loyalty	Dey et al., 2020; Shin et al., 2018	de Arroyabe et al., 2021				
Lower turnover of employees	Dey et al., 2020; Padgett & Galan, 2010; Perrini, 2006; Shin et al., 2018; Ueki et al., 2016					
	Garel & Petit-Romec, 2021; Lampikoski et al., 2014					

3. Responsible Innovation in Business: Perceptions, Evaluation Practices and Lessons Learnt

Abstract:

This study derives from the results of the European Union (EU)-funded SATORI (Stakeholders Acting Together on the ethical impact assessment of Research and Innovation) project. It seeks to gain insights about, firstly, integration of the responsible innovation (RI) concept into companies' practices; and secondly, various evaluation approaches to companies' innovation practices that consider responsibility, ethics and sustainability. Twenty four interviews with companies and business experts were conducted to understand the ways in which companies apply principles, frameworks and evaluation practices related to RI. The results emphasize the confined character of companies' RI practices in the context of corporate social responsibility (CSR), sustainability and ethics. Moreover, the results indicate two main types of RI evaluation and control among companies, namely assessment and guidance. This paper discusses theoretical and practical implications of discrepancies in understanding and evaluating RI for large corporations and small and medium-sized enterprises (SMEs). Consequently, new approaches to RI in business are proposed, calling for strategic and responsible innovation management.

The research leading to these results received funding from the European Community's Seventh Framework Programme (FP7/2007–2013) under grant agreement No. 612231 (SATORI).

3.1 Introduction

Industry plays a crucial role in European innovation as the main funder of European innovation and the principal agent of novel technological solutions (Spulber, 2011). The unburdened promotion of innovation supports economic growth and creativity. Nevertheless, real life cases, such as Volkswagen's emission scandal, misuse of data by Cambridge Analytica or the Hacking Team's surveillance services targeting human rights activists and journalists, raise legitimate concerns about whether science and technology can be left to operate autonomously in the market without regulation and societal guidance.

Policy-makers and social scientists have introduced the concept of responsible research and innovation (RRI) to counter this and encourage innovation that is ethically acceptable and socially desirable (Von Schomberg, 2013). Since the vast majority of research and innovation is funded and produced by industry, a growing body of research focuses on the implementation of RI in industry (Hemphill, 2016; Iatridis & Schroeder, 2016; Dreyer et al., 2017; Stahl et al., 2017; van de Poel et al., 2017; Auer & Jarmai, 2018; Martinuzzi, Blok, Brem, Stahl, & Schönherr, 2018; van de Poel et al., 2020). Nevertheless, companies tend to have virtually no awareness or recognition of this concept (Lubberink, Blok, van Ophem, & Omta, 2017; Stahl et al., 2017). The discourse on the implementation of RRI in the business context has evolved into a link with the more widely known notion of corporate social responsibility (CSR) and corporate sustainability (CS). As a result, for the business context specifically, the simpler term "responsible innovation" (RI) has emerged, which has been used synonymously with the abbreviation "RRI" (Jarmai, 2020).

One of the major drawbacks to adopting RI is a lack of unity, of recognised approaches and professional standards for implementation and evaluation of RI (Shelley-Egan et al., 2016). Ethics assessment is a key element of RRI, which enables the identification and assessment of ethical issues in research and innovation (Shelley-Egan et al., 2016). Companies evaluate and control their activities and impact, including innovation, as part of their strategies to ensure that they meet the desired outcomes and create value. However, there is still considerable ambiguity with regard to evaluation of innovation aimed at strengthening companies' responsibility and strategic planning, exploring competitive opportunities and mitigating negative human rights, societal, ethical and environmental impacts (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015). Furthermore, the private sector is diverse, perceptions and approaches developed and applied by large companies may not be well-suited for small and medium-sized enterprises (SMEs), and vice versa.

This study investigates, first, how companies perceive and integrate the RI concept; and second, how companies evaluate their innovation practices by considering responsibility, ethics and sustainability. Twenty four interviews with companies and business experts were conducted to understand the ways in which principles and practices of RI and evaluation of innovation vary for companies. Consequently, this research aims to determine the extent to which similarities and differences exist in the use of frameworks and procedures. This paper discusses theoretical and practical implications of discrepancies in definitions of responsibility, sustainability and ethics, language used, differences between large corporations and SMEs. As a result, it proposes new approaches to RI in the business context calling for a strategic and responsible innovation management. This study derives from the results of the European Union (EU)-funded SATORI (Stakeholders Acting Together on the ethical impact assessment of Research and Innovation) project (<http://satoriproject.eu/the-project>).

This paper is organised as follows. Section 3.2 gives a brief overview of the relevant research by introducing the concepts of RRI and RI, and comparing them to the related notions of CSR and CS. Moreover, this section explains the role of evaluation and control as necessary condition for responsible innovation in order to strengthen strategic planning and explore opportunities and mitigate risks. Section 3.3 describes the methodology for data collection and analysis for this study. In Section 3.4, a descriptive approach is taken to present the results of the interviews with companies. Deriving from the analysis of companies' experiences, the paper presents specific approaches of how companies deal with responsible innovation and its evaluation. Based on the empirical findings, Section 3.5 takes a normative perspective and proposes new approaches to RI in the business context. Lastly, Section 3.6 summarises the findings.

3.2 Responsible Innovation in Business: Depicting the Field

This section provides an overview of concepts related to responsible innovation in the business context, namely corporate social responsibility (CSR) and corporate sustainability (CS), responsible research and innovation (RRI), and a number of evaluation approaches aiming at assessing companies activities in terms of responsibility, sustainability and ethics, as well as technology and innovation assessment approaches.

3.2.1 Corporate Social Responsibility (CSR) and Corporate Sustainability (CS)

The concept of business responsibility that goes beyond immediate shareholders and making profits has a long history in the business management literature that can be traced back to the 1950s and 1960s. Business responsibility towards society has been conceptualised in various ways, through corporate philanthropy, business ethics, corporate citizenship, stakeholder management, corporate social performance, and recently the most dominant concepts of CSR and CS (Carroll & Shabana, 2010). The most often cited definition of CSR is Carroll's (1979) who conceptualises CSR as 'the economic, legal, ethical, and discretionary expectations that society has of organisations at a given point in time' (Carroll, 1979). Other definitions emphasise five dimensions of CSR, namely environmental, social, economic, stakeholders and voluntarism (Dahlsrud, 2008). In principle, CSR can be linked to four theories: instrumental, political, integrative, and ethical (Garriga & Melé, 2004).

Corporate sustainability derives from the concept of sustainable development defined in the Brundtland Report (World Commission on Environment and Development, 1987). CS is generally defined in two ways, either as primarily focused on the environmental dimension of business; or in a broader sense, includes environmental, economic, and social dimensions (Montiel, 2008). While we still lack a standardised definitions of CSR and CS (Garriga & Melé, 2004; Dahlsrud, 2008; Montiel & Delgado-Ceballos, 2014), in broad terms they focus on responsibility, hence duties and obligations or motivation and opportunities of the companies towards the environment and the welfare of society (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015; Yaghmaei, 2018).

Since the 2000s, there has been a growing interest in the business case for CSR and CS (Carroll & Shabana, 2010). It has been claimed that social responsibility and sustainability can go hand in hand with economic development creating "shared value" (Porter & Kramer, 2011). Gugler and Shi (2009) claim that the economic interests offered by CSR such as better access to market, finance and business; enhanced intangible assets, reputation, community relations; and reduced risk from regulatory sanction, could encourage companies to structural changes including innovative processes and technological upgrading (Gugler & Chi, 2009). As a result, the concept and scope of business responsibility towards society has also evolved, from mere philanthropy actions to the so-called strategic CSR where CSR lies at the core of the business model and is brought into central value creation (Baron, 2001; Lantos, 2001; Crane, Palazzo, Spence, & Matten, 2014). Responsibility dwells in the

management of business operations as well as the impacts of their activities on the environment and society. This study perceives corporate responsibility as a business strategy, where responsibility is designed to create business value and positive societal and environmental change and is managed in a systematic and intentional way (Porter & Framer, 2006; Husted & Allen, 2010). Therefore, social responsibility is embedded in a day-to-day business culture and operations (McElhaney, 2009). However, from a conceptual point of view, CSR and CS tools or actions are generally not designed specifically for innovation. CSR and CS cover all aspects of a company's activity but do not exclusively relate to a company's innovation activities.

3.2.2 Responsible Innovation

Innovation refers to application of new ideas for product, process, organisational and marketing innovations (OECD, 2020), among which some are technological (technology-based new products, processes or features) and others non-technological innovations (social or organisational in nature). Innovation is crucial for companies' profitability and long-term survival, because it enables a company to adapt to the dynamically changing needs of the marketplace (Hauser, Tellis, & Griffin, 2006). While innovation leads to commercial and financial success (Fassin, 2000), it is now increasingly recognised by policy-makers and society that it is important for innovation to be performed responsibly and ethically. The concepts of sustainable innovation, environmental innovation, eco-innovation, open innovation and social innovation are among the most commonly discussed developments in the business context that reflect this change.

The most recent development is the concept of RRI used in EU policy and academic studies to refer to research and innovation that is ethically acceptable and socially desirable, where the science outcomes are aligned with the needs and values of the society (European Commission, 2012; von Schomberg, 2013; Stilgoe, Owen, & Macnaghten, 2013). The aim is to encourage societal actors to work together during the whole research and innovation (R&I) process to better align R&I and its outcomes with the values, needs and expectations of society (European Commission, n.d.). Recent works on RRI emphasize various conditions of innovation process, such as a need to include stakeholders (Owen, Macnaghten, & Stilgoe, 2012), a need for diversity and equality for gender, which should also be anticipatory and reflexive (Brey, 2016). Furthermore, innovation process should be open and transparent, responsive and adaptive to change (Owen, Macnaghten, & Stilgoe, 2012; Wickson & Carew, 2014; Jirotko, Grimpe, Stahl, Eden, & Hartswood, 2016). Additionally, the

policy-makers highlight the importance of science literacy, science education and open access to scientific knowledge (<https://rri-tools.eu>).

Studies suggest that so far companies do not recognise the RRI concept (Lubberink, Blok, van Ophem & Omta, 2017; Stahl et al., 2017). There are various reasons and challenges for the implementation of RRI in the business context. RRI is being developed by science policy-makers, various funding agencies (e.g., European Commission) and academia (Zwart, Landeweerd & van Rooij, 2014; Burget, Bardone, & Pedaste, 2017). Yet the interests of academic researchers and policy-makers may differ from the interests of innovators in the business context, because commercially driven innovation focuses on the economic impact, as argued by Lubberink et al. (2017). Therefore, some aspects of RRI may have conflicting aims and trajectories for industry's objectives, such as promotion of science literacy or open access to scientific knowledge and research results (intellectual property) (Søraker & Brey, 2014; Gurzawska, Mäkinen, & Brey, 2017). Even more of a challenge is the question of companies' motivation for engaging in RRI (Blok, Hoffmans, & Wubben, 2015; Scholten & Blok, 2015).

Definitions and key constructs for CSR, CS, RI have proliferated during the past decade enhancing uncertainty. Ambiguous definitions and constructs may prevent companies from identifying and implementing RI goals for their companies. Nevertheless, this does not necessarily mean that companies innovate in an irresponsible way. This study responds to the question of how companies perceive responsibility in the context of their innovation practices and how they implement this responsibility. A growing body of literature sheds light on the implementation of RI in business (a term more often used in the business context than RRI), including RI principles (Iatridis & Schroeder, 2016); as well as incentives, drivers and barriers of RI (Chatfield, Borsella, Mantovani, Porcari, & Stahl, 2017; Gurzawska, Mäkinen, & Brey, 2017; Auer & Jarmai, 2018). This study responds to the call for learning from the way RRI is implemented in companies (Shelley-Egan, Bowman, & Robinson, 2018), thus it empirically investigates the state-of-the-art of RI approaches in industry contributing to a flourishing research on the implementation of RI in the business context (Asante, Owen, & Williamson, 2014; Garst, Blok, Jansen, & Omta, 2017; Stahl et al., 2017). Moreover, it confronts policy-makers' and academics' ambitions with the current practices of companies.

3.2.3 Innovation Assessment for Responsibility and Ethics

One can ask: how does one know that someone innovates responsibly? A successful implementation of RI requires anticipating potential ethical, societal and environmental opportunities and challenges, as well as envisioning impacts of the innovation process and outcomes. Evaluation and control are an inevitable element of companies' strategies together with planning and implementation (White & Bruton, 2010). Therefore, the following questions arise: how can one know if an innovator is responsible if she does not evaluate and control her innovation? How one can identify and evaluate ethical, societal and environmental issues for technologies that are still emerging because they are still at the innovation stage? What standards and assessment methods one should follow to ensure that innovation processes and outcomes are responsible? Who should conduct such assessment and who else should be involved? Having a better understanding of the place of innovation evaluation, for enhancing responsibility, within the family of previously developed assessment forms may help to contextualise the evaluation of RI by companies.

The fields of CSR and CS suggest that companies apply various evaluation approaches to ensure their operations and outcomes are responsible and sustainable. A multidimensional CSR or CS assessment may involve a range of assessment methods such as impact assessment (IA). IA is the process of identifying the future consequences of a current or proposed action [the International Association for Impact Assessment], e.g., effects on environment (environmental IA), on society (social IA), health (HIA) or human rights (HRIA).

Technology and innovation management studies involve a broader field of technology assessment (TA). TA aims to evaluate potential, and actual, impacts of new technologies on industry, the environment and society; and to develop instruments to steer technology development in more desirable directions (Swierstra & Rip, 2007; Tran & Daim, 2008; Brey, 2012). The assessment is based on known or potential applications of the technology, taking into consideration consequences that are unintended, indirect or delayed (Nielsen, Gurzawska, & Brey, 2015).

RRI emphasises that innovation should be assessed and evaluated with the goal of influencing innovation processes to make them more ethical. As a result, ethics and ethics assessment (EA) have emerged as a key element of RRI evaluation, involving the identification and assessment of ethical issues in R&I. The SATORI project focuses on EA of R&I, defined as 'any kind of assessment, evaluation, review, appraisal or valuation of R&I that makes use of ethical principles and criteria' (Shelley-Egan et al., 2016). The evaluation criteria of EA are guided by ethical principles to determine

whether certain actions or developments are right or wrong, referring to individual and collective rights (e.g., freedom and privacy), benefits and harms (e.g., towards society or environment), fairness and virtues (e.g., integrity) (Shelley-Egan et al., 2016). EA is distinct from other forms of assessment, because it uses normative ethical criteria in assessment. As identified by the SATORI project, EA is increasingly institutionalised and, increasingly, R&I plans, practices and products are subject to ethical review (Shelley-Egan et al., 2016).

While TA and IA evaluation methods have a long history, recently new types of evaluation have emerged which incorporate the ethics dimension. Two of the most notable methods are ethical technology assessment (eTA) and ethical impact assessment (eIA). The first one proposes the engagement of ethicists in technology development throughout the entire lifecycle of development projects to confront developers with ethical issues (Nielsen, Gurzawska, & Brey, 2015). The second is an approach that takes into account the specific context and engages stakeholders to find ways of dealing with ethical issues arising from the development of new technologies (Wright, 2011).

All these evaluation approaches share a common intention of facilitating the social shaping of innovation. Taking into consideration a multiplicity of approaches to responsible business and innovation assessment, this study investigates companies' practices for assessment of their innovation processes and outcomes aiming at enhancing responsibility. This study aims to map companies' evaluation and control approaches, applied tools and methods; and verify these instruments to identify good practices and gaps.

3.3 Methodology

This study draws on lessons learnt from the business world, the academic concept of CSR and our experiences in the EU-funded SATORI project about RRI and ethics assessment and ethical guidance in different fields, organisations and countries (<http://satoriproject.eu>). This research focuses on innovation activities of the private sector, in a way that reflects the current companies' practices and opinions of business experts. To that end, the empirical component of this paper entails interviews and case study reports. The interviews aim to gather information and opinions from, and about, different companies regarding practices of, and attitudes towards RI, and evaluation of innovation.

In total, 24 interviews were carried out in person and via phone and Skype in one to one and half hourly slots. In addition to the interview data, desk research was employed to compile the case study reports, making use of the academic and non-academic (e.g., ethics codes) literature and material found online (e.g., reports, website descriptions of companies) (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015). The interviewees involved companies (and organisations of companies) and experts in responsible business. The first group includes large corporations, SMEs and organisations of companies from top sectors that engage in research and development (R&D) (pharmaceuticals and biotech, automobiles and parts, electronics and electrical equipment) and the lowest R&D engagement (oil and gas, general industrials) (Hernández et al., 2014) (18 interviews). The interviews involved mainly top level management of research and development (R&D), innovation and CSR/CS personnel. The second group engages persons who were regarded as experts in the area of innovation, responsible business, and human rights and business on their work in the field and knowledge of the research. These persons included specialists from consultancy, academia, research institutes and non-governmental organisations (NGOs) (6 interviews). The experts bring a broader perspective on practices of companies because of their experience in collaborating and providing consultancy to companies of various types and sizes. The goal was to generate a broad overview of responsible innovation practices, because the selected experts often engage in evaluation of companies' activities in terms of responsibility. The sampled companies and experts were selected following the overall project's methodology aimed at mapping and analysing the ethics assessment landscape for R&I in the EU, where countries were used as the main structuring principle for data collection (Shelley-Egan et al., 2016). The sampled companies and experts represent both large companies and SMEs from various parts of EU, featuring different institutional and cultural arrangements. Table 3.1 presents the sampled informants from companies and organisations of companies.

Table 3.1*Interviewees representing companies*

Informant	Company's Sector	Major Activity	Size
1	Electronic and Electronic Equipment	Research and development (R&D)	Small and medium-sized enterprises (SME)
2	Electronic and Electronic Equipment	Manufacturing	Large
3	Oil and Gas	Energy production	Large
4	Oil and Gas	Energy production	Large
5	Oil and Gas	Energy production	Large
6	Oil and Gas	Energy production	Large
7	Pharmaceuticals and Biotech	R&D	Large
8	Pharmaceuticals and Biotech	R&D	SME
9	Pharmaceuticals and Biotech	R&D	Large
10	Pharmaceuticals and Biotech	R&D	Large
11	Pharmaceuticals and Biotech	R&D	Large
12	Pharmaceuticals and Biotech	R&D	Large
13	Pharmaceuticals and Biotech	R&D	SME
14	Automobiles and Parts	Manufacturing	Large
15	General Industrials	R&D	Large
16	General Industrials	R&D	Large
17	Various	Various	Large and SMEs
18	Various	Various	Large and SMEs

The interviews were guided by the interview template (Annex), but with the flexibility to use any additional relevant questions (including factual ones). The interview template was developed from a literature survey of the scholarly and grey literature on RI in the business context, CSR, SC, RRI, innovation management and assessment (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015). The semi-structured interviews ensured enough leeway to facilitate modification, elaboration

and occasional digressions. During the interview, the interviewees were informed of the aim and the use that would be made from the information and opinions provided in the interview. They were informed that no full transcript of the interview would be produced, only a summary. Interviews were only taped with prior permission of the interviewee, and explanation was provided of the use of the tape. Anonymity was assured, unless requested otherwise. If the interviewee had so requested, they were sent a copy of the summary for their comments.

The in-depth interviews and additional documents were then analysed using the coding qualitative interview analysis technique (Corbin & Strauss, 1990; Charmaz, 1983) and resulted in collected data being coded with a thematic analysis approach (Miles & Huberman, 1994). This process was interactive and iterative, involving breaking down, examining, comparing, conceptualising and categorising data. A final edit of the codes revealed the following two main themes with a number of subthemes: (1) perception of RI; and (2) RI evaluation and control. First theme includes three subthemes: (a) overarching concepts (umbrella) under which interviewees put RI; (b) what specific topics interviewees associate with RI; (c) principles that characterise and guide companies' innovation processes. The second theme includes three subthemes: (1) assessment; (2) guidance; and (3) dissemination and awareness rising. The following section presents the results of the empirical studies providing an overview of the responsible innovation perceptions and innovation assessment practices among companies.

3.4 Results

This section discusses the results of interviews with companies and business experts. The results are divided into two aspects of implementation of RI in the business context. First, I present interviewees' perceptions of responsibility in the context of innovation and the role of RI in companies' strategies by specifying overarching concepts, reoccurring topics and principles which guide companies' innovation processes. Second, I demonstrate evaluation and control practices of companies that aim to determine whether certain innovation processes and outcomes are responsible, ethical and sustainable.

3.4.1 Perception of Responsibility and Responsible Innovation (RI)

Table 3.2 shows the meanings of concepts by presenting two aspects of RI perceptions: (1) overarching concepts (umbrella) under which interviewees put RI; and (2) which

specific topics interviewees associate with RI. The majority of those interviewed recognise companies responsibility towards society and the environment. Interviewees clearly refer to responsibility, responsible behaviour, and corporate responsibility. The analysis of the interviews (Table 3.2, Overarching concepts) shows that more than two thirds of those interviewed discuss their responsible innovation practices in the context of CSR, and half of them in relation to CS. Interestingly, the interviewees seem to either blend CSR and CS and use them interchangeability, or refer to CS specifically in the context of environment and sustainable use of resources, particularly in the oil and gas and energy related sector. The most striking result to emerge from the data is that only one third of the participants refer to responsible innovation, however framing it as innovating responsibly or, ethical innovation, environmental or eco-innovation and social innovation. Those who refer to some sort of responsible innovation engage in projects funded as part of the EU R&I programme, particularly in topics related to renewable energy solutions or science with, and for, society. Nonetheless, those interviewees who acknowledge the term “responsible innovation”, also tend to link it with CSR and CS and conceptualise companies’ ethical, societal and environmental responsibilities as part of a broader CSR or CS strategy.

For the vast majority of the interviewees, responsibility applies to all aspects of a company, not exclusively to innovation. RI is, therefore, part of broader policies and strategies for CSR or CS. A CSR or CS policy is intended to function as a self-regulating mechanism for business to ensure its compliance not just with laws, but also with the spirit of the law, with international norms and with ethical standards. At the same time some interviewees feel that bigger companies put a lot of emphasis on CSR whereas smaller companies with a lesser public interface are less likely to do so. Some companies are aware of the need to retain public support and based on that work to improve CSR/ethical practices. A number of interviewees emphasise the role of their corporate social and sustainability responsibility as an implicit part of the company’s culture and activities, and therefore their strategy. For instance, one of the interviewees says that: *‘Long-term thinking and responsible action are the basis for our business success (...) Social and environmental responsibility is an integral part of how we perceive ourselves as a company’*. Therefore, responsibility goes into the core of their business. Another interviewee comments on the role of ethical behaviour: *‘We are convinced that an ethically correct behaviour can give a positive return also on the bottom line. The cost for respecting ethics is not considered a cost, but an investment which pays back’*. Some interviewees also feel that a good corporate reputation differentiates a company from its competitors. One of the experts emphasises that it is important for enterprises to understand that bad management of

corporate responsibility is not only a matter of image, but it exposes the company to high risks, decreasing the total value of the business.

At the same time, four of the participants argue that innovation should not be restricted by any means, especially by responsibility or ethics. For two of the company representatives, the main argument is that for companies innovation is risky and costly. If innovation would become part of the responsible innovation agenda, taking into account also sustainability and labour rights, this would limit the creativeness of firms. It is the role of the state to solve societal issues, they claim. The role of a company is different in this regard, its role is to make a profit, provide a work place and pay taxes to the state. These interviewees emphasised the principle and strengths of the free market. One of the experts also wonders who should invest in e.g., social innovation, the public or private sector. Another two experts emphasised that the correlation that exists between CSR and innovation is less critical, even in the case of a business with high technological value. In their opinion, the true challenge is to connect CSR with the actual business performance.

Table 3.2

Responsible innovation overarching concepts and associated topics

	<i>Number of Companies</i>	<i>Number of Experts</i>	<i>Total</i>
<i>1. Overarching concepts</i>			
Corporate social responsibility (CSR)	14	4	18
Sustainability	9	3	12
Responsible innovation (including research, ethical innovation, environmental innovation, social innovation)	6	2	8
Innovation detached from responsibility	2	2	4
<i>2. Associated topics</i>			
Environmental responsibility	16	4	20
Anticipation and reflection (including evaluation, assessment, guidelines)	14	5	19
Social responsibility	14	4	18

	<i>Number of Companies</i>	<i>Number of Experts</i>	<i>Total</i>
Stakeholders:	13	3	16
- Community and society	5	4	9
- Employees	6	0	6
- Stakeholders (general)	4	2	6
- Customers and users (including specific types e.g., patients)	5	0	5
- Shareholders	4	0	4
- Business partners and supply chain	2	2	4
Ethics (including business ethics)	12	4	16
Economic responsibility (including profit)	7	2	9
Gender equality (including diversity and inclusiveness)	7	1	8
Openness and transparency	6	0	6
Legal responsibility	3	2	5
Governance	5	0	5
Science education	4	0	4
Voluntarism	3	0	3
Public engagement	1	0	1
Open access	0	0	0
Responsiveness and adaptation to change	0	0	0

Note: Terms are derived from the most reoccurring terms related to responsible business, corporate social responsibility (CSR), corporate sustainability (CS), responsible innovation (RI) and responsible research and innovation (RRI) (see Section 2). The results are based on the interviewees' responses.

Since the vast majority of interviewees recognise their broader responsibility, the next step is to see how interviewees perceive this responsibility. A variety of perspectives are expressed, however five main topics related to responsibility and innovation emerge from the analysis (Table 3.2, Associated topics), namely:

1. Environmental responsibility
2. Anticipation and reflection (including evaluation, assessment, guidelines)
3. Social responsibility
4. Stakeholders
5. Ethics (including business ethics)

A common view amongst interviewees is that environmental responsibility plays a crucial role in their responsible business practices, including innovation. This opinion is shared by companies from all business sectors, not only directly related to the environment such as automotive, electronics and oil and gas, but also pharma or general industrials. The second topic is anticipation & reflection that involves evaluation and assessment of envision impacts. A vast majority of those who were interviewed agree on the third topic in the context of RI, i.e., social responsibility in the sense of an obligation to act for the benefit of society at large. The fourth topic is related to responsibility towards stakeholder and stakeholder engagement, including external stakeholders (such as local communities, society at large, customers and users, e.g., patients, business partners and supply chain) and internal stakeholders (mainly employees and shareholders). For instance, one of the interviewed companies holds stakeholder forum involving ministries, sub-companies, automobile clubs, environmental organisations, and universities in order to discuss new developments such hydrogen or shale gas. Lastly, ethical responsibility is recognised as one of the crucial aspects of RI. However it should be noted that interviewees are unanimous in their views about ethics. They refer to ethics as either a general moral framework, or specifically medical ethics, (particularly pharma and biotech interviewees), or business ethics understood as aspects related to anti-corruption and anti-bribery. For pharma companies in particular, ethics seems to be an overarching framework. A number of interviewees claim that ethics and ethical issues are part of the everyday routine related to drug development (e.g., a reference to deontology, patient-centred ethics). The findings indicate that other themes, particularly related to RRI (European Commission, 2012; van Schomberg, 2013; Stilgoe, Owen, & Macnaghten, 2013; <https://www.rri-tools.eu>), do not seem particularly prominent in the interview data.

Table 3.3 focuses on guiding principles for companies' behaviour. When the interviewees were asked about principles that characterise RI and that guide their innovation processes, there is a sense of shared crucial principles of RI amongst interviewees (Table 3.3). The most shared principles involve:

1. Social responsibility
2. Environmental impacts
3. Professional integrity
4. Implications for health and/or safety.

Table 3.3

Principles of RI behaviour in business

<i>RI behaviour principles</i>	<i>Number of Companies</i>	<i>Number of Experts</i>	<i>Total</i>
Social responsibility	13	3	16
Environmental impacts	13	2	15
Professional integrity	13	1	14
Implications for health and/or safety	11	2	13
Social impacts	7	1	8
Equality/non-discrimination (e.g., gender)	7	1	8
Human subject research	5	3	8
Implications for quality of life	6	1	7
Treatment of animals in R&I	5	2	7
Scientific integrity	5	1	6
Implications for privacy	5	1	6
Human dignity	4	1	5
Implications for civil rights	3	1	4
Justice/fairness	3	0	3
Outsourcing of R&I to developing countries with lower ethics standards	2	1	3
Autonomy/freedom	0	1	1

<i>RI behaviour principles</i>	<i>Number of Companies</i>	<i>Number of Experts</i>	<i>Total</i>
Dual use (possible military uses)	0	1	1
Other, specify:			
Transparency	3	0	3
Human rights	0	2	2
Freedom of market	1	1	2

Note: Based on the interviewees' responses.

The importance that the interviewees give to the first two principles, (i.e., social responsibility and environmental impacts) reflects the topics that recurred throughout the dataset (Table 3.2, Associated topics), namely attention to the environment and the welfare of society. Third principle, professional integrity, refers to professional standards comprised of practices, ethics, and behaviours that members of a particular profession must adhere to. The fourth shared principle's implications for health and/or safety relates to measures in relation to the employees' safety, security and health, but also related to health and/or the safety of customers and users of their products and services.

Other principles indicated by the interviewees vary depending on the context of innovation and the sector. For instance, in pharma and biotech, higher priority is given to principles related to drug development, experiments and clinical tests, such as scientific integrity, transparency in the publication of results of clinical trials, human subjects research (patients/human safeguard), human dignity, treatment of animal in experiments, privacy, equality and non-discrimination in access to treatment, high ethical standards related to outsourcing of research and/or innovation to developing countries. For automotive, oil and gas and energy-related sectors, environmental and social impacts play a crucial role, but also implications relating to distributive justice, individual and civil rights and quality of life. The electronics sector's interviewees emphasise importance of implications for individual and civil rights and privacy.

The vast majority of participants demonstrate their commitment to responsibility, ethics and sustainability. However, this commitment requires specific actions in terms of planning, implementation and evaluation. Drawing on the perception of RI among companies and business experts, the next step is to understand how companies ensure

that their innovation activities live up to their declarations. Therefore, the next section analyses companies' approaches to RI evaluation and control.

3.4.2 RI Evaluation and Control

The results of the interviews presented in the previous section suggest that anticipation and reflection is an important aspect of RI in the business context. Furthermore, the results demonstrate that a vast majority of interviewees perceive RI evaluation as part of, either their CSR and CS frameworks, or risk management.

Overall, evaluation and control of innovation can be generally divided into two main categories (1) assessment; and (2) guidance. Both assessment and guidance are oriented towards evaluation of projects and practices on the one hand, and professional conduct on the other hand. As a result of the interviews, a third main category of evaluation and control emerged, which involves engagement in networks and trainings. This category is called dissemination and awareness raising. The participants on the whole demonstrate that they engage in evaluation of their innovation activities to anticipate and reflect on responsibility. Nearly half of those who were interviewed declare having assessment procedures or guidelines in place, or a combination of both (Table 3.4). Only a small number of interviewees indicated that they do not evaluate innovation activities in terms of responsibility, ethics or sustainability. Two discrete reasons emerge from this. First, some participants feel that innovation and responsibility are disconnected, and it is the role of the market and consumers to decide whether they want to use a product or service. Second, others consider that currently they do not have such procedures in place, but they admit that such evaluation might be helpful.

Interestingly, there is a difference in the ratios of responses to a general question asking whether the interviewees engage in assessment or guidance, and responses about specific assessment or guidance methods and approaches. While the general responses indicate a lower engagement in RI evaluation practices, the more detailed questions about RI evaluation methods show a higher number of RI evaluation practices. The most likely two explanations of this result are: firstly, the interviewees misunderstand the terms "assessment" and "guidance", thus there is a language difference (especially in the context of the SATORI project that focuses on the ethics assessment of R&I). As emphasised by one of the interviewed experts, RI is not a reference point for them. When they analyse pharma companies developing drugs or activities of electronics companies, they use the CSR or human rights and business frameworks and language. Secondly, the incorporation of RI processes into a more

general corporate social and sustainability framework causes confusion about whether particular innovation activities are subjected to evaluation, and if yes, which assessment tools are relevant in this context.

The vast majority of evaluation activities are conducted as internal procedures within a company (in-house, 17), as opposed to external review (outsourced, 6). As reported by interviewees from both large companies and SMEs, they rather have no separate units or personnel to evaluate and control their innovation activities. For large companies, most of the internal evaluation are conducted by units dealing with CSR, CS or risk management with oversight from boards of directors; and as stated by one interviewee, all activities must be carried out having in mind their company's code of conduct (self-evaluation). One interviewee illustrates the situation in the following way: *'Strategic importance is given to the centre's sustainability in these times of economic crisis, which means resources are reassigned to core activities (identification of R&D opportunities, identification and development of technology-based business opportunities, internationalisation strategy, technological excellence etc.). Resources assigned to deployment of initiatives, compliance and reporting are scarce. Internal communication about CSR strategy and policy has been scarce. There are several lines of work being developed and not always in close coordination'*. Furthermore, one of the interviewed experts suggests that corporate responsibility units do not have the power to influence the strategy or the organisation structure and assets. More likely, in order to obtain results, whole companies should be re-addressed to be corporate responsibility friendly; otherwise the business paradigm will not work in this sense. This view is shared by another interviewee who emphasises that: *'It is a challenge to keep high the attention of the management and employees on these topics, even in period where there are other urgencies or challenges to be faced and therefore people tend to focus only on core business issues.'* Regarding SMEs, one of the interviewees from an SME emphasises that generally, SMEs do not have enough resources for having people dedicated solely to this task. Sometimes certain problems could be overlooked or not timely addressed. Nevertheless, the creation of a company vision, with written policy on this matter, could help to overcome this problem. The interviewee added that they are aware of the need of innovation assessment and its impacts, and they try to address timely the relevant issues involved, though without a structured approach.

Table 3.4*RI evaluation and control*

	<i>Number of Companies</i>	<i>Number of Experts</i>	<i>Total</i>
<i>1. Evaluation activity</i>			
Assessment	8	2	10
Compliance assessment	10	2	12
Impact assessment (IA)	8	2	10
Ethics assessment (EA)	8	1	9
Safety assessment	3	2	5
Guidance	8	2	10
External guidelines and principles	15	3	18
Standards	10	2	12
Internal code of conduct	7	2	9
Other			
(Dissemination & awareness raising)			
Network	11	3	14
Training	7	2	9
None	4	1	5
<i>2. Type of evaluation & control</i>			
In-house	14	3	17
Outsourced	4	2	6
Other	0	0	0

Note: Terms are derived from the SATORI project (see Section 3). The results are based on the interviewees' responses.

3.4.3 Assessment

The interviews indicate four assessment methods and approaches that interviewees refer to as relevant for RI practices, namely:

1. compliance assessment;
2. impact assessment (IA);
3. ethics assessment (EA);
4. safety assessment.

The most common assessment procedure that companies implement is compliance with laws and regulations to ensure that regulatory requirements are met (12). The interviewees allude to the notion of assessment of legal or risk compliance.

The second commonly used assessment approach is IA in its numerous forms (10). The types most referred to include environmental, social, human rights and health impact assessments. The majority of interviewees who use IA are large companies. One interviewee states that the goals they set in the IA process are included in a management plan, and they must be implemented and tracked through the life of the project or operation. Furthermore, in terms of stakeholder engagement in the IA, two divergent and often conflicting discourses emerged. Some of the interviewees emphasise the role of a dialogue with stakeholders in the development process to mitigate potential risks and optimise the delivery of benefits. Others note that there is no real need to engage stakeholders or the general public in the impact assessment procedure. For instance, one interviewee from a large electronics company argues that there is no need because the market will verify a company's investments; the interviewee from a large pharma company says that they would not engage the general public but typically consult with medical experts within the field. Interestingly, one of the interviewees reports that their core business is innovation, thus their CSR strategy and deployment methodology and tools to evaluate the impact of projects were developed in collaboration with the innovation strategies department, and externally with association for promotion of social technology, local government and SMEs.

A number of interviewees refer to ethics assessment (EA) as part of their innovation activities (9). There are four discrete contexts in which EA is conducted, firstly interviewees who participate in activities funded by the EU and where ethics appraisal is an integral part; secondly, in regard to pharma companies which engage in drugs development involving human subject research, clinical trials, animal experimentation and require ethics approval from ethics committees; and thirdly, EA

in the context of data protection and privacy of individuals. EA in the context of business ethics and professional behaviour, for instance related to bribery, fraud or conflict of interests. Nevertheless, EA seems to be conducted in an administrative or reactive way. One of the interviewees feels that there would be a specific need for future-oriented ethical impact assessment (eIA) that realises the assessments in the context of specifically built future scenarios considering, for example, emerging technologies. On the other hand, one expert suggests that an eIA would fall to a great extent within other types of IA, e.g., social impact assessment (SIA), environmental impact assessment (EIA), health impact assessment (HIA) or human rights impact assessment (HRIA). The eIA should be carried out, but the interviewee would not call it eIA, but rather as one of the commonly known IA. The reason for this is that other IA methods are already recognised by the community as types of IA. Therefore, instead of developing a new type of IA it should be integrated with the existing types. Lastly, safety assessment also plays a role in RI, particularly in the context of to safety and efficacy of a product and safety in the workplace (5).

The empirical findings show that the RI assessment in the business context is conducted both internally (in-house) and externally (outsourced). The internal assessment is conducted by, for example, CSR/sustainability officers or departments; the external assessment by external/independent auditors, for example, consultancy companies or organisations with expertise in responsible business. Furthermore, some types of assessment are mandatory such as projects in the context of medical innovation involving clinical trials, or projects funded by the EC. Other types of assessment are voluntary. The interviews show that companies use assessment tools, even if they are not mandatory. As emphasised by one of the interviewees, such an assessment is an investment of time and resources, but can strengthen responsible and ethical behaviour and, long term, could help to anticipate eventual future problems. Lastly, RI assessment is either informal or formal. An informal assessment, may have a form of, for example, a reflection discussion within a company's board or CSR department. A formal assessment may take a form of annual reporting. This tool reflects issues of transparency, anti-corruption and tax-avoidance. Nevertheless, non-financial disclosure on the environmental and social impacts is receiving a wider acceptance in the business world. Recently, companies have been becoming more willing to provide this information voluntary as a part of their annual report and by participating in such initiatives as Global Reporting Initiative (GRI). The interviews reflect this tendency, and a number of interviewees representing large corporations declare that they disclose information on environmental and social performance. One

of the interviewees points out that the integrated report they publish regularly is designed to describe their system of quality control as well as structure and governance.

An important aspect of evaluation is the criteria that companies use to assess their performance. A number of interviewees emphasise the importance of quantitative indicators that help to measure the actual social, environmental, ethical and sustainability performance, and the impact of their activity. The results of the interviews suggest that one of the main assessment criteria that companies use is key performance indicators (KPIs). KPIs are used to evaluate businesses' success at reaching targets and to demonstrate in a quantifiable way how effectively a company is achieving key business objectives. Two of the interviewees declare that responsibility/or sustainability has been established as a strategic corporate objective based on specific targets and KPIs. As stated by one of the interviewees: *'Sustainability is an explicit component of our management system. This means on the one hand that every major project must be measurable in terms of sustainability as a corporate objective, ensuring that, in addition to economic factors, environmental and social aspects are also accounted for in the decision-making process'*. The interviewed experts agree that such indicators are crucial for understanding the impact that businesses have on our lives, nevertheless they point out that there seem to be a lack of agreement around which KPIs should be taken into consideration, especially in the context of RI. Nevertheless, the interviewees suggest that such set of KPIs should be adapted to the context and not "one size-fits-all". A number of interviewees indicate that the assessment criteria should be installed in day-to-day activities. They suggest that one way of connecting companies' responsibility, ethics and sustainability objectives is to do so through connecting these objectives to management objectives. Employees would be incentivised with bonuses for meeting the targets. One participant comments that evaluation measures have a very positive impact on the company. The evaluation has some organisational costs, but it contributes to improving the quality of the company. These processes are binding and a failure to comply is punishable.

3.4.4 Guidance

The second type of RI evaluation and control practice is standard-setting guidance, which refers to the statement of guidelines, principles, rules, codes, and recommendations to which innovation practices are expected or recommended to adhere (Shelley-Egan et al., 2016). Guidance presents ideals to live up to or norms to follow (Shelley-Egan et al., 2016). Guidance differs from assessment, because it does

not involve judgment about a specific project or action: it is not the case that particular types of innovation, or its use in society, are judged to be responsible or irresponsible (Shelley-Egan et al., 2016). Rather, guidance sets general standards according to which any specific activities or outcomes of innovation may be guided. The results of the interviews indicate that guidance are either developed by a company itself (internal) or by other organisation (external). The interviewees provide examples of such guidelines that lead their companies in their responsibility activities. Guidelines include codes of conduct, international and sectoral guidelines and principles, standards, and reporting initiatives to provide quantitative data on corporate responsibility performances. As one interviewee puts it:

‘The conviction [belief] that ethical behaviour is not a cost but a profitable investment could promote the adoption of ethical practices, but clear and precise rules could certainly also help. We prefer them, although besides the rules to be followed, we adopt also internal self-regulatory tools that can strengthen an ethical behaviour and in a long-term perspective could help to anticipate eventual future problems’.

A vast majority of interviewees, particularly representing large corporations, declare that they follow internationally recognised guidelines and principles of responsible business (18), such as the United Nations (UN) Global Compact; the United Nations Guiding Principles on Business and Human Rights (UNGPs); International Labour Organisation Tripartite Declaration of Principles concerning Multinational Enterprises on Social Policy; and the Organisation for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises. Furthermore, the interviewees indicate that their activities are also guided by sectoral guidelines and principles, such as the Code of Conduct of the Electronic Industry Citizenship Coalition (EICC) and the European Federation of Pharmaceutical Industry Associations (EFPIA). One of the interviewees feels that more companies should agree and subscribe to a common set of principles such as the UN Global Compact in order to ensure more ethical corporate behaviour. Interestingly, the interviewee does not see the need for guidelines specific for the pharma industry because they are to a great extent covered by good clinical practice and the Declaration of Helsinki, but setting minimum standards, a tool-kit or conduct of responsible and ethical research across industries or groups that engage in research could be helpful.

A specific type of guidance are codes of conduct. Around one third of interviewees confirm having such instruments demonstrating their values and commitment that is a good practice guide for employees and business partners in their daily work (9).

Interviewees say that codes of ethics ensure the utmost diligence, professionalism, transparency, collaboration, and availability.

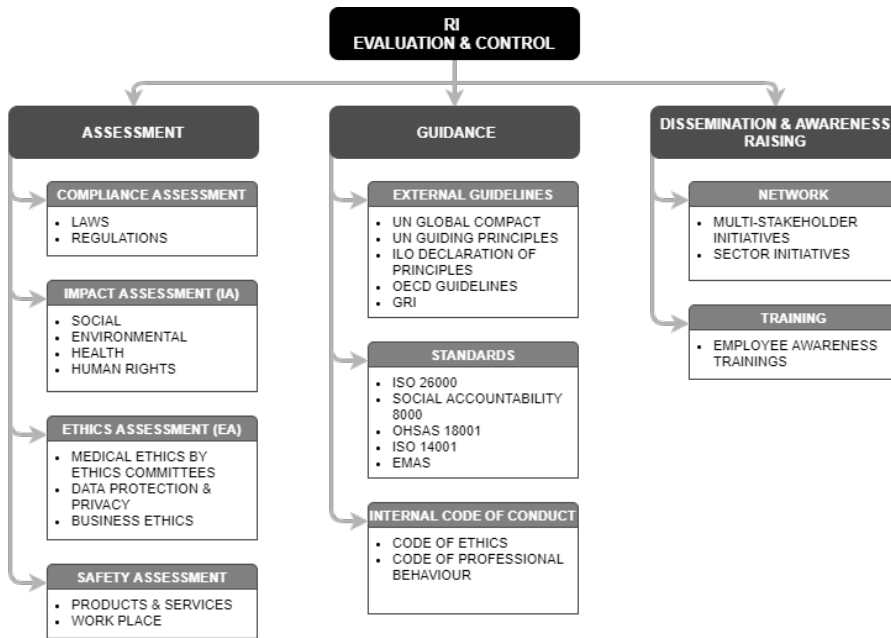
Moreover, the results of the interviews show that also standardisation plays a role in companies' RI activity (12), because it provides clear requirements on development and implementation of management strategies. According to the interviewees, companies' commit to implementation of the following standards: ISO 26000 Guidance Standard on Social Responsibility (ISO 26000); Social Accountability 8000 (focusing on workers' rights and workplace conditions); OHSAS 18001 (regarding the health and safety of employees and minimising the risk of accidents); ISO 14001 and Eco-Management and Audit Scheme (EMAS).

3.4.5 Dissemination and Awareness Raising

The last type of RI evaluation and control that emerges from the interviews is dissemination and awareness raising. A recurring theme is the engagement of companies in a broader discussions about general business responsibility towards the environment and society, as well as technological developments and their impact on changing our life, at the international and sectoral level (14). Such engagement takes various forms, such as participation in multi-stakeholder or sectoral initiatives at the international and national levels. The interviewees also emphasise the role of building a culture of responsibility within a company (employees) and its eco-system (business partners, supply chain). A number of interviewed companies engages in awareness raising and building competency thorough trainings (9). They promote employee awareness of company policies; and ensure safeguards to protect bona fide "whistle-blowing" activities. Figure 3.1 illustrates the RI evaluation and control practices in the business context.

Figure 3.1

Summary of the RI evaluation and control practices in the business context



3.5 Discussion

The results of the interviews show diversity in RI perceptions, implementation approaches, evaluation and control methods among companies. This section discusses the similarities and differences between the companies, using their characteristics and differences in orientation, innovation processes and cooperation. Furthermore, drawbacks of current state-of-the-art are considered, and alternative approaches that call for a strategic approach to RI in the business context are proposed. The proposed solutions are supported with opinions expressed by the interviewed companies and experts.

3.5.1 RI Concept

The majority of those interviewed recognise companies responsibility towards society and the environment, nevertheless there is no wider recognition of the RI concept among companies (Stahl et al., 2017; Lubberink, Blok, van Ophem, & Omta, 2017; Scholten & Blok, 2015). The interviews clearly show the theoretical confusion

regarding the definition of responsibility (Dreyer et al., 2017). The concepts of CSR, CS and ethics are used by interviewees interchangeably and unsystematically. Companies, policy-makers and academia speak different languages (Zwart, Landeweerd, & van Rooij, 2014; Burget, Bardone, & Pedaste, 2017; Lubberink, Blok, van Ophem, & Omta, 2017). As a result, the perception of RI by companies is vague, partially convergent (anticipations and reflection, internal and external stakeholders engagement, ethics) but also somehow distinct (reference to specific aspects of responsibility such as environmental impacts, professional integrity, and implications for health and/or safety) from the definitions proposed by the policy makers and social scientists. A clear definition of RI is necessary for creating awareness among managers and innovators of their responsibility towards society (Verbung, Rook, & Pesch, 2020).

The interviewees show a general commitment to perceiving innovation as an inherent part of their CSR and CS strategies. On the one hand such an approach suggests that responsibility is integrated at every aspect of a company's activity, thus also innovation. This approach follows the view that a company is a system of interrelated and interdependent parts (White & Bruton, 2010), thus responsibility and innovation are connected and have equally important roles. On the other hand, the study shows a scarce interaction and communication between departments. Internally, different departments work separately, not always in a close coordination and cooperation. Current practices of companies do not reflect the complex and multifaceted reality of modern research and innovation ecosystems (Timmermans, Yaghmaei, Stahl, & Brem, 2017). While, literature argues that organisational learning through assimilation of existing knowledge and the generation of new knowledge is crucial for adoption of responsibility within companies (Wicki & Hansen, 2019; Tharani, Jarmai, Schönherr, & Urban, 2020), this study shows that companies often overlook the importance of knowledge management as part of their responsibility (Lubberink, Blok, van Ophem, & Omta, 2017).

In line with the existing literature (Martinuzzi, Blok, Brem, Stahl, & Schönherr, 2018; Porcari et al., 2020), the interviewees present two conflicting views about the role of innovation, either as interlinked with the corporate responsibility framework, or as oriented mainly towards financial success. This dichotomy triggers a question about the real substance of companies' claims and whether they are "walking-the-talk". The results suggest that RI may share the same path as CSR, which was originally meant to strategically shape the corporate identity of companies, but currently it is criticised for mainly focusing on corporate philanthropy (Sheehy, 2015; Oftedal, Foss, & Iakovleva, 2019). There is a risk of "misusing" RI for marketing

purposes by misleading consumers about social, ethical and environmental benefits of a product or service (e.g., greenwashing). The interviewed experts emphasise that it is important for companies to understand that a bad management of corporate responsibility is not only a matter of image, but it exposes a company to high risks (Chatfield, Borsella, Mantovani, Porcari, & Stahl, 2017) and missed business opportunities, decreasing the total value of a company.

The definition of innovation implies that it is a strategic and multidimensional process that affects all units in a company, its organisational structure, people, processes, procedures, and systems (White & Bruton, 2010). Therefore, it is crucial that innovation is managed in a strategic way ensuring cooperation and communication between technology developers and CSR/CS/ethics people. Therefore, corporate responsibility, including responsibility in the context of innovation, should be tied to business strategies and performance, through a systematic approach involving planning, implementation, evaluation and control (Gurzawska, 2020).

3.5.2 RI Evaluation and Control

Findings of the interviews suggest that evaluation and control of RI fall under companies' CSR and CS practices. The study corroborates previous findings (Borsella, Porcari, & Mantovani, 2015; Iatridis & Schroeder, 2016; Martinuzzi, Blok, Brem, Stahl, & Schönherr, 2018) by demonstrating that RI practices are guided by general CSR and CS guidance frameworks, including standards, global initiatives and assessment tools. Monitoring the performance of companies supports CSR and RRI by identifying areas for improvement and potential drawbacks. Companies evaluate and control their innovation practices through assessment, guidance and dissemination and awareness raising. They apply well-known assessment tools, such as those focused on compliance, ethics, impact and safety, helping in decision-making informed evaluation of the economic, social, and environmental effects (Timmermans, Yaghmaei, Stahl, & Brem, 2017). Nevertheless, this research shows a discrepancy between the high importance that the interviewees give to principles of environmental and social impacts that should guide the RI processes and outcomes and a relatively low level of the actual use of evaluation methods of such impacts.

The study shows a general confusion around what should be evaluated and controlled; no distinction around methods and tools applied for evaluation of the innovation process and outcome is made. Such a distinction is mainly used in the pharma industry, where innovation processes are subjected to ethical evaluation,

covering various areas of research that involves humans or animals (research ethics). This is because a great majority of research ethics is comprehensively regulated at the national, EU and international level (e.g., human embryonic stem cell [hESC] research, clinical trials, children, animals, bioethics, dual use, biosafety). Dreyer et al. (2017) propose that research and innovation processes differ, thus programs, tools, and criteria for defining best practice, as well as governance mechanisms, must also follow different rules and principles (Dreyer et al., 2017). Stahl et al. (2017) identify various components of RI (including purpose, process, and product aspects) and identify five maturity levels (unaware, exploratory, defined, proactive, and strategic) (Stahl et al., 2017). Moreover, Werker (2020) proposes four major features which are crucial for assessing, namely (1) innovative agents; (2) Innovative agents' communication and collaboration with partners form their relationships; (3) formal and informal institutions; (4) innovative agents' activities (Werker, 2020).

This diversity of evaluation approaches has a strong disadvantage. It leads to a confusion, the principles, standards and initiatives of which are core. Despite this variety of initiatives, the interviews show the absence of strategic CSR or CS tools explicitly devoted to innovation activities that would be integrated within a broader responsibility framework. Under RI, anticipation refers to systematic thinking about emerging critical issues and discovering new possibilities and opportunities (Ofstedal, Foss, & Iakovleva, 2019). Nevertheless, the results show that companies lack such systemic evaluation practices that would assess the degree to which a company's practices align with RI (Stahl et al., 2017; Yaghmaei, 2018) or innovation activities that aim to reduce the uncertainty around potential negative impacts of innovation (Lubberink, Blok, van Ophem, & Omta, 2017). Furthermore, companies generally focus on evaluation and mitigation of risks, rather than critically examining which desirable implications are missed by the innovation (Lubberink, Blok, van Ophem, & Omta, 2017). The interviewed experts emphasise that general approaches are ineffective. Implementation of RI requires adequate information and mechanisms for companies to take responsibility and for stakeholders to hold companies accountable. This study confirms the need for translating RI into business-relevant KPIs (Yaghmaei, 2018; van de Poel et al., 2017). Such indicators are crucial for companies to measure their performance and impact, but also for customers, policy-makers and broader society to understand impacts that companies have on our lives. The RI is context-sensitive (Porcari & Mocchio, 2020), thus KPIs should reflect such diversity. Evaluation and reporting frameworks should be multi-layered, providing general principles applicable to all types of actors, as well as specific provisions suitable for

different types and categories of actors (e.g., branches of industry). RI evaluation may be used to check compliance (van de Poel, 2020). However, the RI reporting, which is a crucial aspect of communication with external stakeholders, should become much more than an occasional press release, it should be a recognised way of companies' evaluation.

Some of the interviewees argue that companies do not need new tools; what they need is the integration of currently existing tools in order to avoid an overlap and provide a clear, fully compatible and flexible responsible business framework. Nevertheless, new and emerging innovations, such as data-driven policing tools, cellular senescence and life extension, or 3D printed molecules, are complex technological developments. Thus, their potential impacts may go beyond the immediately obvious applications. The currently used tools may not be adapted to capturing such complexities. Innovation by definition takes place in the future, thus we need anticipatory approaches to shed light on social and environmental impacts (Nieminen & Ikonen, 2020). Nevertheless, the interviews do not show that more technology oriented assessment methods (e.g., eTA or eIA) are used by companies. RI in business requires interdisciplinary cooperation and integration of existing approaches, such as ethics and social sciences, in a novel way by shifting focus and placing new emphases (Grunwald, 2011). This approach could be applied through such methods as eTA, eIA, anticipatory technology ethics (ATE), value-sensitive design (VSD), privacy for design, socially responsible design (SRD), eco-design, ethics by design etc. A mutual understanding may enhance responsibility and open new business opportunities.

The benefits of responsibility, ethics and sustainability may not be straightforward, which can easily result in undervaluation of its principles. Responsibility always comes from individual values (Gurzawska, Mäkinen, & Brey, 2017). A vast majority of companies depend on self-evaluation in daily activities. However, if employees, management, owners of the company, their customers and business partners do not understand or appreciate responsible values and principles, it is difficult to capture the benefits of RI. A company may translate the ability of individuals to understand the impact of RI through statement of a company's principles, goals, strategies that involve responsibility, training and education. Recent research by Meijer and van de Klippe (2020) suggests that the future RI evaluation and monitoring should focus on the institutional change through 'empowering individuals to articulate their own values within their institutions by providing them with intellectual resources to do so' (Meijer, 2020). The elements of ethical leadership are also crucial for incorporating

RI leading to good governance and responsible organisation (Dreyer et al., 2017). Furthermore, the interviews reveal an important role of companies' participation in various multi-stakeholder and sectoral initiatives that serve as a forum for learning, sharing and standard setting. Recent developments in the area of RRI, mainly outcomes of the EU-funded research projects, offer various tools that may support businesses to explore responsible innovation opportunities. One example is the Responsible Innovation COMPASS self-check tool developed with intention to help SMEs determine to what extent their practices align with RI principles, how to improve their innovation processes and outcomes, and how they compare to other companies (Responsible Innovation COMPASS, n.d.). The MoRRI (Monitoring the Evolution and Benefits of Responsible Research and Innovation) project developed a list of RRI indicators for adequate measurement of responsibility in research and innovation, which could serve as KPIs (MoRRI, n.d.) Other initiatives provide lessons-learned through pilot studies engaging companies (<https://www.rri-prisma.eu>) and co-creation of good practices through workshops and community networks (<https://www.living-innovation.net>; The Prince's Responsible Business Network, 2020).

3.5.3 Large Companies and Small and Medium-Sized Enterprises (SMEs)

Larger companies generally have structured and complex governance structures, the spectrum of actors on which they have an influence and their impacts are likely wider than SMEs (Gurzawska & Porcari, 2016). Nevertheless, large companies have complex organisational structures, and therefore responsibility for implementation and oversight require compound implementation and evaluation approaches that address various organisational levels.

Regarding SMEs, according to interviews findings, SMEs generally do not have CSR or CS structured strategies, tools or reporting. This does not mean that SMEs manage their business irresponsibly; however without the evaluation approaches it is difficult to depict trends and behaviours about their positive/negative role in the society (Gurzawska & Porcari, 2016). A number of interviewees emphasise that SMEs lack human and financial resources. This situation reduces SMEs' ability to undertake research and development, limits opportunities for commercialisation of innovations (Tam, Moon, Ng, & Hui, 2007; Moon & Sohn, 2010). These constraints drive the goals of SMEs to be relatively short-term and profit-oriented (Tam, Moon, Ng, & Hui, 2007). Although SMEs seem to be less equipped for RI, their nature can compensate

their resource shortcomings, particularly a simple organisational structure, an informal and entrepreneurial leadership style, flexible organisation capacities, better efficiency and responsibility-oriented personnel benefit SMEs over large companies (Bos-Brouwers, 2010; Pavie, Carthy, & Scholten, 2014; Covello & Iatridis, 2020). Nevertheless, for both large companies and SMEs commitment from the leadership (the board, chief executive officer (CEO), director of the organisation) is considered paramount. The definition and review of the responsibility principles and strategy (either in a formal or informal way) should be in charge of the management function of the company (Gurzawska & Porcari, 2016). The findings imply that implementation and evaluation of RI require different approaches and incentives depending on the nature of a company.

3.5.4 Limitations of the Research and Future Work

This work clearly has some limitations. First, various sectors and sizes of companies that were involved in the study represent different approaches and needs. Thus, the current state of the art may not be fully representative for every sector and company. Therefore, given a relatively small sample size, caution must be exercised in terms of generalisation. Second, for large companies, the interviews were conducted with a maximum two people per company, mainly with top level R&D, innovation or CSR/CS personnel. The SATORI project was constrained by limited time and resources. Therefore, it is recommended that further research should be carried out in the following areas: sector specific research on RI implementation and evaluation practices; and in-depth case studies of various companies involving interviews or survey with different units and departments to investigate the level of RI implementation, coherence and, ultimately a strategic approach to RI. Third, the field of responsible innovation has grown significantly since the interviews for this study were conducted. Therefore, it would be interesting to investigate whether and how perceptions and practices of businesses have changed over time.

3.6 Conclusions

This study contributes to knowledge about the implementation of responsible innovation (RI) in the business context combining insights from corporate social responsibility (CSR) and corporate sustainability, ethics and innovation management of new and emerging technologies. To see how companies translate RI concept into practice, 24 interviews with companies and business experts were conducted within

the SATORI project. The interviews illustrate companies' perceptions of RI, its role in their strategies and practices, evaluation and control approaches and methods.

The results show that RI is perceived as part of a broader CSR and CS framework. A variety of perspectives about RI in the business context are expressed; however, five main themes of responsibility related to innovation emerge from the analysis, namely: environmental responsibility, anticipation and reflection, social responsibility, stakeholder (both internal and external) and ethics. Moreover, the interviews suggest that RI in the business context is guided by four main principles, i.e., social responsibility, environmental impacts, professional integrity, and implications for health and/or safety. The vast majority of participants demonstrate their commitment to responsibility, ethics and sustainability. However, this commitment requires specific actions in terms of planning, implementation and evaluation and control. The interviews indicate that evaluation and control of innovation can be generally divided into three categories (1) assessment; (2) guidance; and (3) dissemination and awareness raising. The first two evaluation approaches are oriented towards evaluation of projects and practices on the one hand, and professional conduct on the other hand. The third category involves engagement in networks and trainings. Generally, companies evaluate and control their innovation activities using CSR and CS assessment tools, such as legal compliance assessment, impact assessment (IA), ethics assessment (EA), and safety assessment. Moreover, their evaluation and control are guided by various external and internal guidelines, codes of conduct and standards. The interviewees also emphasise the role of building a culture of responsibility within a company (employees) and its eco-system (business partners, supply chain). Training and multi-stakeholder and sectoral initiatives serve this purpose.

The interviews clearly confirm the theoretical confusion regarding the concepts of corporate responsibility, CSR, CS, ethics and RI. Therefore, this study indicates that three challenges need to be overcome to ensure effective application of responsible innovation in the business context. First, the definitions of CSR, CS and RRI and the relationship between these concepts should be clarified. This could be done by mapping shared meanings and relation between CSR, CS and RI tools, standards and indicators. Second, established indicators of RI in the business context could help in overcoming the conceptual confusion and operationalising and measuring responsibility (societal, ethical, environmental etc.). Such indicators are critical for implementation of RI and any kind of evaluation and assessment method. The RI indicators should be linked with well-known and already operationalised CSR and CS indicators and commonly used CSR and CS standards, such as ISO 26,000, Social

Accountability 8000, OHSAS, ISO 14,001 and EMAS. At the same time, RI aspects could enrich CSR and CS tools and approaches, and in particular companies that focus on technological innovation would benefit from the concept of RI. General CSR and CS tools may not be well suited for tech companies and capturing innovation complexities. By bridging CSR, CS and RI, companies may develop more strategic innovation management through a cooperation and communication between technology developers and CSR/CS/ethics and human rights actors. Indicators are crucial for companies to measure their performance and impact, but also for customers, policy-makers and broader society to understand impacts that companies have on our lives. The RI quantitative indicators should be connected with KPIs, taking into consideration specificities of various sectors and companies. Such an evaluation and reporting framework should be multi-layered, providing general principles applicable to all types of actor as well as specific provisions suitable for different types and categories of actor (e.g., branches of industry, SMEs, large corporations). Third, currently research ethics is applied by companies mainly in the medical field. Companies outside the medical field, such as information technology (IT) and electronics, could also benefit from a paradigm of research ethics, particularly one type of practice, assessment of innovation e.g., via expert committees. However, there is a need for methods that would help tech companies incorporating ethics, particularly for new and emerging technologies. Such methods could include eTA, eIA, anticipatory technology ethics (ATE), value-sensitive design (VSD), privacy for design, socially responsible design (SRD), eco-design, ethics by design etc.

A holistic and strategic approach for responsible innovation management, including evaluation and control, is needed to ensure that RI is implemented in a meaningful way, so that RI does not serve only marketing purposes, but helps companies to realise competitive opportunities while also leading to positive economic, societal and environmental impacts.

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Annex

Interview Template

Appendix A.1. PART A

Appendix A.1.1. A. Interview Questions [Both Companies and Industry Experts and Organisations that Represent Industry]

- 1) Are you familiar with the concept of responsible innovation? How would you de-fine responsible innovation?
- 2) (Questions about the way in which ethics assessment of research and/or innovation in performed)
 - a) Can you describe what kind of ethical assessment your organisation does and what is its goal?
 - b) And what is assessed: e.g., research proposals, research programs, policies, re-search results, technological innovations, behaviours of scientists and/ or innovators, etc.
 - c) Who are the users (consumers) of the assessments?
 - d) What kind of committee(s) or persons do the ethics assessment?
 - i. What is their expertise?
 - ii. How were they are chosen for this task?
 - iii. Is there any consultation of stakeholders or of the public?
 - e) Can you say which ethical values, principles or directives are used in ethical assessment in your organisation? For example, integrity, protection of human beings, promotion of the social good, informed consent, beneficence, justice, protection of the environment?
 - f) Is there a shared framework of such values and principles or do individual assessors (also) bring their own values and principles to the table?
 - g) Which, if any, are the most important other organisations that you interact with in relation to ethics assessment? These may be organisations that have input into your assessments, regulate the way your organisation does assessments, are clients of your assessments, or that otherwise function as stake-holders.
 - h) Can you say how ethical assessment by your organisation is used and what its impact is?
 - i. Are your recommendations binding or non-binding?
 - ii. Are they generally followed; if not, how frequently are they followed, and what are the reasons that people or organisations have for not following them?

- iii. Is there any monitoring of compliance with your recommendations?
If not, why not?
- i) if you have performed any evaluations or assessments of the impact of ethics assessment as performed by your organisation,
 - i. what have you found the impact to be?
 - ii. where does ethics assessment function as desired, and where is it found wanting?
- 3) How would you assess the relative influence or importance of ethics assessment on research and innovation as compared to other forms of assessment, generally, and specifically within your company?
- 4) How would you describe the most important ethical problems in research and in-novation that are assessed by your organisation?
 - a) Can ethical assessment performed by your organisation help solve these problems?
 - b) If not, what else is needed to solve them?
- 5) Are there weaknesses or problems in how ethical assessment takes place at your organisation? If so, can you please elaborate on their nature?
 - a) What actions are currently being taken or planned to improve ethical assessment?
 - b) What needs to change within or outside your organisation to make further improvements possible?
 - c) Do you think these problems might be addressed through capacity building and training activities? If yes, what kinds of needs should these activities address?
- 6) Do you think it would be desirable to have a shared European approach for ethics assessment of research and innovation, with shared standards, procedures, and protocols for all European countries, and all organisations that engage in ethics assessment?
 - a) Do you believe it is possible?
 - b) What would be the obstacles to such an approach? What would be the benefits?
 - c) Would it be desirable for such an approach to have shared ethical values and principles, or only protocols and procedures?

- d) If you are not sure if a shared approach for all types of organisation is desirable or feasible, do you think that it would be desirable for organisations of your type alone, that is, would you be interested in more shared standards and approaches with similar organisations in European member states?

Appendix A.1.2. Additional Questions for Companies

- 1) Is your company subjected to the new EU Directive on disclosure of non-financial and diversity information by large companies and groups?
- 2) If so, how do you approach the following disclosure of information: on environmental matters, social aspects, respect for human rights, anti-corruption and bribery issues?
- 3) Do you make any connection between these issues and (a) your CSR policies, and (b) ethical assessment of your R&D activities?
- 4) How can, in your opinion, ethical practices in R&D in industry best be improved? By what regulatory or self-regulatory tools?
- 5) What laws and regulations for corporate social responsibility and ethical research and innovation are you subjected to?
- 6) Do you have to file, under national legislation(s), any social and environmental impact statement and do these have any relation to ethical issues in research and innovation in your company?

Appendix A.1.3. Additional Questions for Industry Experts and Organisations that Represent Industry

- 1) How do your industry collaborators/members generally construe the relation between CSR policies and the assessment of ethical issues in research and innovation? Are they integrated activities or separate?
- 2) How, to your knowledge, is ethical assessment of R&I generally approached in the companies you collaborate with/represent?
- 3) Are there big differences between different sectors (e.g., pharmaceuticals, IT, agriculture, electronics, etc.)? Are there big differences between SMEs and large corporations? If so, which?
- 4) How do you expect the new EU Directive on disclosure of non-financial and diversity information by large companies and groups will affect EU companies, particularly their activities in research and innovation and their ethical assessment?
- 5) How can, in your opinion, ethical practices in R&D in industry best be improved? By what regulatory or self-regulatory tools?

Appendix A.2. PART B

Appendix A.2.1. B. Additional Factual Questions [Both Companies and Experts and Organisations that Represent Industry]

- 1) What is the full name of the organisation (in original language and in English, if available), and what is the name of the unit that engages in ethics assessment, if it is different? What is the website address?
- 2) Does the organisation have any policies or assessment procedures for the following, and if so, how are they used and how is compliance monitored, if at all?
 - a) scientific integrity (avoiding scientific misconduct, such as fraud, data falsification, plagiarism, etc.)
 - b) professional integrity (especially for innovators/engineers) (rules and principles for interacting with clients, employers, and other stakeholders, avoiding conflicts of interest, honesty, responsibilities to the environment, to general welfare, etc.)
 - c) human subjects research (including special provisions for children and individuals who lack full autonomy)
 - d) treatment of animal in experiments
 - e) dealing with risks and anticipating social and environmental impacts, including
 - i. implications for individual and civil rights, specifically:
 - freedom - non-discrimination and equality (are any specific
 - autonomy groups mentioned, e.g., women, minorities, disabled, etc.)
 - privacy - bodily integrity
 - human dignity
 - ii. implications for (distributive) justice
 - iii. implications for health and safety
 - iv. implications for the environment
 - v. implications for quality of life
 - vi. dual use (the possibility of military use of research and innovations) outsourcing of research and/or innovation to developing countries which may have lower ethics and/or social/environmental standards than the country in which the outsourcing agent is located.

- 3) Does the organisation have any methods or procedures for assessing the impact of ethics assessment as performed by the organisation? Please state what they are.

Appendix A.2.2. Additional Factual Questions for Companies

- 1) What is the company's policy, if any, for corporate social responsibility (CSR), and the units and personnel who are involved in it, and their relation to the rest of the organization?
- 2) To what extent does the CSR policy also cover ethical issues in research and innovation?
- 3) Are there separate policies, units and personnel for the ethical assessment of re-search and innovation?
- 4) Is the company's research and/or innovation assessed by any external ethics assessment bodies (for example, research ethics committees)?
- 5) Does the company address ethical issues (such as the ones mentioned earlier in the interview) in its annual reports, and do these include ethical issues in research and innovation?

Appendix A.2.3. Additional Factual Questions for Industry Experts and Organisation that Represents Industry

- 1) What is your role in ethical assessment of research and innovation, if any?
- 2) Are you involved in setting professional standards for your constituents, lobbying government with respect to CSR or ethics standards and legislation, or other activities?

4. Implementation of Responsible Research and Innovation (RRI) Practices in Industry: Providing the Right Incentives

Abstract:

Responsible Research and Innovation (RRI) is a term used by policy-makers and academics to refer to research and innovation that is ethically acceptable and socially desirable. Despite the fact that the vast majority of research and innovation (R&I) is funded and produced by industry, companies tend to have no awareness or recognition of this concept. This is unfortunate, as the RRI paradigm could be mutually beneficial for both business and society: it could help businesses realise competitive opportunities while also leading to positive economic, societal and environmental impacts. This paper investigates how industry can be incentivised to engage in research and innovation following the approach of RRI. We propose a matrix of incentives for stimulating the adoption of RRI. We categorise incentives according to three dichotomies: external and internal, instrumental and non-instrumental, direct and indirect. The incentives are formalised in a causal loop diagram, which can be used to demonstrate the sound character of investing in RRI from a business perspective. We discuss examples of incentives, including corporate reputation and critical consumerism, certification, employee engagement, and governance. Lastly, to ensure effective implementation of RRI, we outline factors for the realisation of successful incentives for RRI in industry.

The research leading to these results received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement No. 609817 (Responsible-Industry) and under grant agreement No. 612231 (SATORI).

4.1 Introduction

Responsible Research and Innovation (RRI) is a term that has often been used in European Union (EU) policy and academic studies to refer to research and innovation that is ethically acceptable and socially desirable (Von Schomberg, 2013). Research and Innovation (R&I) may contribute to finding solutions to some of society's main challenges, such as climate change, demographic change, well-being, energy security, food safety, and secure societies. The EU recognises these challenges and strives for RRI as a partial solution to them. The RRI approach fosters improving the value of publicly funded research so that it may benefit society. At the same time, the vast majority of R&I is funded and produced by industry: in 2015, the business enterprise sector accounted for 64% of total R&D expenditure in the EU (Eurostat, 2016).

While policy-makers and academics apply and promote RRI, companies do not recognise the concept (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015; <http://satoriproject.eu/the-project/>). Other papers in this Special Issue also confirm this observation (see, e.g. Lubberink, Blok, van Ophem, & Omta, 2017; Stahl et al., 2017). This is unfortunate because not adopting RRI could lead to missed competitive opportunities as well as negative economic, societal and environmental impacts. It is in the interest of the EU and society to incentivise industry to conduct research and innovation in an ethical, responsible and sustainable way to evade these negative consequences and enhance its competitive advantage. Literature shows, however, that RRI is also beneficial, more often than not, for companies (Porter & Kramer, 2006; Porter & Kramer, 2011; Schiederig, Tietze, & Herstatt, 2012; Karakaya, Hidalgo, & Nuur, 2014), because social and environmental innovations can create economic benefits and business opportunities (Voegtlin & Scherer, 2017). The question that arises is how to incentivise the industry to conduct research and innovate in a responsible way and how to create incentives that are effective.

In this paper, we propose a matrix of incentives that can be used to motivate and stimulate the adoption of RRI in industry. Creativity in tailoring the right set of incentives that both match the policy-makers objectives and encourage companies to implement RRI can help to appropriately align incentives with policy-makers goals and increase performance (Girth, 2017). Therefore, to ensure the effective implementation of RRI, we outline factors that can affect successful incentives of RRI in industry. Moreover, we acknowledge the diversity of companies and therefore the matrix eschews the approach "one size fits all". Our approach draws on lessons learnt from the business world, the academic concept of corporate social responsibility (CSR)

and our experiences in two EU-funded projects on RRI (<http://satoriproject.eu/the-project/>; <http://www.responsible-industry.eu/>).

The remainder of the paper is structured as follows. In section 4.2, we outline the field of our research, and introduce RRI by comparing and contrasting it to the related notion of CSR and arguing for its value and importance. Section 4.3 then describes various classifications of incentives. In the same section, we introduce our approach for the analysis of RRI incentives in industry by creating an RRI incentives matrix with two layers of analysis; firstly the incentives and secondly the factors affecting the implementation of RRI in industry. Furthermore, in section 4.4 we discuss the relationship between these incentives by developing a causal loop diagram. Our analysis of incentives is divided into two parts. In the first part, we present incentives that can be linked to the impact of RRI on various stakeholders. Our understanding of RRI stakeholders is described in subsection one; external stakeholder incentives and examples of incentives in this category are presented in subsection two; internal stakeholder incentives and examples in subsection three; and lastly we discuss the role of governance in the RRI incentives. In the second part, we analyse two factors that can affect the successful implementation of RRI in industry. The first factor is the size of a company, where we differentiate between large multi and transnational corporations (MNCs and TNCs) and small to medium sized enterprises (SMEs). We finish our analysis with the second factor, which is the type of industry and ecosystem. The study partially rests on empirical results of the Responsible Industry Project (RI) (<http://www.responsible-industry.eu/>).

4.1.1 Methodology

Our study includes empirical investigations, literature review and synthesis, and the development of conceptual tools. To verify the effectiveness of RRI incentives, we need a systematic method that incorporates an understanding of the nature of incentives and a system for characterising incentives. We develop a conceptual tool for categorising and analysing incentives: an incentives matrix. The system of characterising incentives that we develop assists us in organising, analysing and synthesizing data. It also allows for the characterisations of conditions in which different types of incentives are likely to be effective. The matrix was developed based on a review and synthesis of different category systems of incentives.

Our study uses system dynamics to produce a causal loop diagram (CLD) to visualise the main causal relationships concerning the adoption of RRI in industry. System dynamics is a method that aims to enhance the understanding of complex

systems by identifying interconnections and feedbacks that determine the behaviour and the structure of the system under examination. Because RRI in industry is a complex network of relationships, system dynamics was chosen to improve the understanding of the relevant incentives. The information for the CLD was gathered mainly by a literature review because the paper aims to create a general model that utilises existing theories related to RRI and its effects on business processes. The definition of RRI and empirical studies, in the form of discussions, interviews and workshops with Responsible Industry project partners, informed the guidelines for the literature review. The explanation and reasoning of the CLD is presented in Section 4.4.

To map a variety of potentially effective incentives, the paper derives from the results of the Responsible Industry (RI) Project. The Project used empirical studies to identify incentives that are typically effective. A first methodology used by RI was stakeholder dialogues, a commonly accepted methodology to develop better solutions acceptable to all parties, by incorporating public values and concerns into decision making. Stakeholder dialogues were held in May 2015 and May 2016, with the aim of bringing together stakeholders in order to enable discussions and gather concrete feedback on the progress of RI and questions surrounding the RRI concept, the importance of RRI for both industry and society (Hahn, Ladikas, & Yaghil, n.d.). The stakeholder dialogues allowed us to identify a number of incentives that participants agreed were typically effective. To verify the results of the stakeholder dialogue, we used the Delphi method, a technique for structuring group communication, to collect and synthesise opinions and to achieve a degree of convergence on RRI perception. Using an anonymised, iterative, multistage survey process, the opinions of all participants helped us to assess attitudes, expectations and opinions of a large number of relevant stakeholders (Borsella, Porcari & Mantovani, 2015).

4.2 Outlining the Field: RRI and CSR

EU policies and academic studies often use RRI as a term to refer to research and innovation that is ethically acceptable and societally desirable. The term “Responsible Research and Innovation” (RRI) is a recent expression that is used by the European Commission (EC) to denote part of its research and innovation strategy. René von Schomberg has given the most well-known definition of RRI: “a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and

societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)” (von Schomberg, 2013). Moreover, von Schomberg emphasises the importance of the stakeholders’ role in the RRI process, and therefore RRI “should be understood as a strategy of stakeholders to become mutually responsive to each other, anticipating research and innovation outcomes aimed at the “grand challenges” of our time, for which they share responsibility” (von Schomberg, 2013).

Although van Schomberg’s definition of RRI is the most well-known, a variety of definitions of RRI exists, and the concept of RRI is also operationalised in different ways (Burget, Bardone, & Pedaste, 2017). Concerning a further specification of RRI dimensions, there are those that tend to recur in various interpretations of the concept, and those that are more idiosyncratic. In the official European Union policy interpretation of RRI (European Commission, 2012), RRI is thought to have six dimensions or “pillars”, i.e. RRI is research and innovation that: (1) incorporates citizen engagement and participation of societal actors in research; (2) incorporates ethical principles so as to ensure the compatibility of research and innovation processes with fundamental values; (3) promotes science literacy and science education; (4) promotes gender equality; (5) promotes open access to scientific knowledge; and (6) is guided by transparent, accountable, and coherent multi-stakeholder governance (European Commission, 2012).

The academic literature on RRI tends to be less concerned with the specific policy objectives expressed in the EU’s definition, and rather focuses on features of R&I that are believed to make it more responsible. Oft-cited features include, amongst others, inclusion (also called engagement, or involvement of society), anticipation (assessment at an early stage in R&I of benefits and risks, so that informed choices can be made), reflexivity (reflecting on values and beliefs during R&I) and responsiveness (the ability to change routines, structures and systems to adapt to changing circumstances and new insights (Stilgoe, Owen, & Macnaghten, 2013; Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014). These dimensions tend to be compatible with the EU definition, and therefore can be subsumed, in particular, under the engagement, ethics and governance dimensions. In this paper, we choose to mainly draw from the EU’s conception of RRI, although we also appreciate and support many of the academic conceptions. For industry, the EU’s conception may be more straightforward to incorporate, even though a couple of its dimensions, notably the promotion of science literacy, may not have a very good fit with industry’s objectives.

Thus, as we will utilize it, RRI is a strategic concept that imposes a number of demands on the way in which R&I is organised (Arnaldi, Gorgoni, & Pariotti, 2016). First, it requires the participation of as many stakeholders in R&I as possible. RRI should aim at being inclusive, which asks researchers and innovators to involve diverse stakeholders (such as users, NGOs, etc.) in the process, to broaden and diversify the sources of expertise and perspectives. This will enhance the societal acceptability of R&I. Second, ethical issues in R&I should be carefully considered and assessed, and mitigating actions should be taken if R&I could lead to outcomes that conflict with ethical criteria, including the fundamental values that societies uphold in their constitutions and legal frameworks. R&I should also be subjected to principles of good governance, which include anticipation, openness, transparency, and accountability. In addition, R&I should strive to adhere to socially accepted norms in areas such as open science and gender equality.

Studying the relationship between ethical, responsible and sustainable research and innovation and companies' socially responsible practices leads to a question on the business approach to RRI (Sutcliffe, 2011; Owen, Macnaghten, & Stilgoe, 2012; von Schomberg, 2013; Stilgoe, Owen, & Macnaghten, 2013; Reber, 2017). RRI is often discussed in relation to the more widely known notion of Corporate Social Responsibility (CSR). In general, CSR refers to responsibility, i.e., duties and obligations or motivation and opportunities of the companies towards society (Gurzawska et al., 2015). The European Commission defines CSR as “the responsibility of enterprises for their impacts on society” (European Commission, 2011).

The findings of the Responsible Industry Project suggest that companies lack knowledge about the concept of RRI (Gauttier, Søraker, Arora, Brey, & Mäkinen, 2017). However, this does not necessarily mean they conduct R&I in an irresponsible way (Gurzawska et al., 2015). Most large corporations have CSR strategies and policies. Companies with intense R&I activities are starting to consider specific actions often in connection with aspects related to quality and environmental performance (Gurzawska et al., 2015). Examples include internal recognition (awards) of design processes and innovations leading to energy saving during production and addressing other sustainability issues (e.g. eco-design) (Gurzawska et al., 2015). We perceive RRI as an opportunity to increase awareness for companies of the specific ethical issues and responsibility aspects related to research and development. It should be seen as a step beyond compliance with standards and regulation (“above the baseline of the law”).

The two concepts share an emphasis on companies' responsibilities towards social goods as well as on stakeholder engagement, which invites a comparison between the two concepts. Despite some similarities, the concepts are rather different. Firstly, RRI is largely a top-down approach created in the policy world, in which policy-makers aim to induce a system enhancing ethical, responsible and sustainable R&I (through, for example, European research funding such as Horizon2020). At the same time, CSR is based, to a great extent, on a bottom-up approach where CSR policies function as a self-regulating mechanism for business to ensure its compliance not just with laws, but also with the spirit of the law, with international norms and with ethical standards (Gurzawska et al., 2015). Secondly, while the main focus of RRI is ethics assessment and potential and actual social impact, CSR rather concentrates on the impact on community and environment (Gauttier, Søraker, Arora, Brey, & Mäkinen, 2017). Thirdly, CSR is generally applicable to all company activities, and thus also R&I, but is not specifically designed to affect R&I (Gurzawska et al., 2015).

In recent years, RRI has been used extensively for publicly funded research. RRI projects (Gauttier et al., 2015), not only in RRI but also RRI used in different scientific fields (e.g. RRI in nanotechnology) (<http://www.nano2all.eu/>), have stimulated greater stakeholder involvement, better consideration of ethical issues, better anticipation of social and environmental impacts or R&I and better consideration of other social issues such as gender in R&I and open science. Although RRI needs adaptations when being transposed from publicly funded to privately funded R&I, it is currently an approach that could prove value to both industry and society through its specific focus on R&I, which is missing in current CSR strategies, as well as its acceptance in government and academia, which could lead industry to create a better alignment with these sectors by also adopting RRI.

4.3 Defining Incentives and Our Approach

In general, incentives can be defined as a motivating force and a stimulus to incite for action (Sweeney & Sweeney, 2004). Grant (2002) explains that we reach for them when we wish to bring about change (Grant, 2002), therefore incentives help to steer people's choices in certain directions (Grant, 2002). Grant also describes incentives as the most attractive option for the person responding to the incentive above any other alternative when both parties stand to gain from the resulting choice (Grant, 2002). Incentives are not an objective, per se; they are a tool to achieve strategic goals and objectives (Sweeney & Sweeney, 2004).

There is a considerable amount of literature on incentives. In economic literature, a wide array of incentives are used to stimulate industry. Traditional classification of incentives is based on the monetary aspect. Following Bartik (1992) incentives take a form of either financial incentives (e.g. tax relief, industrial revenue bonds, and direct loans) or other non-financial incentives (e.g. regulatory relief, trainings, prestige, appreciation or praise) (McGuire & Bartik, 1992). Other authors divide incentives using the terms direct and indirect assistance (Bernstein, 1986; Miller, 1999). Some authors perceive these two categories as identical (Lim, Sensoy, & Weisbach, 2016), where financial incentives are the same as direct assistance, and non-financial incentives as indirect assistance. There seems to be a disagreement about the nature of incentives. Some authors suggest that they may take various forms from rewards to sanctions (e.g. Girth, 2017). Others emphasise the voluntary character of actions by all parties, meaning both the offering party and the responding party (e.g. Grant, 2002). Furthermore, in the psychology and marketing literature, researchers classify incentives as either outcome- or behaviour-based (Anderson & Oliver, 1987; Cravens, Ingram, Laforge, & Young, 1993). Outcome-based incentives reward on tangible outcomes (e.g. achieved revenue), whereas behaviour-based incentives compensate for supporting intermediate behavioural activities such as maintaining channel relationships (Iqbal & Feick, 2002). The same literature stream also refers to external incentives, which are defined as an event or object external to the individual that can incite action (Locke, 1968). This suggests the existence of internal incentives that depend purely on an individual. External and internal incentives can be used referring to an individual or an organisation (e.g. Mackenzie, 2007).

Recent institutional economics and behavioural economics literature sheds new light on the perception of incentives, augmented by including empirically grounded sociological and behavioural sciences research. The behavioural economic literature focuses on human and company behaviour (Williamson, 2000), as well as reasoning and motivations for their behaviour. For instance, Sen (1977) criticises the traditional dichotomy between egoism and universalised moral systems (e.g. utilitarianism) and argues for accommodating commitment as a part of behaviour (Sen, 1977). Some other authors analyse a question of rationality of one's behaviour (Sen, 1977; North, 1990; Thaler & Sunstein, 2008; Anderson, 2010). Incentives aim at changing a specific behaviour, either of individuals or groups of individuals. Therefore, they are directed towards reaching a specific target, e.g. companies should not use child labour in a production process or they should pay fair wages to employees. The question that arises is how to make someone behave in a specific way. Psychology can engender

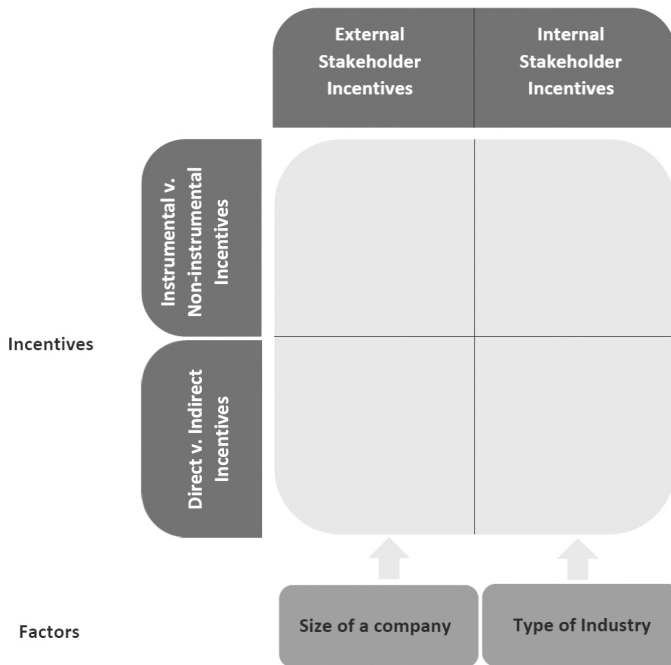
persuasion, therefore can lead to convincing someone to do or believe something. For example, Cialdini (1983) proposes six key principles of persuasion: reciprocity, consistency and commitment, social proof, liking, authority and scarcity (Cialdini, 2008). Behavioural economics literature provides a concept of “behavioural change intervention”, which can be defined as “coordinated sets of activities designed to change specified behaviour patterns” (Michie, van Stralen, & West, 2011). Michie et al. (2011) make a distinction between interventions understood as activities aimed at changing behaviour and policies, which are actions on the part of responsible authorities that enable or support interventions (Michie et al., 2011). New institutional economics and behavioural economics literature can provide solutions for effective stimulation of RRI among companies, through the governance system of organisations (players) and institutions (the rules of the game) (North, 1990; Ostrom, 2010). The effective design and implementation of incentives is contingent on the context (Michie et al., 2011), therefore, it is crucial to fit the correct institutional rules to each specific social-ecological setting (Ostrom, 2010).

Considering the variety of classifications, in this paper, we develop our own approach to analyse the incentives of RRI in an industry context (Figure 4.1). Our approach has two layers of analysis; firstly the incentives and secondly the factors affecting the implementation of RRI in industry. We refine our setup as a variation of the aforementioned classifications built on, and adapted to, the fields of CSR and RRI. The incentives layer is composed of three divisions of incentives: (1) external stakeholder incentives and internal stakeholder incentives; (2) instrumental and non-instrumental incentives; and (3) direct and indirect incentives. The first category derives from firstly, the differentiation between internal and external incentives mentioned above, and secondly the importance of the engagement and interaction with stakeholders, which we have learnt from CSR (stakeholders theory, Freeman, 1984) and RRI (science with and for society, European Commission, n.d. c; public engagement in RRI, European Commission, n.d). Therefore, we look at incentives through the lens of stakeholders of RRI and the impact a responsible process for R&I would have on stakeholders and performance. As a result, we create a new classification differentiating incentives between external stakeholder incentives and internal stakeholder incentives. The second category is based on a differentiation between instrumental and non-instrumental incentives. We define instrumental incentives as means to an end, therefore any action carried out for the sole purpose of achieving some goal. One of the examples is legal regulation such as the EU law (European Parliament and Council, 2014) requiring large companies to publish

regular reports on the social and environmental impacts of their activities (European Commission, n.d. a) with the aim of encouraging these companies to develop a responsible approach to business and allowing investors, consumers, policy makers and other stakeholders to evaluate the non-financial performance of large companies (European Commission, n.d. a). Another example is certification and labelling of environmentally-friendly products to enhance recognition among consumers and potential business partners to ultimately enhance more responsible behaviour from companies. Non-instrumental incentives are ends in themselves, e.g. profit. These are ends for businesses. For persons, profit is usually a means: money is a means for consumption, well-being, etc. The third category includes direct incentives and indirect incentives, where direct incentives are understood as financial incentives, such as financial support (e.g. for start-ups, SMEs clusters), responsibility awards in the form of money, and indirect incentives as non-financial incentives e.g. positive media attention and reputation among professionals. We want to emphasise that non-instrumental incentives, therefore the ends in themselves, can have both financial and non-financial character, where non-financial ends would include for instance added value or continuity of a company.

Figure 4.1

Matrix: categories of incentives and factors



Furthermore, to ensure the effectiveness of incentives, our research recognises the differences between the addressees of the incentives. These differences are captured in the second layer of analysis—factors affecting the implementation of RRI in industry. Given that companies vary in size, each will face its own distinct challenges. Different incentives should, therefore, be created and applied to large enterprises and SMEs. Moreover, the diversity of industry sectors should be addressed. Companies from the health care sector would require different incentives than information technology or telecommunication services. Consequently, our approach is based on the principle “one does not fit all”.

In the following sections, we analyse the effective implementation of RRI in industry according to the matrix. First, we discuss the initial layer of the matrix: incentives. Second, we analyse factors that affect the implementation of RRI among companies, namely the size of a company and type of industry.

4.4 Incentives for RRI in Industry

Systems thinking can augment the understanding of incentives for RRI in industry. According to the definition of Arnold and Wade (2015), systems thinking consists of eight elements: recognising interconnections, identifying and understanding feedback, understand system structure, differentiating types of stocks, flows and variables, identifying and understanding non-linear relationships, understanding systemic behaviour, reducing complexity by modelling systems conceptually, and understanding systems at different scales (Arnold & Wade, 2015). Conceptual models are important in enhancing the understanding of the underlying system by explicitly presenting its structure and determinants of certain dynamic behaviours. Causal loop diagram (CLD) is a flexible and simple method to create conceptual models.

Neoclassical economics theory has dominated the economics discussion in the last few decades (Agboola, 2015), which has led business managers to adopt neoclassical management principles. According to neoclassical economics theory, companies and customers are trying to maximise their profit and utility, respectively (Agboola, 2015). For this reason, the causal loop diagram (Figure 4.2) presents the influence of RRI on profit. Because companies are required to produce profit, companies need to consider the economic impact of their activities (Chatfield, Iatridis, Stahl, & Paspallis, 2017). Presenting the influence of RRI on profit reveals an interesting system structure that can be utilised to find appropriate RRI incentives for different stakeholders.

A profitable company is able to invest in the business development and pay the owners. This implies that the more the company makes profit the more it has resources for business development. Profit can be defined as total revenue minus total expenses. Thus, every investment or payment for the owners reduces the current profit. However, successful investment will increase the profit in future. The return of investment (ROI) depends on the type and the execution of the investment decision.

The profitability of a company is highly determined by productivity and sales. Investments in business development can improve business tools, equipment and processes, which have a direct effect on productivity. In addition, business development resources can be allocated to improve employee engagement and education, which are parts of the RRI framework. The work environment is a determinant of employee engagement (Anitha, 2014), which means that traditional business development activities, such as upgrading working conditions, will also improve employee engagement.

Research has discovered that employee engagement has a positive influence on productivity (Cook, 2008; Anitha, 2014; Kompas & Sridevi, 2010), recruitment quality (Cook, 2008) and customer satisfaction (Cook, 2008; Yi & Gong, 2008; Kompas & Sridevi, 2010). Thus, investment in employee engagement has a direct effect on profit due to improved productivity. Furthermore, an engaged workforce generates good reputation among professionals, which enables the company to recruit the best employees, which, alongside with employee education, improves a company's productivity due to higher quality of the workforce. Engaged employees also have less intention to leave the company, which leads to a lower turnover of employees (Cook, 2008; Kompas & Sridevi, 2010). Moreover, lower employee turnover reduces recruitment costs and improves the quality of employees because the company can better preserve the job and company-specific knowledge of experienced employees (Van Loo, de Grip, & de Steur, 2001).

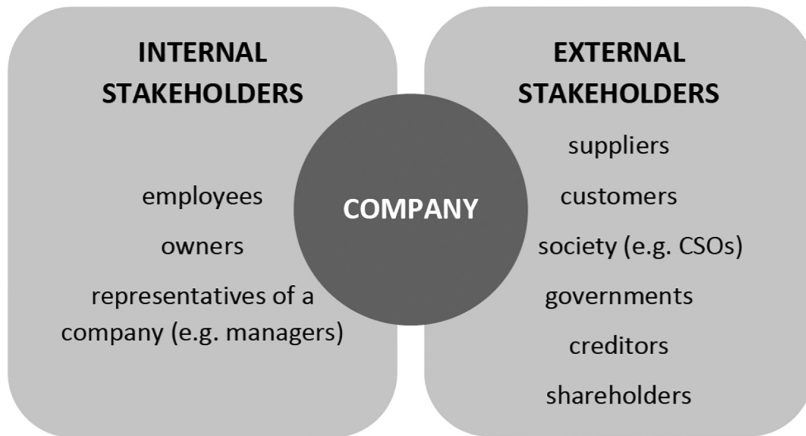
Sasser, & Schlesinger, 2008) and will continue the customer relationship without any marketing. Engaged customers will also lead to engaged employees due to inspiring a positive relationship between customers and employees (Yi & Gong, 2008; Yi, Bijmolt et al., 2010; Natarajan, & Gong, 2011). However, it is not easy to achieve loyal and engaged customers even though the theory behind these favourable customer attributes is not complicated. Studies show that customer satisfaction will lead to customer loyalty (Hennig-Thurau, Gwinner, & Gremler, 2002; Heskett et al., 2008; Yi & Gong, 2008) and customer engagement (Yi & Gong, 2008).

Business ethics also have an influence on sales. Thus, by aligning a company's ethics with public ethics in target communities, the company can improve the attractiveness of its products in the eyes of the target customer segments. A company's ethics is an aggregate of the ethics of its workforce. Chatfield and co-workers' (2017) study also suggests that internal efforts to align employees' values with organisational values can support and nurture responsible innovations (Chatfield et al., 2017). Changing ethics, however, is not straightforward and implementing the desired ethics in the business model, as well as in the mindsets of employees, probably requires time and resources.

The CLD visualises important variables and their interconnections, which helps to find attractive incentives for companies and other stakeholders. In this study, we analyse a couple of RRI incentive examples. The examples were chosen deliberately. According to our findings, these examples have a potential to be successful tools to enhance RRI among companies. We structure our analysis of the examples of incentives by focusing on RRI stakeholders, which we define in subsection 4.4.1. In subsection 4.4.2, we explore external stakeholder incentives, and in subsection 4.4.3 internal stakeholder incentives. In the last subsection 4.4.4, we study the role of governance in the RRI incentives.

4.4.1 RRI Stakeholders

The stakeholders should be identified in a structured and exhaustive way (Achterkamp & Vos, 2008) derived from the stakeholder theory (Freeman, 1984). To be able to identify stakeholders, it is crucial to define "a stakeholder", e.g. in the form of a stakeholder classification model. Moreover, how the actual stakeholders fit within these classes and how they are determined accordingly have to be taken into consideration (Achterkamp & Vos, 2008). In this paper, we define a stakeholder for the RRI process as either a group or an individual who potentially affects, or is affected by, RRI and/or has a (vested) interest in the RRI (Achterkamp & Vos, 2008).

Figure 4.3*Internal vs External Stakeholders (examples)*

Note: Based on: Jones (1995); Brem & Viardot (2015); Cardwell, Williams, & Pyle (2017).

The stakeholders involved in RRI are the same as those involved in any research, development and innovation (R&D&I) process (namely industry, researchers, civil society organisations (CSOs) and policy makers, including representatives from the European Commission, universities and institutions providing policy advice). For the purposes of this study, we divide stakeholders into two main classes: internal and external stakeholders (Figure 4.3). The internal stakeholders include employees, owners and representatives of a company such as managers. The external stakeholders consist of, among others, suppliers, customers, society, governments, creditors and shareholders.

In addition to a stakeholder definition, the stakeholders can also be identified in a proactive way by conceptualising the roles of actors in an RRI process (Achterkamp & Vos, 2008). Some of these roles are explicitly mentioned above (e.g. researchers; the representatives from the European Commission). In those cases, “stakeholders” refers to the non-standard roles that have to be identified on a case-by-case basis for RRI projects. For instance, the Responsible Industry Project focuses on information and communication technologies for health and ageing. Therefore, we recognise elderly people as both customers and a stakeholder group in health care projects. However, in a different context, they would probably not be a stakeholder group. Furthermore, a role-based stakeholder classification enables the ad hoc inclusion of other non-standard stakeholders such as other groups of “the society”, end-users themselves (not

all of them are represented by CSOs or may not always be well represented by “their” CSOs), and other organisations (e.g. churches in stem cell research). Moreover, stakeholders can be determined in terms of their social identities (Crane & Ruebottom, 2011), which are the markers that groups use to define and distinguish themselves from others (Tajfel & Turner, 1986), as well as the different interests, ideologies, values, and expectations these identities bring forward in relation to the company (Crane & Ruebottom, 2011). In the next subsection, we discuss the first category of incentives: external stakeholder incentives.

4.4.2 External Stakeholder Incentives

In this subsection, we discuss two examples of incentives for industry that external stakeholders can use to stimulate ethical, responsible and sustainable R&I practices among companies. Firstly, we analyse corporate reputation and critical consumerism, and, secondly, we focus on certification. We also address the conditions for making these incentives effective tools in the context of RRI.

Corporate Reputation and Critical Consumerism

According to the resource-based view (RBV), a model that perceives resources as key to superior company performance, a good corporate reputation differentiates a company from its competitors (Lai, Chiu, Yang, & Pai, 2010). Corporate reputation is an important factor in stakeholders’ decisions, for employees deciding to work for a company, for investors to invest in it, and for consumers to buy its product and services (Maden, Arkan, Telci, & Kantur, 2012). A number of studies (e.g. Bhattacharya & Sen, 2004; Du, Bhattacharya & Sen, 2010; Melo & Garrido-Morgado, 2012) have shown that companies benefit from engaging in responsible corporate activities (Hur, Kim & Woo, 2014). Companies profit from obtaining favourable consumer awareness, attitude and a sense of attachment as well as by building a long lasting positive corporate image and good reputation (Hur et al., 2014). Several researchers have found that the perceived fit between firm and responsible activities have a positive effect on consumer response (Sen & Bhattacharya, 2001; Menon & Kahn, 2003; Becker-Olsen, Cudmore, & Hill, 2006). Therefore, as consumer interest in responsible corporate activities continues to rise, consumers should be considered as the key element when enhancing companies RRI activities.

Consumers can play an important role as an RRI incentive for companies. On the one hand, they can actively pressure companies to conduct research and innovate in a responsible way. On the other hand, they are a crucial reference group for

companies to better align their products and services to the expectations and needs of consumers. According to the causal loop diagram, the company can attract consumers and increase sales by aligning its business ethics with the ethics of target customer segments, by utilising the positive word of mouth from customers or by marketing. The positive word of mouth is an effect of customer satisfaction and engagement. Thus, customer satisfaction and engagement are attractive incentives for companies. On the other hand, successful marketing and the achievement of desired business ethics goals require information about the preferences and purchasing behaviour of consumers.

Consumers more often look for ethical, sustainable, and Fairtrade (<http://www.fairtrade.org.uk>) products. The rising popularity of responsible brands such as Patagonia, who produce clothing ethically, Lush Fresh Handmade Cosmetics, who offer 100 per cent vegetarian cosmetics, or Fairphone, who provide phones using responsible sourcing, illustrate this trend. However, consumers and society at large have to have reliable information about companies' practices in order to serve as a stimulus for implementation of RRI in industry. This may be particularly challenging because of the global reach of companies activities. Over the last few decades, we have observed growth in terms of multinational R&I, relocation of company R&D to affiliates abroad and international cooperation through R&D networks (Rangi et al., 2015). Consumers, therefore, have limited means to evaluate brands and firms regarding their responsible behaviour, and, in reality, their purchase decisions do not always reflect their ethical views (Brunk, 2017). The majority of consumers' engagement seems to be re-active rather than pro-active and is clearly visible when a striking corporate scandal occurs, such as the cases of British Petroleum (BP) and the oil spill in the Gulf of Mexico in 2010, the Volkswagen emissions scandal in 2015 or the recent case of Novartis undertaking inappropriate trials on the homeless in Poland. This is because consumers are more sensitive to negative CSR information than to positive CSR information thus increasing the risk of boycott due to events of perceived social irresponsibility (Beckmann, 2007). Companies have been confronted with the power and impact of consumers, NGOs and media. Therefore, companies can no longer sweep their misconducts under the rug. The internet-connected and media-savvy NGOs regularly campaign and challenge a company's reputation and even their fundamental social license to operate (Freeman, 2006). Corporate governance scandals diminish trust in business in the eyes of the public and therefore consumers (Freeman, 2006). The reputational threats create a situation where companies have to start considering not only whether "the resources are *available*, but also whether they

are *acceptable* to powerful constituencies in their home countries” (Bray, 2003). Such cases should serve as a reminder for R&I companies to review and monitor their processes and cultures before such incidents happen, raising the need for the kinds of implementation frameworks and assessment tools developed in this and other RRI projects.

To raise awareness and interest of consumers about companies’ R&I practices, there is much to be learnt from relevant, similar domains, such as “fair trade” and “sustainable development”. Important tools that enable consumers to make a more informed decision as to whether they want to financially support a given organisation include online resources where consumers can assess the practices of particular companies. The existing services in this vein are typically restricted to issues such as fair trade, ecological footprint and, to a lesser degree, workplace conditions and there are few if any comparable resources when it comes to RRI. Project Just (<http://www.projectjust.com/>) focuses on ethical clothing and has created an accessible, transparent and user friendly online platform providing information about clothes brands. The project recognises the importance of stakeholders’ dialogue and therefore engages shoppers, brands, industry experts, makers, non-profits, journalists and academics to strengthen its database (Chalofsky & Krishna, 2009). Another example is Ethical Consumer (<http://www.ethicalconsumer.org>), which is a non-profit UK magazine and website providing information on the social, ethical and environmental behaviour of companies and issues around trade justice and ethical consumerism. Ethical Consumer publishes detailed ethical ratings for over 40,000 companies, brands and products taking into account 19 criteria, in five main categories: animals, environment, people, politics and sustainability (<http://www.ethicalconsumer.org>). Ethical Consumer’s online tool allows a user to personalise their product guides to produce a shopping list that accurately reflects the issues that are most important to them, e.g. animal testing, climate change, sweatshop labour, genetically modified crops or palm oil. They also offer a one-click tool for sending an email to the company, either praising or reprimanding them for their ethics (Ethical Consumer, n.d.). The tool also has a mobile-friendly version of the website to ensure easy access for users. Our final example is the GoodGuide (<https://www.goodguide.com>), which combines manufacturer-provided information about product ingredients with authoritative information on the health effects of chemicals, giving consumers the information they need to make better shopping decisions. GoodGuide provides ratings on products focused on their health impacts, which is based on an evaluative health algorithm that was developed by experts in the

fields of environmental and health sciences. To make it easily accessible and user-friendly they offer the GoodGuide iOS App, Product Scanner for Android and access to mobile websites to be used while shopping (<https://www.goodguide.com>). These three examples might be a promising avenue to pursue by the EC in collaboration with RRI researchers, NGOs and media, especially if made easily accessible, user-friendly, personalised, mobile and supported by a marketing strategy aiming to raise recognition among consumers.

Recognition of a company and consumer awareness can also be assisted with certification. In the next subsection, we discuss how certification can serve as an effective incentive for RRI implementation in industry.

Certification

The current proliferation of norms referring to firms' social responsibility can give some light on stimulating implementation of RRI in industry. Many companies use CSR certificates such as Social Accountability 8000 (SA8000) (Social Accountability International, n.d.) focusing on workers' rights and workplace conditions; OHSAS 18001 (SCCM, n.d.) regarding health and safety of employees and minimising the risk of accidents; ISO 14001 and Eco-Management and Audit Scheme (EMAS) (ISO, 2004) on environmental management, as well as the EU Ecolabel (or "EU Flower") or B Corporation certification (<https://www.bcorporation.net>). Based on these examples, we claim that a label certified by a third party can signal companies' RRI practices. An RRI label would be granted after a certification procedure has been carried out by an independent, either public or private, agency guaranteeing that the R&I process meets a certain quality threshold. Certification is one of the ways to help companies build reputation and recognition of the company and its products on the market as well as create respect and trust in the company's practices. It can also assist investors and companies to choose business partners who respect the same values and principles. At the same time, certificates and labelling will guide consumers to make informed decisions about a product or service offered by a company. Various studies show a positive effect of CSR certification and labelling, for instance on customers' willingness to purchase and their perception of the company's reputation (Maden et al., 2012; Wu & Wang, 2014; Arikan, Kantur, Maden, & Telci, 2016; Gauttier et al., 2017).

Despite clear benefits of certification and labelling, the practices have not escaped criticism. The primary claims against CSR certification are valid as well for a potential RRI certification. Harbaugh et al. (2011) highlight the negative effects of multiple

competing labels that can cause uncertainty around the informativeness and authority of labels as well as potential association effects on products when another product with a good or bad reputation displays it (Harbaugh, Maxwell, & Roussillon, 2011). Therefore, there is a risk that some companies may strategically apply certificates to manipulate such information spillovers (Harbaugh et al., 2011). More and more companies are engaging in practices misleading consumers about their environmental performance or the environmental benefits of a product or service (Delmas & Burbano, 2011). These practices are known as “greenwashing”, defined as “the intersection of two firm behaviours: poor environmental performance and positive communication about environmental performance” (Delmas & Burbano, 2011), or in other words “the practice of making unwarranted or overblown claims of sustainability or environmental friendliness in an attempt to gain market share” (Dahl, 2010). Greenwashing raises concern not only about negative effects on consumer confidence in green products, but also about the erosion of the consumer market for green products and services (Delmas & Burbano, 2011). Companies illegitimately purporting to be environmentally friendly lead to the situation when companies true to their environmental mission lose their competitiveness (Furlow, 2009). Moreover, as Zimmer et al. (1994) warn, overuse and misuse of the “green” claims can ultimately deprive the greenness of the product of its meaning to the consumer (Zimmer, Stafford, & Stafford, 1994). Other problems that certification may cause are the increase of costs, additional bureaucracy, and variance in standards (Gauttier et al., 2017). This can be particularly challenging for SMEs lacking resources. However, these threats can be overcome. Consider B Corp Certification, a private certification for B Corps, which are for-profit companies certified by the non-profit B Lab to meet standards of social and environmental performance, accountability, and transparency (Wu & Wang, 2014). B Corp Certification is tailored to the size (number of employees), type (sector) of business and its location (Wu & Wang, 2014). Fees are annual and they vary depending on a company’s annual sales within the range \$500 to \$50,000 (<https://www.bcorporation.net>). Furthermore, to ensure validity of the certificate, the certification term is two years. After the two-year term, a company must recertify (<https://www.bcorporation.net>). What is particularly interesting and innovative about B Corp Certification is the fact that B Corporation is a vigorous community that offers various benefits for its members such as being part of a movement to “redefine success in business” (<https://www.bcorporation.net>); regular monitoring of activities for continuous improvement; partnering with peers in the network of certified B Corps; distinction on the market; encouraging investors;

generating media attention; attracting talents; and raising recognition of the brand among consumers (<https://www.bcorporation.net>). Furthermore, thinking about the affordability of certification particularly for SMEs, it is in fact the case that most B Corporations are privately held SMEs (Kim, Karlesky, Myers, & Schifeling, 2016). According to Suntae and Schifeling (2016), there are two underlying reasons for companies to seek out B Corporation certification (Suntae & Schifeling, 2016). Firstly, for SMEs that have long been committed to social and environmental values, B Corporation certification provides a means to express their authentic commitment to these values (Suntae & Schifeling, 2016). They emphasise the need to distinguish themselves in the midst of a “greenwash” revolution and “to help consumers sort through the marketing hype to find businesses and products that are truly socially and environmentally responsible” (Crabtree, 2013). Secondly, the recent proliferation of B Corporations is a response to the way business is currently done (e.g. greenwashing). Therefore, traditionally ethical, sustainable and responsible companies participate in the movement to unite and initiate changes in the industry environment (Kim et al., 2016). The success of B Corp Certification lies in a strong marketing strategy and investment in the recognition of the label. The advantage of this approach is also confirmed by the experience of the EU Ecolabel (or “EU Flower”), which is a voluntary ecolabel scheme established in 1982 by the European Commission (Morales & Vuerich, 2014; European Environmental Bureau, n.d.). The EU Ecolabel experience shows an increase in Ecolabel sales when promotional actions are carried out (Morales & Vuerich, 2014). Furthermore, examples of countries such as Denmark and Austria where broader marketing activities are developed in a more consistent and regular manner show good results in terms of consumer awareness and market uptake (Morales & Vuerich, 2014).

The Responsible Industry Project (<http://www.responsible-industry.eu/>) has argued that RRI certification can serve as an effective tool for companies to improve R&I management and efficiency, enhance credibility, engage stakeholders, and identify and manage risks associated with social, environmental and ethical factors. However, learning from successful standardisation and certification schemes (e.g. CSR certification, B Corp Certification and EU Ecolabel), we argue that such schemes work only under certain conditions (Waldman & Kerr, 2014). Therefore, we claim that RRI certification should be designed as a flexible tool in order to provide an opportunity to tailor the certification as an individual approach well-suited for the needs of each company. The RRI certification should not cause any additional burden, but instead optimise the existing rules and give visibility to the practices in

place (Gauttier et al., 2017). To ensure the effectiveness of the RRI certification, it should be created in cooperation with industry and the RRI community to stimulate the shared ownership of the norms of the RRI certification. Moreover, RRI certification should build a community with a strong brand that is attractive for companies (including SMEs) for its prestige, improvement opportunities, recognition in media and among stakeholders, investment and partnering potentials. The RRI certification requires a strong marketing strategy, with meaningful campaigns which measure return on investment to attract companies and boost consumers' recognition. Lastly, the argument supporting RRI certification can be illustrated by the results of the experiment conducted by Etilé and Teyssier (2016). The authors compared the market effect of third-party certification and the free incorporation of CSR attributes into brand-building strategies through unsubstantiated claims (Etilé & Teyssier, 2016). Their findings conclude that it will be difficult to bring about CSR development if companies use CSR claims without being certified (Etilé & Teyssier, 2016). The authors emphasise that CSR must be incorporated into brand-building strategies through third-party certification (Etilé & Teyssier, 2016). The same claim may be valid for RRI; without certification, the enhancement of ethical, responsible and sustainable research and innovation may fail. At the same time, further in-depth study of the RRI certification potential is still required to validate this claim. The literature provides several questions (Roe, Teisl, & Deans, 2014; Waldman & Kerr, 2014). Particularly, whether the RRI certification should be voluntary or mandatory and, therefore, what should be the role of the government versus private sector in certification, who should bear the costs of certification (e.g. consumers, producers, taxpayers), and how to balance the costs of certification against the suite of social welfare impacts generated by improved information, altered externalities, modified market structure, etc. (Roe et al., 2014) According to Roe et al. (2014), consumers' willingness to trust a certificate can be associated with the entity certifying the label (Roe et al., 2014). Who, then, should be more credible and more adequate as a certifying entity in the case of RRI certification? Furthermore, how to address the risk of manipulation from companies, e.g. companies from developed countries using labels as strategic tools to raise rivals' costs, resulting in trade distortions and often leaving poor countries' producers out of the market (Dröge, 2001; Klooster, 2006; Ponte, 2008)? What should be certified (e.g. products or producers), and what evaluation criteria should be used (e.g. outcome-based approach or input-based approach) (Waldman & Kerr, 2014)? Finally, new technological solutions are complex and require a variety of components. Therefore, another question is how to ensure

the control over a final product and an intermediate product as an input into a final product (Dröge, 2001; Klooster, 2006; Ponte, 2008).

4.4.3 Internal Stakeholder Incentives

Internal stakeholders play an essential role in a company's ethical, responsible and sustainable behaviour, since they primarily include the employees who actually do the R&I—the workers whose practices should be aligned with RRI. The key to having internal incentives motivate the wilful adoption of RRI is to educate industry on the advantages of doing so (for instance a substantial return-on-investment by means of positive effects on the workforce). In this section, we argue that RRI implementation has a strong positive effect on employee functioning, and, as a result, also on companies' performance. We provide an example of internal stakeholder incentives, which emphasise the relationship between employee engagement and companies' financial performance to show how RRI can affect employees in ways that are detrimental or beneficial for business.

Employee Engagement

The causal loop diagram indicates the effects of employee engagement in the success of a company. Employee engagement is a determinant of productivity, costs and sales, which are the main performance indicators of any company. Furthermore, employee engagement, alongside profit, is included in many self-reinforcing feedback loops, which means that the employee engagement as well as profit tends to increase (or decrease) after the initial push in the right (or wrong) direction. For this reason employee engagement is an attractive incentive for companies and explained thoroughly in this subsection.

According to the Harvard Business Review (2010), Millennials, which represent roughly 50% of the global workforce, view work as a key part of life and place a strong emphasis on finding work that is personally fulfilling (Meister & Willyerd, 2010). Increasingly companies recognise the need to provide their employees with a supportive working environment and work-life balance that ensures their well-being. There are two reasons for this. Firstly, they want to attract and engage talent. Secondly, as Tehrani et al. (2007) point out, employee well-being “brings benefits for people at all levels inside and outside the workplace. It makes the workplace a more productive, attractive and a corporately responsible place to work” (Tehrani, Humpage, Willmott, & Haslam, 2007). “Well-being” is a multifaceted notion and one of its aspects is well-being at work. It can be defined as “creating an environment to

promote a state of contentment which allows an employee to flourish and achieve their full potential for the benefit of themselves and their organisation” (Tehrani et al., 2007). Furthermore, it encompasses a number of workplace factors, such as efficient application of work, employee retention, creativity, business outcomes and engagement (Harter, Schmidt, & Keyes, 2003; Gauttier et al., 2017). According to Suff and Miller (2016) employee well-being consists of five interrelated domains: health, work, values/principles, collective/social and growth (Suff & Miller, 2016). Well-being of employees is interconnected with employees’ willingness to contribute in the workplace and engagement at work.

One of the important aspects of well-being is employee engagement, sometimes referred to as employee commitment. According to the Corporate Leadership Council, employees with high levels of commitment perform 20% better and are 87% less likely to leave the organisation (Corporate Leadership Council, 2004). Employee engagement has been defined as “the extent to which employees commit to something or someone in their organisation, [and] how hard they work and how long they stay as a result of that commitment” (Corporate Leadership Council, 2004). Further studies suggest that engaged employees are significantly more productive than their counterparts. For instance, the results of a large meta-analysis of 30 years of Gallup research on employee engagement carried out by Harter et al. (2003), demonstrate that employees in the top quartile of engagement in large companies were significantly more productive than the bottom quartile, and the difference between the two in value was estimated to be as much as \$960,000 per year (Harter et al., 2003). The meta-analysis also shows that employee engagement is strongly associated with “higher business unit customer loyalty, higher profitability, higher productivity and lower rates of turnover” (Harter et al., 2003). Despite significant evidence suggesting a positive impact of employee engagement on companies’ performance, Gallup’s findings reveal that only 13% of employees reported a sense of engagement at work, while 24% were actively disengaged (Crabtree, 2013). Another example of a positive impact of employee engagement is the impact on employee turnover. A company with employees characterised with a high engagement level suffers less from employee turnover (Huselid, 1995; Cook, 2008; Kompaso & Sridevi, 2010; Gauttier et al., 2017). High turnover causes high recruitment costs because employees that leave the company must be replaced to preserve current production or service levels (Gauttier et al., 2017). There is also a cost to the company not only in terms of recruiting and training, but also the risk of the new employees being an unknown quantity and

therefore the risk of having to undergo HR processes to manage poor performance or terminate a contract.

Bearing in mind the correlation between employees' well-being and their engagement, the question that arises is how to stimulate well-being and employee engagement. The answer comes with the drivers of employee commitment, which Chalofsky and Krishna (2009) identify as the forces emphasising the congruence between individual and organisational goals and values, and internalisation of organisational values and its mission (Chalofsky & Krishna, 2009). Furthermore, Grant (2007) concludes that an organisation caring about user needs and societal welfare can spark motivation and positively affect employee's actions and behaviour (Grant, 2007). However, employees' engagement can be compromised by the lack of alignment between organisation policies and practices and a perception that the organisation engages in unethical behaviour or policies (Cartwright & Holmes, 2006). As a result, it can cause a negative attitude in the employees towards their employing organisations and lead to a deep deterioration of their mutual commitment and trust (Cartwright & Holmes, 2006; Gauttier et al., 2017). The effective adoption of RRI within a company can help companies through increasing engagement and commitment that employees feel and demonstrate towards their organisation. Furthermore, RRI can assist companies in raising a sense of meaning in their employees' work or a purpose for the overall organisation (Harter et al., 2003). Ultimately, RRI is about conducting research and innovating in an ethical, responsible and sustainable way for the benefits of the society. This perception of R&I may enhance employees sense of having "meaningful work". To encourage implementation of aforementioned internal stakeholder incentives, we believe it is crucial to educate industry on the advantages of doing so—and these advantages need to be framed in terms of profit maximisation. RRI implementation should be introduced to industry as a business decision likely to generate a substantial return-on-investment by means of positive effects on the workforce.

4.4.4 Governance

The last example of RRI incentive for industry is governance. Governance touches upon the question of how R&I should be governed in order to ensure sustainability and societal desirability of R&I processes and their marketable products. When developing the governance of RRI systems in industry, two levels of governance have to be taken into account, firstly the internal level of a governance system within a company, e.g. how RRI should be administered within companies by executives, and

secondly the external governance system, e.g. the governance of RRI from a political perspective.

Within a company, the RRI principles and practices should be integrated along the whole value chain (The Responsible-Industry Project Consortium, 2017). RRI values that are embedded in the governance of a company might improve integration of the aims of the company personnel with those of the corporate policy (Chatfield, Borsella, Mantovani, Porcari, & Stahl, 2017). However, it is the role of CEOs, senior executives and project managers to organize RRI internally to pursue responsible practices and behaviours when developing devices, products and services (The Responsible-Industry Project Consortium, 2017). It is the management that is at the core of the RRI governance within a company. The management makes a statement of a company's principles and values, by adopting a specific strategy for the assessment and management of ethical and social risk impacts, integrating RRI principles all along the value chain, ensuring that the company is committed to (and accountable for) risk and ethical assessment of the R&D projects and creating an "ethical culture" amongst the employees (The Responsible-Industry Project Consortium, 2017). A company can incentivise RRI among its employees through raising awareness on RRI principles, integrating ethical thinking into the design/production process, advocating and encouraging employees to maintain a responsible attitude and discouraging/stigmatising unethical behaviour (The Responsible-Industry Project Consortium, 2017). Management also influences the adoption of voluntary governance tools to support the strategy implementation (The Responsible-Industry Project Consortium, 2017). This brings us to the second aspect of governance, namely the political level.

Governance at the external political level is based on a variation of institutional norms such as routines, common habits, established practices, rules, laws, standards and so on (Malerba, 2005). Institutions provide a variety of firm, specific incentives. Requirements and incentives provided by institutions are the most concrete, the most visible to customers and the most easily evaluated. This has led to a relatively good adaptation of responsibility in various regulated practices. However, law and regulation provide only the minimum level of responsibility. The CSR field can shed some light on how the RRI institutionalisation can be organised. CSR governance is based on development of standards that define specific procedures and processes to govern corporate performance (Albareda, 2013). Nevertheless, despite a couple of decades of institutional CSR developments, academics, business people, policy-makers, lawyers as well as NGOs, and the society at large, call into question the

institutional setup of CSR and its effectiveness. The main argument in the discussion focuses on the binding and non-binding character of CSR instruments, therefore, hard-law and soft-law. Hard-law regulation provides certainty, credibility of commitments and accountability in case of breach of the rules (Abbott & Snidal, 2000). This is because it provides actors with a means to instantiate normative values (Abbott & Snidal, 2000). However, the binding character of hard-law entails legal consequences, restricts actors' behaviour and even their sovereignty (Gurzawska et al., 2015). As a result, actors are reluctant to pay these costs. Most of the CSR standards, principles and codes of conduct have a soft-law character (Gurzawska et al., 2015). It means that they are not binding and a company may voluntarily adhere to these soft-law instruments. Soft-law CSR instruments are widely criticised for their voluntary character having no effect because they lack an independent judiciary that supports enforcement powers (Abbott & Snidal, 2000). At the same time, soft-law instruments carry a number of advantages. Firstly, soft-law is less controvertible and faster to establish, because it represents a compromise between actors with different interests and values (Abbott & Snidal, 2000). Secondly, it offers more effective ways to deal with uncertainty, especially when it initiates processes that allow actors to learn about the impact of agreements over time (Abbott & Snidal, 2000). Thirdly, in many cases, soft-law regulation emerges as a quick reaction for existing problems (Gurzawska et al., 2015).

Our findings show that industry stakeholders wish to see incentives for the uptake of voluntary RRI tools and practices (Gauttier et al., 2017). However, they also reject the idea of legally binding obligations, because they perceive RRI as more than compliance with the law (Gauttier et al., 2017). Moreover, SMEs do not have enough resources to dedicate to complex legal procedures (Gauttier et al., 2017). Voegtlin and Scherer (2017) point out a number of advantages of soft-law regulation in the context of innovation (Voegtlin & Scherer, 2017). Firstly, they claim that soft-law mechanisms can help overcome the limitations of hard-law in global governance for responsible innovation by engaging companies that are the main source of innovation, in the process of norm setting (Voegtlin & Scherer, 2017). As a result, they become more committed to the norms (ownership of the norms). Secondly, soft-law regulation enables regulation of R&I on a global scale (even if with varying success) (Voegtlin & Scherer, 2017). Thirdly, soft-law can cover a wide range of innovation processes and types of innovation (Voegtlin & Scherer, 2017). Moreover, soft-law regulation can inspire new innovations, because regulations that are accepted by companies as industry standard or that serve as benchmarks can “reduce uncertainty and create

long-term stability for industries to innovate, invest and compete” (Nilsson & Persson, 2012). Lastly, soft-law regulation is more flexible than hard-law in adapting to new circumstances, what is particularly important for R&I and their unforeseen negative consequences (Voegtlin & Scherer, 2017). Bearing this in mind, we believe that the adoption of voluntary RRI governance tools can help to address and organise critical ethical issues, as well as to comply with the existing regulatory frameworks (The Responsible-Industry Project Consortium, 2017).

At the same time, we argue that the effectiveness of voluntary RRI governance tools depends on the process of institutionalisation of RRI. The main aspects include a bargaining process, actors engaged in the discussions, leadership forces, an advocacy level, timing and the politics surrounding these matters. These elements are crucial for perceiving RRI as a shared responsibility owned by all RRI stakeholders, including companies, civil society organisations (such as NGOs, responsible investors and consumers), researchers and policy-makers. Therefore, the process of RRI standard-setting should be based on a co-creation, where all RRI stakeholders are involved. Voegtlin and Scherer (2017) emphasise that “the clear separation of the political and the economic sphere has to give way to political involvement of business and civil society representatives in norm-setting” (Voegtlin & Scherer, 2017). In addition, they propose a global governance model based on deliberation, based on principles of open participation, balanced decision making and transparency, with the role of governments and intergovernmental organisations as initiators, controllers and/or facilitators through the responsible orchestration of these efforts (Voegtlin & Scherer, 2017). The successful orchestration can ensure the right balance of powers in the initiative, guaranteeing that one actor does not dominate the initiative (e.g. companies or NGOs, Abbott & Snidal, 2010). It could also enhance responsible leadership by the facilitation and moderation of the dialogue among different stakeholders (Voegtlin, Patzer, & Scherer, 2012), reduce costs (Abbott & Snidal, 2010), and help generate new initiatives and consolidate existing initiatives (Voegtlin, Patzer, & Scherer, 2012). Moreover, following the concept of the standardisation cycle (Brunsson, Rasche, & Seidl, 2012) described in the literature and taking examples from global-scope CSR multi-industry standards, we claim that the RRI governance tools should include various types of performance mechanisms such as reporting, labelling and certification, capacity-building, rating agencies, value chain management, monitoring and verification strategies (Albareda, 2013). Lastly, the successful governance of RRI in industry lies in the recognition of RRI as an investment, and not as a cost (The Responsible-Industry Project Consortium, 2017).

4.5 Factors of Effective Incentives

Despite the variety of incentives that can support implementation of RRI in industry, this research identifies two factors that may affect the process. This section discusses these factors. They are: (1) size of a company; and (2) type of industry and ecosystem. The adequate identification of these factors may help to produce a better alignment of incentives for particular companies and their employees.

4.5.1 Size of a Company: SMEs vs. Large Corporations

The first factor is the size of a company, differentiating between SMEs and large corporations. We focus our analysis on SMEs because despite the fact that SMEs represent 99% of all businesses in the EU (European Commission, n.d. c), they face a number of challenges to implement RRI.

There are multiple definitions for SMEs, which use various quantitative and qualitative measures. The quantitative criteria are most often used to define the arbitrary boundaries of a SME (Rostek, 2015). For example, EU law (EU recommendation 2003/361) defines SMEs as companies with less than 250 employees and a turnover of less than €50 million. Even though quantitative criteria are usually used, qualitative criteria shed light to the differences between SMEs and MNCs. The qualitative measures focus on the functional characteristics of the SMEs. Separate management and ownership, privately traded equity, non-formalised management structures and relatively small share of markets are exemplars of the qualitative criteria that are often used (Rostek, 2015).

The definitions of SMEs imply that the vision of the manager is closely correlated with the success of the company, which drives the focus of the manager to the core operations of the company. In addition, SMEs are constrained by the lack of financial and human resources. The lack of resources reduces SMEs' ability to undertake research and development, constrains opportunities to optimise operations and decreases the support for selling and marketing activities (Tam, Moon, Ng, & Hui, 2007). Commercialisation of innovations is also threatened due to limited resources (Moon & Sohn, 2010). Resource constraints drive the goals of SMEs to be relatively short-term and profit-oriented (Tam, Moon, Ng, & Hui, 2007).

It is difficult for SMEs to compete against MNCs with the same strategy because large enterprises have greater resources, a better economy of scale and more stable organisational culture (Dobre, 2016). MNCs also have better recognition, credibility and stability, as well as more power and influence over their partners (Tam, Moon,

Ng, & Hui, 2007). For these reasons, SMEs must create an attractive brand to beat its larger competitors. They should also utilise the advantage of their simple organisational structure, which enables greater flexibility and better efficiency (Tam, Moon, Ng, & Hui, 2007).

Table 4.1 shows the special characteristics of SMEs and attractive incentives for SMEs to adopt the principles of RRI. However, many of these incentives are equally applicable for MNCs. For example, MNCs are equally if not more concerned about their brand and financial success.

Table 4.1

Incentives for small to medium sized enterprises (SMEs) to adopt responsible research and innovation (RRI) principles

Problem in SMEs	Attractive Incentive
Lack of financial resources	Setting responsibility as a criterion for public funding or funding from foundations Financial benefits of RRI
Lack of human resources	Reputation among professionals Engaged employees have motivation to work harder for the company Skilled employees have knowledge to perform at high level
Brand creation	Responsibility awards Positive media attention

Table 4.1 is not meant to be a comprehensive list of SME incentives. Instead, it presents the discovered SME problems and exemplar incentives for SMEs to adopt RRI principles.

4.5.2 Type of Industry and Ecosystem

The second factor we have identified as having an impact on RRI incentives is the type of industry and ecosystem. The type of the industry and characteristics of the ecosystem a company is operating in have an impact on the attractiveness of several incentives. A business ecosystem is a large, complex and global network of organisations collaborating and competing to produce offerings to end-point customers (Basole, Clear, Hu, Mehrotra, & Stasko, 2013). Sectoral studies have shown that industries have differences in knowledge base, actors involved, links and

relationships among actors and relevant institutions (Malerba, 2005). Chatfield and co-workers' (2017) study shows that the sector in which a company operates may be an important influencing factor for the perceived drivers and obstacles of corporate responsibility (Chatfield et al., 2017). They further suggest that for companies operating in sectors that have pervasive social impacts corporate responsibility and competitiveness are naturally aligned in driving innovation (Chatfield et al., 2017).

Responsibility always comes from individual values. Thus, the knowledge base in the ecosystem determines the ability of individuals to understand the impact of responsibility. Benefits of responsibility are not straightforward, which can easily result in undervaluation of its principles. If customers, employees, management or owners of the company do not understand or appreciate responsible values, it is difficult to capture the benefits of RRI. However, training, education and informing may solve the problem and enable the company or the ecosystem to harness a greater competitive advantage. Different industries have naturally different knowledge bases due to the differing educational and personality requirements of professionals in disparate fields. On the one hand, in low knowledge ecosystems or industries, responsibility has a potential to play a significant role in branding and process development. On the other hand, in high knowledge industries, responsibility may be a requirement of success or survival.

Ecosystemic thinking enhances the capability to utilise value co-creation with stakeholders. Understanding the links and relationships among actors enables the identification of value co-creation opportunities. However, seizing the opportunity requires managing the relationship with the relevant stakeholders. Anitha's (2014) research has shown that co-worker relationships are one of the key determinants of employee engagement. The causal loop diagram (Figure 4.2) presents motivation to manage internal relationships in the form of the outcomes of employee engagement. Furthermore, because co-worker relationships in a company have an impact on employee engagement, a reasonable assumption is that organisational relationships and cross-organisational co-worker relationships have an impact on organisational engagement in an ecosystem. Even though the previous assumption has some support (Thompson & LeBlanc, n.d.), research is needed to confirm the assumption. Still, enhanced functioning of the ecosystem by fruitful relationships among agents is an attractive incentive for organisations to consider and adopt RRI principles.

4.6 Limitations of the Research

We are aware that our research may have some limitations. Although most of this research is quantitative in nature, it is not standardised and the concepts and methods used vary greatly, so it has not been feasible to do a formal meta-analysis of the results. It should be noted that the question of incentives is immensely complex due to substantial conceptual overlap and lack of precision in the empirical research. We were unable to investigate a whole range of factors that may play a role in choosing the right incentive, for example, the significant relationships between the type of incentives and location of a company. Further data collection would be needed to determine in what circumstances different types of incentives are likely to be effective.

4.7 Conclusions

In this research, we examined incentives that can stimulate the industry to conduct research and innovation in an ethical, responsible and sustainable way. To conceptualise our analysis, we developed a matrix of incentives that have a potential to motivate and stimulate the RRI implementation in industry. The matrix is based on two layers of the analysis: incentives for the uptake of RRI by industry and factors that can affect this process. We categorised incentives into three categories: (1) focusing on external and internal stakeholder incentives; (2) instrumental and non-instrumental incentives; and (3) direct and indirect incentives, hence financial or non-financial incentives. To demonstrate the benefit of investing in RRI from a business perspective, we developed a causal loop diagram that illustrates the relationships and interconnections between incentives and a company's performance. We provided examples of potential incentives that can be used to enhance RRI among companies.

However, these incentives can function as effective means to do so only if they are designed and applied in specific conditions. Critical consumerism requires innovative smart approaches to help consumers to learn about products and services provided by companies, such as product ratings and mobile applications for product scanning. One of the tools that can signal consumers to whether a product conforms to RRI principles is certification. Certification also improves recognition of a company among consumers and potential business partners. Nevertheless, to serve as an effective incentive, we argued that certification should be designed as a flexible tool tailored to the needs of each company, created in cooperation with industry and RRI researchers and built as a community with a strong brand that is attractive for companies and recognisable for consumers. Companies can also be encouraged to introduce RRI to

their organisation by showing them the importance of employee well-being and employee engagement. Employees who are physically and mentally capable and feel that their work is meaningful improve companies' performance in terms of productivity, profitability, lower turnover, and customer loyalty. The success of enhancing RRI among companies also depends on governance of RRI within a company as well as at the external political level. At the same time, we argued that the effectiveness of the voluntary RRI governance tools depends on the multi-stakeholder approach and the process of institutionalisation of RRI. However, overall, the successful governance of RRI in industry lies in the recognition of RRI as an investment, and not as a cost.

Finally, we identified factors that can affect the successful implementation of RRI among companies and therefore should be considered when applying incentives for a particular company or industry. The size of a company matters. Incentives for SMEs, which lack resources, publicly traded equity, formalised management structure and relatively small share of markets, should take a form of supporting SMEs' financial and human resources as well as brand creation. Moreover, incentives should be adapted to the type of industry and ecosystems that can enhance the capability to utilise value co-creation with stakeholders.

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5. Strategic Responsible Innovation Management (StRIM) – A New Approach to Responsible Corporate Innovation Through Strategic CSR

Abstract:

Businesses are increasingly focused on innovation in order to improve their financial performance and market share. At the same time, businesses seek to improve their corporate social responsibility (CSR) strategies to gain greater social acceptance of their activities. However, surprisingly, they have no strategic model that integrates CSR and innovation. The disconnect between these two aspects of corporate activities may lead to avoidable financial losses for a company in the long run, as well as negative economic, environmental and societal impacts with associated damage to the company's reputation. Therefore, the challenge is to innovate in a responsible way. An effective strategic approach to responsible corporate innovation would have sustainable outcomes for both business and society. This paper proposes a new approach called strategic responsible innovation management (StRIM). The approach derives from, and broadens, the existing concepts of strategic CSR, the multi-stakeholder approach, CSR-driven innovation and innovation-driven CSR.

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5.1 Introduction

Over recent decades, companies have operated in complex business environments. On the one hand companies are facing fierce competition and need to achieve and manage innovation to maintain a competitive advantage, improve their financial performance and market share. On the other hand, businesses need to fulfil their legal obligations and seek to improve their corporate social responsibility (CSR) for multiple stakeholders in order to gain greater social acceptance of their activities. Despite the popularity of both innovation management and CSR most companies do not necessarily connect them and manage them strategically (Husted & Allen, 2007; Husted, Allen, & Kock, 2015). We lack a broader holistic perspective on the complex connection between innovation and CSR (Yin & Jamali, 2016; McWilliams & Siegel, 2006). In other words, we do not have a strategic and generic business model connecting innovation and CSR, through which innovation practices can create business value, and, positive societal and environmental change. The disconnectedness of these two aspects of corporate activities may lead to missed business opportunities, avoidable financial losses for a company in the long run, as well as negative economic, societal and environmental impacts. Therefore, the challenge is to innovate in a responsible way. An effective strategic approach to responsible corporate innovation would have sustainable outcomes for both business and society. I argue that intertwining innovation and CSR may bring opportunities for both business and society. In order to bring sustainable economic, societal and environmental outcomes, companies should have a strategic approach to innovation and CSR management. This chapter places the assessment of responsible innovation (including measuring, monitoring and reporting) in a broader picture of a business strategy. This analysis is crucial to understand why, when and how the evaluation and control of responsible innovation should be done in order to mitigate risks and strengthen strategic planning.

The remainder of this study is as follows: Section 5.2 defines the concepts of innovation and CSR, explores their relation to business strategy, and addresses current discussions providing the theoretical understanding based on the existing literature; Section 5.3 explores the connection between innovation and CSR with a reference to the concepts of Responsible Research and Innovation (RRI), CSR-driven innovation, innovation-driven CSR and the multi-stakeholder approach; Section 5.4 derives from the strategic management literature and formulates a new approach called Strategic Responsible Innovation Management (StRIM); Section 5.5 summarizes the findings.

5.2 Innovation, CSR and their relation to business strategy

5.2.1 Innovation

Innovation in the business context can be broadly defined as the successful application of new ideas (Dodgson, Gann, & Phillips, 2013). Various definitions of innovation exist, however this study takes a holistic approach to innovation characterised as ‘the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations (OECD, 2005). Therefore, four types of innovations can be differentiated that encompass a wide range of changes in companies’ activities: product innovations, process innovations, organisational innovations and marketing innovations (OECD, 2005). The crucial characteristic of innovation is that it is not a single action, a single idea, or the invention of a single new device, but rather an integrated process involving various steps (Conway & Steward, 2009; Trott, 2008). Innovation emerges from various sources and has a multiplicity of influences, e.g. new regulations, new technological standard, collaborative partners or potential funding opportunity (Dodgson et al, 2013). However, there are two main sources of innovation, namely market pull and technology push (Bennett & Cooper, 1981). Innovation originating from market pull comes from consumers’ needs and identifying new market opportunities or a segment of an existing market that has been neglected (Baker, 2014; Whittington, 2001), whereas technology push comes from scientists and engineers, whereby scientific discovery or the availability of new technology leads to the development of a product (Bennett & Cooper, 1981). Innovation is a crucial competence because it enables a company to adapt to the dynamically changing needs of the marketplace and is pivotal to the profitability and long-term survival of any company (Hauser, Tellis, & Griffin, 2006).

As far as innovation is said to be a key driver of economic development (Hanekamp, 2007), it may challenge ethical values and human rights. One of Kranzberg's laws states that ‘technology is neither good nor bad; nor is it neutral’ (Kranzberg, 1986). Recent controversies around misuse of Facebook users’ data by Cambridge Analytica and potential implications for the US presidential elections in 2016 or the Social Credit System introduced in China (to score its citizens based on various data including social media information) (Reuters, 2018), raise legitimate concerns as to whether innovation, science and technology can be left to operate autonomously in the market without societal guidance and regulation. These

considerations raise questions about companies' responsibilities for their innovation activities with respect to the environment, stakeholders and society. This issue is often discussed in relation to the more widely known concept of Corporate Social Responsibility (CSR).

5.2.2 Corporate Social Responsibility (CSR)

The debate whether companies have responsibilities to society beyond making profits has created an enormous amount of interest and controversy over the last 60 years. Nevertheless, companies more often recognise that they do have responsibilities that go beyond immediate shareholders and making profits (Crane & Matten, 2016). Companies operate in, and interact with, society and the environment and serve customers in one or more countries. They fulfil their responsibilities by applying the well-established concept of Corporate Social Responsibility (CSR), which is a popular business management concept. Many companies have put some sort of CSR policy in place or have made explicit CSR communications (Maignan & Ralston, 2002).

The most well-known definition of corporate responsibilities is Carroll's (1979, 1991) four-part definition of CSR which identifies four categories of responsibilities: economic, legal, ethical and discretionary/philanthropic (Carroll 1979; Carroll 1991). Dahlsrud (2008), in a comprehensive review of CSR definitions, identifies five dimensions of CSR; specifically, environmental, social, economic, stakeholder, and voluntariness (Dahlsrud, 2008). Garriga and Melé (2004) suggest there are four groups of CSR theories (Garriga and Melé 2004), namely instrumental, political, integrative and ethical theories. Basu and Palazzo (2008) propose that business approaches to study of CSR can be divided into three categories: (1) stakeholder driven (pressures from external stakeholders); (2) performance driven (the effectiveness of CSR actions in terms of their purpose by the organisation and their impact on the outside world); (3) motivation driven (the reasons why organisations undertake CSR) (Basu & Palazzo, 2008). From the managerial perspective, CSR can be defined as 'the process by which managers within an organisation think about and discuss their relationship with stakeholders as well as their roles in relation to the common good, along with the behavioural dispositions with respect to the fulfilment and achievement of those roles and relationships' (Basu & Palazzo, 2008). There are many ways to think about CSR, but broadly speaking, CSR refers to responsibility, hence duties and obligations or motivation and opportunities of the companies towards society (Gurzawska, Cardone, Porcari, Mantovani, & Brey, 2015). CSR derives from organisational sensemaking and dwells as an intrinsic part of a company's character (Basu & Palazzo, 2008).

5.2.3 Strategy and strategic management

In today's complex business world, corporate success depends on crafting and implementing effective business strategies (De Kluyver & Pearce, 2006). According to Mintzberg's and McHugh's "grass-roots model" (1985), a strategy consists of intended and focused plans, on the one hand, and of emergent and often highly unexpected developments, on the other hand (Mintzberg & McHugh, 1985). Rapid changes in the competitive environment requires 'crafting long-term vision for an organisation while maintaining a degree of flexibility about how to get there and creating a portfolio of options for adapting to change' (De Kluyver & Pearce, 2006). Therefore, strategic management can be defined as the field dealing with 'the major intended and emergent initiatives taken by general managers on behalf of owners, involving utilisation of resources, to enhance the performance of companies in their external environments' (Nag, Hambrick, & Chen, 2007). Husted and Allen (2000) incorporate these definitions, and construe strategy as plans and actions taken to create unique resources and capabilities that leverage organisational routines and that are the source of sustainable competitive advantage and superior performance (Husted & Allen, 2000). From a practice point-of-view, strategy is about creating tools for managers to decide about how the company is going to win in the future (Husted & Allen, 2010).

The purpose of strategic management is to bring about the conditions under which the organisation is able to create value. Value can be created through either the development of new products, processes, organisational innovations and marketing innovations or through the creation of entirely new markets (Husted & Allen, 2007). In other words, companies use strategies to provide a competitive advantage or avoid a competitive disadvantage (Powell, 2001). Husted and Allen (2010) argue that corporate strategy aims to achieve superior performance and both economic and social objectives of the company (gain economic and social competitive advantage or avoid economic or social disadvantage) (Husted & Allen, 2010). They perceive strategy as a rational process that seeks two valuable and rational ends – economic value creation and social value creation (Husted & Allen, 2010).

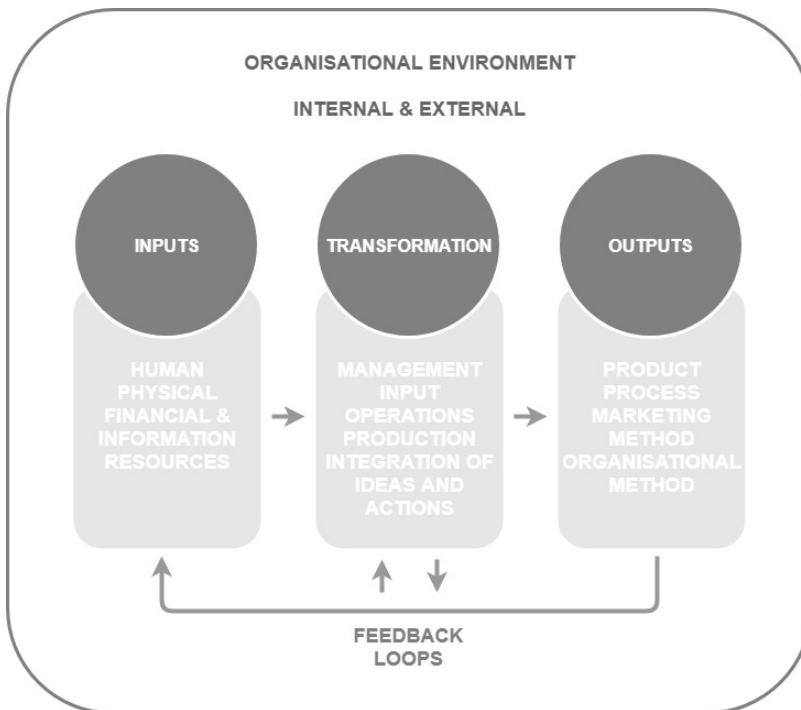
Innovation and strategy

There is a deep connection between corporate and innovation strategy in many business sectors (Berkhout, 2013). Innovation is regarded as the focal point of a company's strategy (Milling & Stumpfe, 2000). Innovation influences various aspects of companies' economic performance and corporate competitiveness, ranging from effects on sales and market share to changes in productivity and efficiency (OECD,

2005). Nevertheless, benefits from innovation vastly depend upon how well it is managed. Therefore, in recent years, the field of managing and shaping innovation has attracted considerable attention from academics, policymakers, and business practitioners (Conway & Steward, 2009). The definition of innovation implies a process that involves the elements of strategic management, and therefore it should also reflect this systemic, strategic approach to innovation. According to this approach, the company is a system of interrelated and interdependent parts (White & Bruton, 2010) that involves a framework of inputs, transformations, outputs (Muller, Välikangas, & Merlyn, 2005; De Weerd-Nederhof, 2007; Davila, Epstein, & Shelton, 2012) and feedback along the entire process (White & Bruton, 2010). Figure 5.1 presents the system approach to innovation management.

Figure 5.1

A system approach to innovation management



Note: Adapted from Muller, Välikangas, & Merlyn (2005); De Weerd-Nederhof (2007); White, & Bruton (2010); Davila, Epstein, & Shelton (2012).

Innovation is managed strategically through creating supportive structures, practices, and processes which additionally requires that companies harmony with the contextual conditions in which they operate (Dodgson et al., 2013). Innovation is an organisation-wide concern that affects all units in a company, its organisational structure, people, processes, procedures, and systems (White & Bruton, 2010). Many businesses that engage in innovation have separate Research and Development (R&D) divisions, Innovation Managers or Innovation Boards, which are often a driving force for their success.

CSR and strategy

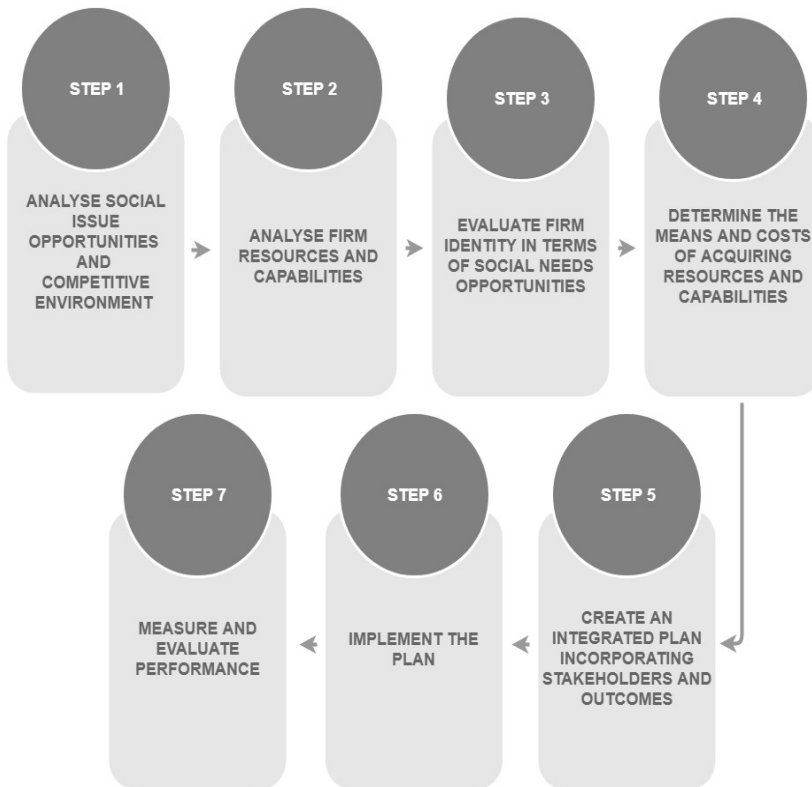
Over recent decades CSR has shifted from the margins to the mainstream of business practice. The concept and scope of CSR has also evolved, from mere philanthropic action to the so-called strategic CSR (Baron, 2001; Lantos, 2001; Gugler & Shi, 2009) where corporate responsibility is managed in a systematic and intentional way. As emphasised by Galbreath (2006) ‘CSR is ultimately a strategic issue, one that can not be separated from a firm’s overall strategy’ (Galbreath, 2006). According to the strategic CSR literature, CSR is strategic when it is integrated into companies’ core business operation and, therefore, as an important part of corporate competitive strategy as it yields substantial business-related benefits to the company (Burke & Logsdon, 1996). In other words strategic CSR is ‘a business strategy that is integrated with core business objective and core competencies of the company, and from the outside is designed to create business value and positive social change, and is embedded in a day-to-day business culture and operations’ (McElhaney, 2009). Strategic CSR engagement is at the heart of the core business model and is brought into central value creation (Midtown, 2009).

Many companies choose a CSR agenda and engage in “doing good” by developing and engaging in projects that meet societal and environmental obligations and objectives, however irrespective of a company’s interest (Husted et al., 2015). Porter and Kramer (2006) assert that businesses usually only consider CSR in generic ways instead of in ways appropriate for their future strategies (Porter & Kramer, 2006). In contrast to simply “doing good”, a strategic approach to CSR requires that companies deliberately create, implement and measure strategic investment and outcomes of social projects that seek a competitive advantage and economic value (Porter, 1985; Liedtka, 2000). In this way social projects replicate the strategic intention of “market” behaviour (Husted et al., 2015). CSR needs to be considered more in terms of the opportunities it provides to the business and a fundamental value

creation driver, rather than a reactive-defensive strategy and a support function to reduce risks and costs for shareholders (Midttun, 2009; von Weltzien Hoivik & Shankar, 2011). Lantos (2001) differentiates strategic CSR from ethical CSR (moral responsibility to any individuals or groups where a company might inflict actual or potential injury) and altruistic CSR (being a “good corporate citizen” by “giving back” to society, regardless of whether or not this will benefit the company itself). He emphasises that strategic CSR ‘creates a win-win situation in which both the company and one or more stakeholder groups benefit’ (Lantos, 2001). Husted and Allen (2010) propose a seven step model of corporate social strategy (Figure 5.2) based in strategic analysis literature (Husted & Allen, 2010).

Figure 5.2

Seven step model of corporate social strategy



Note: Adapted from Husted & Allen (2010).

Some scholars look into CSR from the “business case” perspective and claim that strategic CSR can improve corporate competitiveness and, subsequently companies’ economic and financial performance (Burke & Logsdon, 1996; Zadek, 2000; Kurucz, Colbert, & Wheeler, 2008; Carroll & Shabana, 2010). Porter and Kramer, the pioneers of connecting CSR and competitiveness (Kramer, 2001; Porter & Kramer, 2002), claim that companies can improve their long-term performance by connecting the company’s financial and societal goals. They further argue that a strategic approach to corporate philanthropy can align both economic and social objectives (Porter & Kramer, 2002). Through strategic CSR a company could make most significant societal and environment impact and harvest the greatest business benefits (Porter & Kramer, 2006). Husted and Allen (2010) argue that companies that include social action programs in the strategic decision making process achieve better results in economic and social value creation (Husted & Allen, 2010). Moreover, strategic CSR could allow companies to achieve a unique business position through differentiation from competitors in a way that lowers costs or better serves a particular set of customer needs (Porter & Kramer, 2006). However, because of the increasing stakeholder pressure and benefits that CSR brings, a company’s survival in modern society ‘seems to require an awareness of social responsibility as an indispensable part of strategy’ (Galbreath, 2006). Therefore, today there are hardly any major consumer products companies that do not actively innovate to develop socially responsible products (Iyer & Soberman, 2016). Being socially responsible is much more important than ever before.

5.3 The link between Innovation and CSR

CSR initiatives are meant to be applied to all company’s activities and business and, therefore, also to innovation processes. Nevertheless, although some companies explore potential benefits of linking innovation and CSR, many businesses perceive investment in CSR as an unnecessary and costly burden (Porter & Kramer, 2006). Higher costs due to the trade-off between returns from traditional business models and the cost of changes into responsible innovation practices and investment constraints are an argument for disconnecting CSR and innovation, particularly among small and medium- sized enterprises (SMEs) (Gurzawska et al., 2015; Gurzawska, Mäkinen, & Brey, 2017). As a result, innovation activities are usually excluded from a companies’ responsibility agenda. There are several reasons for this situation and arguments against them, including the extent to which innovation and

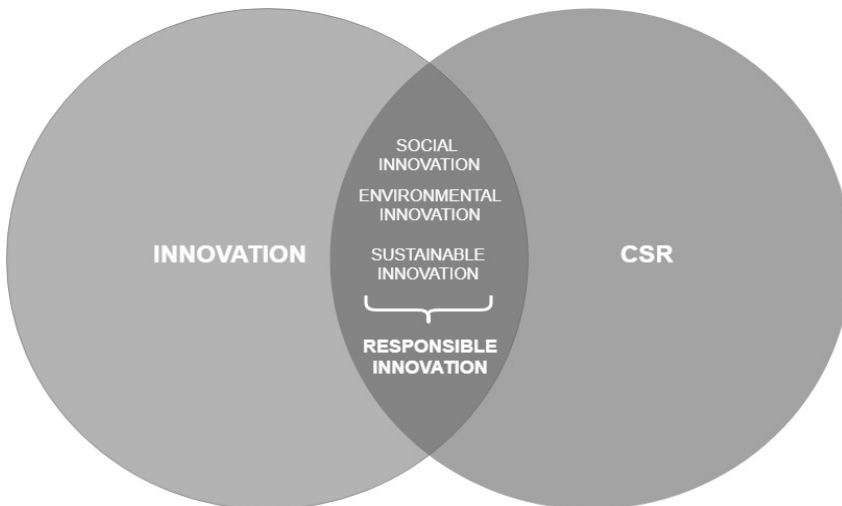
CSR overlap and the question whether and how responsible innovation practices pay off either through value creation, competitive advantage, strengthening companies' reputation, enhancing the company's networks and stakeholder relationships, and therefore expanding intangible resources such as knowledge, co-creation and innovation capability. This section discusses these arguments and proposes a counterbalance for these claims.

5.3.1 Conceptual perspective

From a conceptual point of view not every corporate innovation should be perceived through the lenses of responsibility, nor should CSR be solely focused on innovation. This is because not every corporate innovation raises societal, ethical, human rights or environmental issues. At the same time, CSR covers all aspects of a company's activity but does not exclusively relate to a company's innovation activities, thus CSR tools or actions are generally not designed specifically for innovation. Nevertheless, the sphere where these two concepts converge allow for the search of the responsible corporate innovation. Figure 5.3 demonstrates the relationship between corporate innovation and CSR showing the responsibility juncture.

Figure 5.3

Conceptual relationship between CSR and innovation



The merging point of corporate innovation and CSR encompasses a variety of well-known concepts that capture responsible innovation in various forms. Over the last 20 years, we have witnessed an expansion of literature, business activities and cross-sectoral exchanges, deliberately engineering societal and environmental responsibilities and objectives. As a result, several responsible innovation concepts exist that tackle various aspects of corporate responsibility. Social innovation; environmental and eco-innovation; and sustainable innovation are among the most commonly discussed. Social innovation has been mainly developed by practitioners to ‘meet pressing social needs and to improve human and environmental well-being’ (Choi & Majumdar, 2014). In the business context, it can be defined as a process where companies take ‘community needs as opportunities to develop ideas and demonstrate business technologies, to find and serve new markets, and to solve long-standing business problems’ (Kanter, 1999). Environmental and eco-innovation is an innovation that reflects the concept’s explicit emphasis on a reduction of environmental impact (OECD, 2009). Regarding sustainable innovation, as emphasised by Adams et al. (2016), a variety of conceptualisations of sustainable innovation exist, however we lack a clear definition of sustainability. This confusion is reinforced by an array of labels applied to sustainable innovation, such as CSR; green-, eco- or ecological innovation; social environmental management; and responsible innovation (Adams et al., 2016). While some authors argue for a responsible approach and give equivalence to environmental, social and economic dimensions in sustainability (Hansen, Grosse-Dunker, & Reichwald, 2009; Longoni & Cagliano, 2018), the majority of previous work focuses on ecological sustainability such as eco-innovation and environmental innovation (Carrillo-Hermosilla, del Río, & Könnölä, 2010) and often overlooks the social dimension (Adams et al., 2016). Moreover, Lubberink et al. (2017) point out that the social, political and ethical implications of possible solutions are not part of the sustainable innovation discourse and practice. Nevertheless, the sustainable innovation literature provides attempts to connect sustainability with business models and strategies (Boons, Montalvo, Quist, & Wagner, 2013; Koistinen, Laukkanen, Mikkilä, Huiskonen, & Linnanen, 2018), which should be acknowledged. For instance, Iñigo and Albareda (2016) propose a sustainable innovation framework from the complex adaptive system perspective that aims to explain how firms engage and experiment. The authors conceptualise sustainable innovation around five components: operational, instrumental, collaborative, organisational and holistic; the interaction between these components is characterised by non-linearity, self-organising and emergence (Iñigo & Albareda, 2016). Patala et

el. (2016) build a process framework, which consists of: (1) the identification of potential impacts; (2) the identification of customer value creation mechanisms; (3) the choosing of key indicators; (4) life cycle value modelling; and (5) the demonstration of life cycle value (Patala et al., 2016).

Recently, academics and policy makers often refer to responsible innovation in the context of Responsible Research and Innovation (RRI). The most well-known definition of RRI by von Schomberg (2013) defines RRI as ‘a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)’ (von Schomberg, 2013). Besides von Schomberg’s definition, there is a variety of other definitions and approaches to RRI and RRI is operationalised in different ways (Sutcliffe, 2011; Stilgoe et al., 2013; Taebi, Correlje, Cuppen, Dignum, & Pesch, 2014; Foley, Bernstein, & Wiek, 2016; Lindner et al., 2016; Burget, Bardone, & Pedaste, 2017; Ribeiro, Smith, & Millar, 2017; Reber, 2018; Rip, 2018). With regard to further specification of RRI dimensions, there are those that tend to recur in various interpretations of the concept, and those that are more idiosyncratic (Gurzawska et al., 2017). Responsible innovation in the RRI context is thought to focus on inclusion (also called engagement, or involvement of society), anticipation (assessment at an early stage in R&I of benefits and risks), reflexivity (reflecting on values and beliefs during R&I) and responsiveness (the ability to change routines, structures and systems to adapt to changing circumstances and new insights (Gurzawska et al., 2017). The European Commission has provided RRI orientation in the form of six policy keys, i.e. RRI is research and innovation that: (1) fosters R&I processes that are collaborative and multi actor; (2) incorporates ethical principles so as to ensure the compatibility with fundamental values; (3) promotes science literacy and science education; (4) promotes gender equality; (5) promotes open access to scientific knowledge; and (6) is guided by transparent, accountable, and coherent multi-stakeholder governance (European Commission, 2012). Therefore, responsible innovation should be societally desirable, sustainable, and ethically acceptable (von Schomberg, 2013). RRI and CSR share an emphasis on companies’ responsibilities towards social goods as well as on stakeholder engagement. Nevertheless, despite some similarities the concepts are somehow different (Gurzawska et al., 2017). Firstly, while RRI is largely a top-down approach created in the policy world (e.g. Horizon 2020 funding), CSR can be characterised as a bottom-up approach where CSR policies

function as a self-regulating mechanism for business. Secondly, RRI focuses on ethics appraisal and potential and actual social impact; CSR rather concentrates on the impact on community and environment (Gauttier, Søraker, Arora, Brey, & Mäkinen, 2017). Lastly, while RRI is about research and innovation, CSR is generally applicable to all company activities.

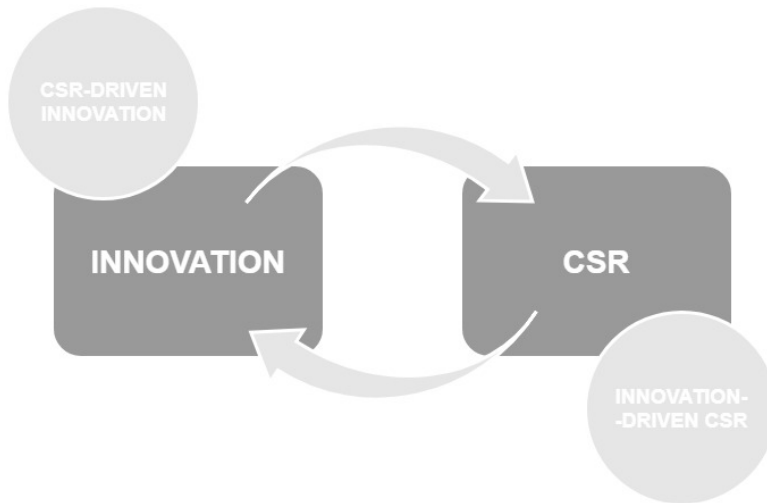
Various other forms of a conjunction between CSR and innovation exist, such as Social Design, Socially Responsible Design (SRD), eco-design, design for values and open innovation. While there are differences between how responsibility is conceptualised and defined in these different concepts, i.e. social innovation, environmental innovation, sustainable innovation and RRI (Lubberink et al., 2017), this book chapter construes responsible corporate innovation as an umbrella term for any innovation centred around various forms of corporate responsibility including sustainability, societal, ethical, human rights and environmental issues. A stronger understanding of scattered and often overlapping terminology can ultimately advance the integration of different disciplines. Therefore, for the purposes of this research, responsible innovation encompasses social innovation, environmental innovation, sustainable innovation, responsible innovation in the context of RRI and other concepts of innovation that centre around various forms of responsibility.

5.3.2 Bi-directional link between CSR and Innovation

There is a considerable literature on the way in which, across different sectors and through time, companies have adjusted to the pressures and opportunities presented by the need to become more socially responsible and sustainable taking account for stakeholder expectations, more responsible products, processes and services that reflect these changes (Maxfield, 2008; Gugler & Shi, 2009; Hanke & Stark, 2009; Nidumolu, Coimbatore, & Madhavan, 2009; Berkhout, 2013; Lai, Ling, & Wang, 2015; Sánchez & Benito-Hernández, 2015; Herrera, 2016; Ueki, Jeenanunta, Machikita, & Tsuji, 2016). European Commission believes that CSR makes companies more sustainable, competitive and innovative (European Commission, n.d.). It also recognises the importance of CSR in companies' ability to innovate, as well as in risk management, cost savings, access to capital, customer relationships, and HR management (European Commission, n.d.). Additionally, responsible innovation encourages a move beyond defensive and proactive CSR into a more rewarding synthesis between social and commercial concerns fulfilling public needs and private interests (Midttun, 2009). According to Maxfield (2008), CSR activities that are tightly linked to innovation functions, might bring more financial benefit than those oriented

toward public relations, marketing and human resource management (Mayfield, 2008).

A vast majority of CSR and strategic CSR literature focuses on the linkage between CSR and competitiveness highlighting the need to go beyond mere window-dressing work and investing in strategic CSR. In this view strategic CSR is linked to innovation and therefore depends on an 'innovative way to enhance efficiency in a socially friendly manner' (Gugler & Shi, 2009). Grayson and Hodges (2017) explain that CSR creates largely untapped opportunities for product innovation, market development and non-traditional business models (Grayson & Hodges, 2017). Moreover, CSR plays a role in differentiation strategies at the product and company levels through innovation, for example, by developing products that are socially responsible as has been done by companies such as Ben & Jerry's, the Body Shop, and Health Valley (McWilliams & Siegel, 2000). The relationship between CSR and innovation appears to be bi-directional. On the one hand, companies can use social programs as a way to foster product and process innovation (Kanter, 1999). In addition, social and environmental programs may help generate competitively valuable resources for the company (Sharma & Vredenburg, 1998). On the other hand, companies that have an ability for continuous innovation are more likely to be able to leverage that same resource in other arenas, such as the development and implementation of social strategy. McWilliams and Segal (2000) argue that CSR and R&D investment are highly correlated, since many aspects of CSR create either a product or process innovation (McWilliams & Siegel, 2000). According to the study on the connection between CSR and company innovation by Luo and Du (2015), the positive relationship is stronger for companies with higher R&D investment and where companies operate in more competitive markets (Luo & Duo, 2015).

Figure 5.4*Bi-directional relation between CSR and Innovation*

Note: Adapted from MacGregor & Fontrodona (2008).

Accordingly to MacGregor and Fontrodona (2008) there is a bi-directional system between CSR and innovation based on CSR-driven innovation and innovation-driven CSR (MacGregor & Fontrodona, 2008). The authors point out that CSR-driven innovation is about “doing the rights things”, and innovation-driven CSR is about “doing things right” (MacGregor & Fontrodona, 2008). Findings of the pan-Nordic project “CSR-driven innovation” point out, that while some companies identify the societal or environmental need before beginning to think about the business model and profit generation, for other companies social performance is a means for achieving the goal of creating private profit (Hockerts et al., 2009). Therefore, CSR-driven innovation is a situation when a socially or environmentally important need contributes to creation of new innovative product, service, or process; and innovation-driven CSR refers to a situation when a technological innovation that already exists, allows it to be used to achieve an important societal or environmental goal (Pyszka, 2012). Figure 5.4 presents this two-way spiral model of CSR and innovation based on CSR-driven innovation and innovation-driven CSR, that I discuss in the next subsections.

CSR-driven Innovation

Globalisation, particularly thanks to the internet, has brought tremendous changes for most companies and society. Internet-connected stakeholders have become more

aware of the products, services and processes that companies can offer and their marketing practices. This has caused an increase in stakeholder pressure on companies to take a greater responsibility as part of their corporate citizenship. As a consequence, companies more often innovate in order to find solutions for current and emerging societal and environmental challenges. This phenomenon is known as CSR-driven innovation. CSR-driven innovation is ‘an innovative process which aims at designing a profitable product or service which in an innovative and user-oriented way can prove beneficial to the surrounding environment and society’ (Nordic Innovation Centre, 2010). Companies that invest in CSR-driven innovation are characterised by ‘the willingness and the capacity to discover, adopt, evaluate and exploit new technologies, products, services or processes for environmental and societal benefit’ (Brik, 2007). The literature discusses CSR-driven innovation referring to Corporate Social Innovation (CSI), Bottom of the Pyramid (BOP) innovation, eco- and environmental innovation, and social entrepreneurship (Rexhepi, Kurdish, & Bexheti, 2013). CSR-driven innovation aims at ‘creating a successful business by having sustainability as a focal point when developing a new product or service’ (Nordic Innovation Centre, 2010). These innovative products or services may tackle such societal and environmental problems as global warming, poverty or diseases, like in case of UNDP that has introduced the first eco-driving simulator among transport drivers in Azerbaijan aiming at reducing the carbon emission footprint and make environmentally friendly driving habits more mainstream through training and the application of smart technologies (UNDP, 2018).

Helping to address global problems may also be profitable for business. Many businesses, therefore, have already implemented a new approach to innovation, as in the case of Digital Green, addressing poverty through connecting smallholder farmers with their peers via video training conducted in local languages (Digital Green). In the automotive industry, CSR-driven innovation is about investment in long-term innovations that will reduce the threat of climate change, including electric, hybrid, fuel-cell, and solar vehicles (Khaledabadi & Magnusson, 2008). The energy sector is exploring alternative sources of energy, including solar panels, wave power, wind turbines, and bioenergy. One of the energy sector CSR-driven innovation is the US company SolarCity, which from 2008 was providing comprehensive solar power solutions for energy-efficient lighting as part of a sustainable cities initiative. Thanks to integrated sales, financing, design, installation, monitoring and efficient services, customers could get cleaner and more affordable energy. In 2016 the company

merged with Tesla Inc. and introduced the Tesla Solar Roof based on solar roof tiles, made of glass (Tesla, Energy).

Moreover, companies develop innovation and business models based on consumers' preferences regarding social responsibility (Iyer & Soberman, 2016). CSR-driven innovation may create an environment in which consumers identify with a product or service or brand because of its socially responsible approach, ultimately creating a strategic business model based on responsible innovation. One example of a company placing responsibility at the core of its business is Fairphone. This Dutch social enterprise engages in fairer electronics by developing a business model that puts ethical values first (Fairphone, n.d. a). Fairphone produces repairable and recyclable phones made of conflict-free minerals (natural resources not extracted in a conflict zone and sold to perpetuate the fighting), manufactured with respect for workers' rights and wellbeing. The Fairphone community consists of 100,000 owners of fair smartphones, over 136,000 fans on Facebook and thousands of Twitter and Instagram followers (Fairphone, n.d. b). Nearly every aspect of the company's value chain reinforces the societal and environmental dimensions of its value proposition, distinguishing Fairphone from its competitors. Another example is Lush Fresh Handmade Cosmetics, a British cosmetics business with a global brand, offers 100% vegetarian cosmetics no-packaging-required and when packaging is unavoidable, they use recyclable or compostable packaging. The company supports human rights, environmental conservation, and animal welfare through (for instance) developing a palm-free soap base¹. The last example of a strategic business model based on responsible innovation is a Dutch company called Rural Spark. Rural Spark provides a smart energy grid based on the concept of Smartly Distributed Energy networks for rural villagers. For a monthly subscription, villagers rent a Rural Spark Energy Kit and become Local Energy Suppliers who generate, use and sell energy (<https://www.ruralspark.com>). Rural Spark provides access to clean, safe and sustainable energy, it also leapfrogs the outdated, top-down centralised energy grids and empowers users and encourages entrepreneurship (<https://www.ruralspark.com>).

¹ The palm-oil industry has been linked to deforestation, habitat degradation, climate change, animal cruelty and indigenous rights abuses in the countries where it is produced. See e.g. Say No to Palm Oil, <http://www.saynotopalmoil.com/>

Innovation-driven CSR

Empirical studies confirm that R&D intensive companies are more competitive on the market (Kinkel, Lay, & Wengel, 2005). R&D is a part of innovation situated at the front end of the innovation life cycle. Studies by McWilliams and Siegel (2000) and Bansal (2005) show a positive correlation between CSR and R&D intensity 'because both are associated with product and process innovation' (McWilliams & Siegel, 2000). Other studies, such as Bouquet and Deutsch (2008) and Hull and Rothenberg (2008) seem to confirm this correlation. Padgett and Galan (2010) extend these findings and show that R&D intensity positively affects CSR in a way that R&D is perceived as a form of investment resulting in increased knowledge that leads to product and process innovation (Padgett & Galan, 2010). Furthermore, they claim that these innovations can lead to CSR-related processes and products (Padgett & Galan, 2010). This model is known as innovation-driven CSR. It is a situation in which a technological innovation already exists and can be used for the realisation of societal and environmental objectives. Therefore, it is a technological drive or an entrepreneur's desire to develop new products that drives the innovation (Hockerts et al., 2009). However, through the innovation processes, a company may improve its effectiveness and efficiency, e.g. through minimising its CO₂ footprint, water footprint, and/or reducing the number of casualties or fatal accident rates. These actions, as Padgett and Galan (2010) claim, should be taken into consideration when developing companies' CSR strategies, because process and product innovations may already be involved in CSR activities (Padgett & Galan, 2010). Therefore, the authors suggest that an 'innovative firm should focus their efforts on identifying opportunities in their R&D processes to initiate related CSR activities. This will allow the company to manage costs more effectively and determine whether other CSR activities might be necessary to meet stakeholder expectations' (Padgett & Galan, 2010).

Innovation-driven CSR is a new phenomenon that requires further empirical study on its functioning and consequences. Nevertheless, it shows that the interconnectedness of CSR and innovation is not linear, but this process is more complex as there are numerous feedback loops. CSR has an indirect influence on innovation. It may give rise to new products and processes. Innovation, however, can also influence CSR instruments.

5.3.3 CSR, Innovation and value creation

Companies engage in social responsibility and go "beyond compliance" for various reasons including market demand, cost advantage, differentiation strategy, upgrading

strategy, to build intangible brand value around social responsibility or sustainability reputation, to reduce regulatory and other risks (Berkhout, 2013). According to Burke and Logsdon (1996) ‘the ultimate measure of strategic benefits from CSR activities is the value they create for the firm’ (Burke & Logsdon, 1996), where value creation is understood as having identifiable, measurable economic benefits that the company expects to receive (Burke & Logsdon, 1996). Value creation is crucial for strategic success (Tantalo & Priem, 2016).

Burke and Logsdon (1996) identify five CSR behaviours that bring strategic benefits: (1) philanthropy (e.g. engineering research fellowship and community support) ensuring customer loyalty and future purchasers; (2) direct or indirect employee benefits (e.g. flexible working hours, health and wellness) may improve productivity through improved employee loyalty and morale; (3) environmental management may lead to product and process innovation (e.g. new “green” products) and improved public relations and/or marketing advantage ultimately opening up new markets; (4) through a political activity companies may achieve favourable changes in economic or social regulations and create new market opportunities or geographical market opportunities; and lastly (5) product or service related characteristics, innovations or processes such as product reformulation (e.g. improved “green” design) may lead to new markets, first-to-market or leadership benefits and provide edge in meeting emergency needs (Burke & Logsdon, 1996). Lubin and Esty (2010) claim that CSR-related issues are one of the so-called “megatrends” that incipient societal and economic shifts, such as globalisation, the rise of the information society, and the move from hierarchical organisations to networks (Lubin & Esty, 2010). These transformations arise from technological innovation or from new ways of doing business (Lubin & Esty, 2010). Nowadays, thousands of companies are placing strategic bets on innovation in CSR-related issues such as renewable power and pollution control (Lubin & Esty, 2010). This would not be possible without innovative technologies and business approaches. In the sustainable innovation literature stream, strongly sustainable business models do no harm but create positive environmental, social, and economic value (Koistinen et al., 2018). Accordingly, strongly sustainable companies take financial, societal and environmental costs into account and measure financial rewards, social benefits and environmental regeneration (Koistinen et al., 2018). Nevertheless, value should be created to the whole range of stakeholders and the natural environment (Koistinen et al., 2018). In line with this assertion, Patala et al. (2016) introduce a concept of sustainable value propositions as ‘a promise on the economic, environmental and social benefits that a

firm's offering delivers to customers and society at large, considering both short-term profits and long-term sustainability' (Patala et al., 2016). From the system's point of view, we should consider value creation as not only economic, but as a psychological, sociological and ecological concept, which includes value for the organisation, customers, ecosystem and society (Den Ouden, 2011).

Value creation through responsible corporate innovation can be placed in a broader discussion on measurable benefits of CSR. Financial benefits of responsible corporate behaviour can be found particularly in the areas of human resources, reputation and branding, reduction of risk and operational cost (McElhaney, 2009). Moreover, Gugler and Shi (2009) claim that the economic interests offered by CSR such as better access to market, finance and business; enhanced intangible assets, reputation, community relations; and reduced risk from regulatory sanction, could encourage companies to structural changes including innovative processes and technological upgrading. As a result, these transformations enhance productivity and efficiency, and ultimately compensate the initial costs and enable competitiveness (Gugler & Shi, 2009). Nevertheless, the discussion on the relationship between CSR and a companies' performance seem to be unresolved. While some studies disagree on the link between corporate social performance (CSP) and corporate financial performance (CFP), some seem to indicate the existence of a positive relationship between CSP and CFP (Margolis & Walsh, 2003; Orlitzky, Schmidt, & Rynes, 2003; Carroll & Shabana, 2010; ING, 2018), some other studies point out inconsistencies (Griffin & Mahon, 1997; Roman, Hayibor, & Agle, 1999).

According to the study by Bonini et al. (2009), CSR-related programs create measurable value through return on capital, risk management, and quality of management and growth. This study is particularly interesting in the context of CSR and innovation, showing that companies' growth is ensured thanks to opportunities to access new markets and new customers, cutting-edge technologies and innovative products/services for unmet societal or environmental needs and possibility to use these products/services for business purposes, such as patents and proprietary knowledge that ultimately leads to higher brand loyalty, reputation and goodwill with stakeholders (Bonini, Koller, & Mirvis, 2009). Therefore, innovation is one of the key pathways through which CSR creates measurable business value (Bonini et al., 2009). Similar findings can be found in the study by Husted and Allen (2010), who emphasize that 'the firm's social projects allow it to achieve measurable social objectives as well as improved corporate financial performance when the social action is linked to product and service innovation, process innovation, or corporate reputation' (Husted

& Allen, 2010). Martinez-Conesa et al. (2017), in their recent study, argue that 'innovation may help to ensure the sustainability of a more responsible approach to business, resulting in system level solutions that are at the same time, responsible and profitable' (Martinez-Conesa, Soto-Acosta, & Palacios-Manzano, 2017). Therefore, it is crucial for companies to integrate different business activities and tie them in with the firm strategy as this is the only way to generate value (Martinez-Conesa et al., 2017).

5.3.4 Responsible innovation and stakeholder management

However, to generate value companies need to transform their approach to CSR from a bolt-on activity to built-in to business strategy activity supporting business purpose and objectives (Grayson & Hodges, 2017). Studies by Husted et al. (2007) show that a company's resources for continuous innovation are significantly related to the use of strategic social positioning (Husted & Allen, 2007). According to study by Luo and Du (2012), in companies where CSR is not a peripheral activity, it can become a pivotal component of competitiveness and growth (Luo & Duo, 2012). As a result CSR programs can make a company more innovative (Luo & Duo, 2012). In their study of 128 companies in all major industry sectors, they found that companies that are in the top third in terms of CSR activities brought out, on average, 47 new products a year, while companies in the bottom third brought out only 12 (Luo & Duo, 2012). The authors conceptualise that the reason for this is the fact, that CSR builds broader and deeper relationship networks with external stakeholders, such as customers, suppliers, NGOs, and governments, facilitating the sharing and exchange of external knowledge of its stakeholders (Luo & Duo, 2012; Luo & Duo, 2015). From the strategy point of view, stakeholders' external knowledge complements the company's internal knowledge and promotes a company's innovation (Luo & Duo, 2015). According to Hanke and Stark (2009) the internal culture of a company (e.g. the way human resource development and organisational learning processes are performed) affects the level of innovation and the organisation's development with respect to its environment (Hanke & Stark, 2009). For instance, in the context of sustainable vehicles, governmental regulations can foster innovations in sustainable vehicles; at the same time, sustainable vehicle development can foster environmental regulations (Khaledabadi & Magnusson, 2008). Therefore, the relationship between the company and its key external stakeholders (e.g. customers, governments, society) enables each sector gaining profit by mutual learning and exchange, and through developing corporate social innovation (Hanke & Stark, 2009). Amos and Awuah (2017) argue

that a company could achieve its strategic objectives and improve competitiveness when blending in the potential of stakeholders (Amos & Baffour Awuah, 2017). A company may achieve a unique competitive position in the local market through a collaboration with stakeholders (e.g. the local community and NGOs) at the same time creating and delivering societal and economic benefits (Amos & Baffour Awuah, 2017). The integration of CSR and multiple stakeholders into innovation activities leads to new innovations (Hansen et al., 2009) and bundles of products and services that suit local market conditions. As discussed in the previous subsection, responsible innovation is about creating value for the organisation, customers, ecosystem and society (den Ouden, 2011). Responsible innovation calls for integration of stakeholder, especially the people who might be affected by the innovation (Adams et al, 2016; Lubberink et al., 2017). From a business strategy perspective, the success of innovations depends ultimately on consumers' acceptance and, therefore, to succeed a company firstly needs to understand customer needs and then develop products that meet those needs (Hauser et al., 2006). Innovation is about identifying opportunities and creating strategies to fulfil customer needs and expectations (Husted & Allen, 2010). Responding to customer's social needs may stimulate innovation (Husted & Allen, 2010). These findings strongly reflect one of the approaches to CSR, namely stakeholder theory that focuses on 'managing potential conflict stemming from divergent interests' (Frooman, 1999).

Furthermore, companies with a strategic priority to innovation can use CSR as an effective means to reduce information asymmetry between themselves and stakeholders (Shen, Tang, & Zhang, 2016). Moreover, the development of regional and supra-regional networks and efficient network governance of different actors may be vital for an innovative and sustainable CSR strategy (Hanke & Stark, 2009). Unsurprisingly, Husted and Allen (2007) found that there is a high correlation between stakeholder integration and continuous innovation (Husted & Allen, 2007). Nevertheless, connecting innovation and CSR raises some challenges and uncertainties, which are discussed in the next subsection.

5.3.5 Challenges and limitations in connecting CSR and innovation

The link between CSR and innovation is a relatively new topic. Midttun points out that innovation and CSR are complex, multidimensional phenomena/concepts/fields (Midtown, 2006). He identifies an incompatibility between the dynamic nature of innovation and the static character of CSR. Therefore, he calls for a dynamic reinterpretation of CSR which can be better aligned with the "disruptive"

innovation literature. This approach may also ‘provide important insights into the socio-economic realignment necessary to accommodate new technology and business models’ (Midtown, 2006). Furthermore, despite some theoretical considerations, the empirical evidence is scarce and inconclusive (Gallego-Alvarez et al., 2011; Luo & Du, 2015; Shen et al., 2016; Halkos & Skouloudis, 2018). On the one hand, empirical studies on the relationship between CSR and innovation by Gallego-Alvarez et al. (2011) show that the bidirectional relationship between CSR and innovation is negative. These findings seem to be concurred by Halkos and Skouloudis (2018). On the other hand, findings by Luo and Du (2015) and by Shen et al. (2016) demonstrate that CSR activities boost innovation. Moreover, the pan-Nordic project “CSR-driven innovation” presents several success stories of businesses engaged in CSR-driven innovation. Moreover, we lack synergies in a system approach, between the external (a system level) and internal business (a company-level) environments to achieve responsible corporate innovation. There should be an interplay between policy oriented external environments (e.g. legal and governance frameworks) and business strategy change, for instance through a cooperation between the public and private sectors in the form of private-public partnerships (Koistinen et al., 2018).

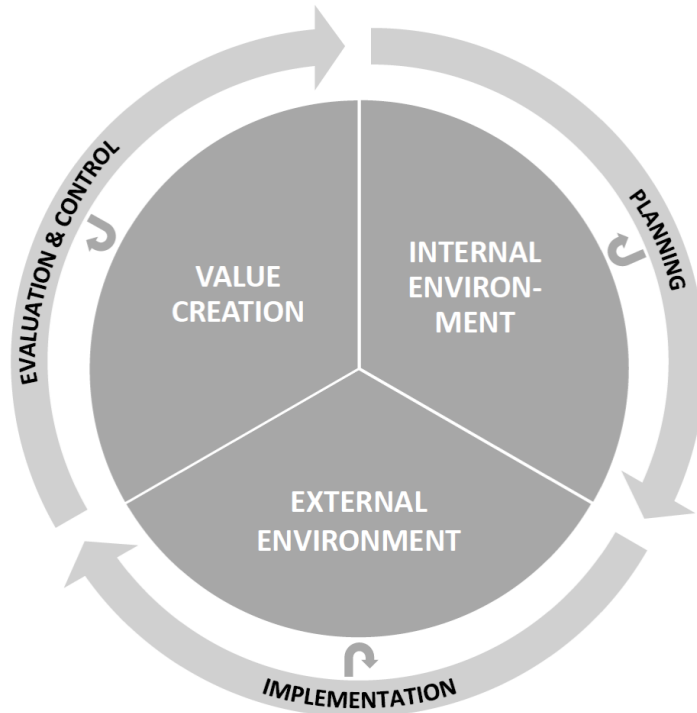
Taking into consideration that responsible corporate innovation management raises both opportunities and challenges, further studies are required, particularly empirical studies, to investigate the nature, benefits and challenges, measurement metrics and business models for responsible innovation. While difficulties remain, undoubtedly some of the most successful corporations are also among the most socially responsible.

5.4 Strategic Responsible Innovation Management (StRIM)

When considering the opportunities and benefits of linking innovation and CSR, this study proposes a new approach called strategic responsible innovation management (StRIM). I argue that a responsible innovation strategy model based on the commitment of the company, in conjunction with the strategic use of responsible innovation, can lead to a competitive advantage and value creation, while incorporating key market and non-market stakeholders. In developing the model, I build on the concepts discussed in Section 3: innovation management; strategic CSR (including Husted and Allen’s seven step model of corporate social strategy); recent developments on business models in the sustainable innovation literature stream (including models by Hansen, 2009; Iñigo & Albareda, 2016; Patala, 2016); value

creation; CSR-driven innovation and innovation-driven CSR; and the multi-stakeholder approach. Deriving from RRI, I argue that responsible corporate innovation is a strategic concept (von Schomberg, 2013; Lindner et al., 2016) related to strategic CSR that imposes several demands on the way in which innovation is organised. Firstly, innovation should be guided by the principles of good governance, which includes anticipation, openness and transparency. Secondly, responsible innovation requires the participation of a variety of stakeholders in the innovation process. Thirdly, societal and environmental issues should be carefully considered, evaluated and controlled throughout the innovation process. Responsibility should be embedded in both the process of innovation (e.g. fair labour conditions, ethical sourcing, avoiding animal cruelty) as well as its outcomes (e.g. run-tracking device ensuring users' privacy, non-discriminatory software systems for predictive policing). If innovation could lead to negative societal or environmental consequences or conflicts with ethical criteria, including the fundamental values that societies uphold in their constitutions and legal frameworks, mitigation actions should be undertaken (Gurzawska et al., 2017).

The StRIM approach is built on the traditional strategic management process. The strategic process of a company has three components: (1) planning; (2) implementation; and (3) evaluation and control (White & Bruton, 2010). These activities should be performed simultaneously and continuously. A successful company should manage its strategies in three main areas: (1) the company's internal environment, including resources and capabilities; (2) the external environment within which the organisation operates; and (3) the company's ability to add value to what it does (Lynch, 2015). The internal environment involves departments, management teams, individual employees, but also resources and capabilities that form the company. The external environment refers to external forces that impacts the company. Figure 5.5 presents the strategic management scheme based on a system approach presenting the company as an association of interrelated and interdependent parts (White & Bruton, 2010).

Figure 5.5*Strategic Responsible Innovation Management (StRIM) scheme*

Note: Adapted from White & Bruton (2010); Lynch (2015).

The systems approach to strategically responsible innovation management (StRIM) involves a framework of strategic process components and three main areas that the company needs to manage and feedback during the entire process. Decisions made on each stage of the strategy (planning, implementation and evaluation and control) feedback into the internal environment, resources and capabilities; the external environment; and the value creation. It is because of changes in the company's internal environment (e.g. reorganisation in the R&D department, new more sustainable production methods, changes in a company's identity and a culture embodied in a new code of conduct); the external environment (e.g. new customer group, new legal regulations on CO₂ emission threshold); and in the value the company creates which will all have an impact on subsequent strategic decisions which are represented in the scheme. This approach reflects the non-linearity of the process with a bi-directional link between innovation and CSR with feedback loops. The next subsections discuss individual stages of the StRIM approach.

5.4.1 Planning

Starting from the outer circle, planning of the strategy includes strategic analysis and strategic development.

In the strategic analysis phase, a company should examine the internal and external environment, the links between them and identify its vision, mission and objectives (Lynch, 2015). In the internal environment analysis, a company should explore the internal resources (tangible and intangible) and capabilities, what their role is, added-value and competitive advantage and how they can be improved over time (Lynch, 2015). The internal environment consists of the company's culture, structures, and processes. Adapting Husted's (2015) approach to social strategy, StRIM requires the integration of strategic business and strategic responsibility actions (Husted et al., 2015). While business strategies employ a company's resources and capabilities to achieve purely market-based competitive objectives (Husted et al., 2015), StRIM would use a company's resources and capabilities to meet both financial as well as societal and environmental objectives. Therefore, the purpose of StRIM is to create value for the company, especially economic value, by embracing societal and environmental objectives. Responsible innovation and corporate responsibility can be perceived as specific intangible resources that provide benefits to companies (McWilliams & Siegel, 2011). Components of corporate culture, such as corporate values and philosophy, are specific resources essential to a company's identity (Albert & Whetten, 1985). They can provide a competitive advantage and help in inclusion of non-economic objectives within a company's strategy (Husted & Allen, 2007). The company's culture and identity should be evaluated in terms of societal and environmental needs and opportunities (Husted & Allen, 2010). The successful integration of innovation with strategic concerns should begin with a company's capabilities, because the business ultimately develops its competitive advantage through capabilities (Barney, 1991). Capabilities are skills that a company develops (White & Bruton, 2010). The capabilities of a company can be classified as either technical or market capabilities. Technical capabilities address how the company approaches technology it already has or wishes to have in the future, and market capabilities are market-relevant skills that indirectly impact the technology of the company (White & Bruton, 2010). The external environment analysis determines what is happening or is likely to happen outside of the company (external environment), including societal and environmental risks and opportunities, competitive environment, and relationships with non-market stakeholders. In this stage, a company should identify external factors that could affect or be affected by

the innovation process, for instance, economic, political and technological developments, potential alliances, networks and partnerships leading to sustainable co-operation, competitors, and customers preferences. The external environment analysis is crucial, because a company can impact or be impacted by its broader environment (White & Bruton, 2010). Based on the internal and external environment insights, a company should develop and review its vision, mission and strategic objectives.

The second part of planning is the strategic development that involves the identification and rational selection of options available to achieve the agreed objectives and determination of the strategy, its structure and style (including organisational structure and people) (Lynch, 2015), taking into consideration value creation. These objectives should be intrinsic with a company's resources and capabilities, mission and vision and the external environment.

As discussed above, responsible innovation requires embedding the principles of good governance, that includes anticipation, openness, transparency, and accountability in the corporate vision, mission, objectives, and corporate culture rooted in beliefs and value systems shared by employees. Moreover, relevant internal and external stakeholders should be engaged in responsible innovation planning. They can improve the quality of the environmental analysis and strategic development providing specific knowledge, experience and through communicating their preferences, needs and concerns. Nevertheless, the company should manage and prioritise these various interests.

5.4.2 Implementation

The implementation stage is a process of applying the chosen strategy in practice. The success of the implementation stage depends on three specific policies and practices: a company's formal organisational structure, its formal and informal management control systems, and its employee compensation policies (Hesterly & Barney, 2008). Responsible innovation should be integrated along the whole value chain and, therefore, into the governance of the company and into existing management systems (Gurzawska et al., 2017). Efforts to create innovations that are socially and environmentally responsible should be treated and managed as core business strategy, just as are the strategies of capital expenditure, talent management, and marketing. Responsible innovation principles that are embedded in the governance of a company might improve integration of the vision, mission and objectives of the company's

personnel with those of the corporate policy (Chatfield, Borsella, Mantovani, Porcari, & Stahl, 2017).

Senior leadership and management of the company should organise innovation internally to pursue responsible practices and behaviours when developing new products, processes and services (Responsible Industry, 2017). Responsible corporate innovation has little effect on strategy if individuals and leaders within the organisation are not committed to responsible behaviour. Therefore, senior leadership and management of the company, including the board of directors, must make an authentic, firm, and public commitment to responsible innovation efforts, and engage with them (McElhane, 2009). A clear commitment towards responsible innovation principles can build a consistent picture of corporate values as an ideological system that aligns employees to strategic objectives and binds them to these corporate goals (Berkhoud, 2013). Aligning employees' values with organisational values can support and nurture responsible innovations (Chatfield, Iatridis, Stahl, & Paspallis, 2017). According to Grant (2007) a company that cares about user needs and societal welfare can spark motivation, positively affect employee's actions and behaviour (Grant, 2007), enhance their sense of having "meaningful work" and enhance employee engagement (Gurzawska et al., 2017). It is not only beneficial for an employee, but also for a company. This is because employee engagement is correlated with higher productivity, costs and sales, which are the main performance indicators (Gurzawska et al., 2017). A company can incentivise employees to pursue responsible corporate innovation, because a properly designed reward and incentive system is crucial for creating motivation and commitment (De Kluyver & Pearce, 2006). A company can do this through awareness raising, an integration of ethical thinking into the design/production process, advocating and encouraging employees to maintain a responsible attitude and discouraging/stigmatising unethical behaviour (Responsible Innovation, 2017, Gurzawska et al., 2017). Management should also adopt social responsibility governance tools to support the strategy implementation. These tools should be based on co-creation and shared responsibility of all stakeholders (Gurzawska et al., 2017).

5.4.3 Evaluation and control

A strategy is effective when it creates value for shareholders, partners, suppliers, employees and the community, yet it delivers customer value by satisfying their needs, including societal and environmental needs, better than rivals. The evaluation and control stage focuses on monitoring innovation to ensure that it meets the desired

outcomes and creates value, both financial and social. It is necessary, that after an innovation is implemented, the company monitors changes that may affect innovation, making it irresponsible and unethical, technologically obsolete, replaceable or competitively weak (White & Bruton, 2010).

Every company should measure its performance and created value. Performance metrics serve as a powerful management tool in ensuring that the company focuses on accomplishing their mission and objectives and creating incentives for staff and managers (Sawhill & Williamson, 2001). As discussed in subsection 3.3., innovation linked to CSR is one of the key ways through which a company can achieve measurable social objectives and create measurable business value. Nevertheless, the responsible innovation metrics should be selected carefully to support the strategy, otherwise the strategy cannot be delivered. The key here is to develop metrics based on the company's context which is not only internal but also relevant to their key external partners and ecosystems. Measuring societal and environmental objectives may be challenging, nevertheless non-profits performance metrics could provide some lessons learnt about approaches to quantifying success, even for highly ambitious and abstract goals. Sawhill and Williamson (2001) determine three kinds of performance metrics: (1) metrics measuring companies' successes in mobilising resources, (2) metric measuring staff's effectiveness on the job, and (3) metrics measuring progress in fulfilling companies' missions.

StRIM offers a more conscious and integrated approach connecting companies' innovation and CSR strategies. It could help to arrange patterns of organisational behaviour in terms of strategising responsible corporate innovation. Following Mintzberg et al. (1998), this strategy should be developed as 'a transformational process based on learning and growth, both of the informal (culture, vision, position, people) and formal (programs, products, structure, system) parts of an organisation' (Mintzberg et al., 1998). This business strategy should be integrated with core business objectives and embedded in day-to-day business culture and operations. Furthermore, it should encourage stakeholder dialogue and "social learning" (multi-stakeholder approach). Such an approach would foster the responsible development of innovations that are profitable for companies, accepted by society, and relevant to societal and environmental problems. Nevertheless, a strategic approach to responsible innovation raises some challenges and uncertainties, which are discussed in the next subsection.

5.5 Conclusions

A specific contribution of this book chapter was to develop a better account of how companies may create economic and social value through integrating responsible innovation in their strategies. This study explains how the link between innovation and CSR may assist in improving a company's competitiveness, value creation and stakeholder management. In this paper, I connect innovation and CSR in order to foster the responsible development of product, process, organisation and marketing innovation. Firstly, I delineate the field by defining the concepts underpinning responsible innovation, including innovation, CSR and their relation to business strategy. This analysis allows me to provide recommendations for ways, in which companies can develop strategies for responsible corporate innovation management. By identifying the key analytical factors (innovation management, responsible innovation, strategic CSR, CSR-driven innovation and innovation-driven CSR, multi-stakeholder approach) it is possible to recognise several strands or connections that help frame understanding of the relationship between innovation and CSR. Both innovation and CSR should be perceived as a strategic tool and a goal. Therefore, companies should explore innovations that are accepted by society and address societal and environmental problems. I argue that the concept of CSR enriches innovation process by emphasising the interdependence of business and society. At the same time, CSR activities are tightly linked to innovation functions that might ensure a competitive advantage and therefore be more profitable than those oriented toward public relations, marketing and human resource management. I propose a new approach, called strategic responsible innovation management (StRIM), that is intertwined with companies' social responsibility. This approach is intended to redefine companies' perceptions of a "successful innovation" by shifting the focus from a company's financial success to sustainable outcomes, for both business and society. A strategy is unique for an organisation, therefore, StRIM can help to develop strategies best suited to the company's continuous success. In this way, responsible innovation will create and generate revenue, not just minimise costs and risks. The conceptual framework developed in this article may support companies to reflect on their relations with other parts of society. The framework may also be helpful to answer questions on CSR strategising. Nevertheless, there will be further questions on the deep-rooted values and beliefs in companies, which are responsible for the acceptance (and non-acceptance) of an organisational engagement. Hence, the conceptual framework serves as a first attempt to arrange patterns of organisational behaviour in responsible innovation strategising.

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6. Towards Responsible and Sustainable Supply Chains: Innovation, Multi-stakeholder Approach and Governance

Abstract:

Supply chains are an indispensable element of any global economy. At the same time such supply chains create a societal and environmental burden. Drastic actions are required to mitigate these effects. Supply chains should become responsible and sustainable (where responsibility and sustainability are understood in a broad sense) addressing economic, political, societal, legal, human rights, ethical and environmental concerns. This research shifts from the question of why companies should implement responsibility and sustainability into supply chains, to how they should do so effectively. Illustrated by a case study of Sedex, a collaborative platform for buyers and suppliers, this paper proposes three solutions for responsible and sustainable supply chain management (SCM). Firstly, supply chains have to be supported by research and innovation (R&I). Secondly, supply chains should be based on multi-stakeholder efforts of industry, governmental and non-governmental organisations. Thirdly, the responsibility should lie not only with an individual company and its employees, but also with organisations of companies (supra-agency). As a result, responsible and sustainable supply chains require technological, political and ethical solutions involving the development of sound, multi-stakeholder business and governance models. These models should be based on the equal consideration of all three dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and legitimate requirements of the stakeholders of a supply chain.

The research leading to these results received funding from the European Community's Seventh Framework Programme (FP7/2007–2013) under grant agreement No. 612231 (SATORI).

6.1 Introduction

Today's global economy is based on dynamic and complex networks of businesses known as supply chains. Thanks to supply chain businesses, suppliers, products and services can be provided to consumers. Supply chain management (SCM) helps to organise this flow of goods and service and to manage complex relationships among manufacturers, intermediaries, and end users. SCM also provides means of developing competitive advantage and positioning strategy.

Along with globalisation of economies, SCM is generating considerable interest in terms of responsibility and sustainability. As supply chains grow and become complex and unclear networks, they increasingly become more difficult to be managed. These challenges are driven to a greater extent by difficulties in identifying resource scarcity, population growth and continuing urbanisation, market developments and internationalisation, shifting consumption patterns, technological advances and disruption risks. Increasingly, the production processes are broken down into various distinct activities that are organised and performed in distinct locations spread across different countries or regions (Rangi et al., 2015¹). With global supply chains, companies aim to take advantage of differences across places in terms of, for example, technological development, legal regulations, workforce productivity, labour and production costs. At the same time, supply chains create a tremendous footprint on scarcely available resources and cause serious societal and environmental problems. Intensified pressures from governments, customers, employees, civil society organisation (CSOs) and other stakeholder groups have prompted companies to address societal and environmental impacts of their activities (Roberts, 2003; Zadek, 2004; Seuring & Müller, 2008a, 2008b; Björklund, 2011). Taking account of issues like ethical sourcing, workers' rights, fair wages, intellectual property rights, carbon and water footprints is becoming a silent feature of discussion. This change is driven by various forces. Firstly, information flow has become faster, and therefore incidents of environmental misconduct, human rights violations or unethical business behaviour are immediately reflected in the market. This tendency is clearly visible when a striking corporate scandal occurs, as in the cases of, for example, the Volkswagen emissions scandal; the quality-faking admission from Kobe Steel (auto

¹ Sedex case study derives from the author's contribution to the SATORI report 'How Globalisation Is Changing Research Agendas, Activities and Assessment Procedures within Research & Innovation. Deliverable 3.3', compiled by Sudeep Rangi (UNESCO), published in September 2015. The report is available online: http://satoriproject.eu/work_packages/legal-aspects-and-impacts-of-globalization

and airplane parts provider of Boeing, Ford, Toyota, and others); Samsung Electronics dealing with exploding Note 7 batteries and bribery charges; credit rating firm Equifax making profits from selling personal, often sensitive information to financial institutions and lenders; or recent controversies around misuse of Facebook users' data by Cambridge Analytica and potential implications for the US presidential elections in 2016. Secondly, we as consumers alter our beliefs, attitudes and buying behaviour due to societal and environmental concerns, and therefore we scrutinise companies accordingly to their reputation (Pelsmacker, Janssens, Sterckx, & Mielants, 2006; Newholm & Shaw, 2007; Castaldo, Perrini, Misani, & Tencati, 2009). Thirdly, corporate reputation becomes an important factor for companies and plays a crucial role in attracting employees (both current and future) as well as investors (Maden, Arikan, Telci, & Kantur, 2012; Stammer, 2016).

These SCM concerns are not new and have been broadly discussed by industry, governments and researchers in the fields of SCM and business ethics (BE) from societal, environmental, economic, legal, ethical and technological perspectives, which are all closely interrelated (Carter & Rogers, 2008; Seuring & Müller, 2008a, 2008b; Pagell & Wu, 2009; Carter & Liane Easton, 2011; Ahi & Searcy, 2013; Marshall, McCarthy, Heavey, & McGrath, 2015). Yet the current focus has altered from the question of why companies should implement responsibility and sustainability into SCM activities, to how they should do so effectively. Therefore, in this article the author shifts the conceptual focus from a question of “why” too “how”. Accordingly, the author's objective is to develop a theoretical account of how supply chains can be managed in a responsible and sustainable way and test this account by applying it in a case study. Companies search for solutions which decrease their negative and increase their positive societal and environmental footprints in their supply chain. Nevertheless, despite intensified efforts to ameliorate these problems, current solutions are unsatisfactory. Consequently, this study argues that new business and governance models are needed to manage supply chains in a responsible and sustainable way. Supported by the case study of Sedex, which is a collaborative platform for buyers and suppliers, this paper argues that these models should build on three types of solutions. Firstly, responsible and sustainable SCM requires innovative technological solutions. Secondly, it necessitates political solutions in the form of multi-stakeholder collaborative partnerships and cooperation along, as well as across, supply chains. Thirdly, ethical solutions in the form of responsibility of various tiers of supply chains are crucial, including the responsibility of organisations of companies

(supra-agency). Responsible and sustainable SCM, therefore, must take a systemic approach.

The main contribution of this paper is a unique proposal for connecting research and innovation (R&I), a multi-stakeholder approach, and a supra-agent responsibility and governance as the inevitable interdependent solutions for responsible and sustainable SCM. In particular, the SCM governance by organisations of companies (supra-agency) is analysed. Consequently, this research argues for responsible supply chain governance. The remainder of the paper is structured as follows. Section 6.2 discusses the methodological approach of this study. Section 6.3 provides a theoretical account for SCM laying the groundwork for a discussion on how supply chains can be managed in a responsible and sustainable way. Section 6.4 outlines the main challenges in SCM and possible solutions for responsible and sustainable supply chains that should be address. Section 6.5 discusses three technological, political and ethical solutions for responsible and sustainable supply chains, namely: innovation, multi-stakeholder approach, and supra-agent responsibility and governance. In section 6.6, the case study of Sedex is presented to test three aforementioned solutions in practice. Lastly, section 6.7 concludes the research and provides further research directions.

6.2 Research Methodology

This research is funded by and derives from the results of the SATORI Project.² The SATORI Project focuses on ethical impact assessment of research and innovation (R&I). Part of the SATORI Project's work addresses the ethical problem of globalisation of R&I exploring how globalisation is changing research agendas, activities and assessment procedures within R&I. As part of this research, six topics were investigated to address specific effects of globalisation and ethical considerations. Responsible Supply Chain was one of the topics. This paper is partially derived from the SATORI Project's findings, nevertheless it provides further insight and analysis.

This paper incorporates literature review and synthesis, empirical investigations, and the development of a conceptual tool. A preliminary literature review was conducted to identify trends, challenges, ethical implications and recent developments

² The research leading to these results received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement No. 612231 (Stakeholders Acting Together On the ethical impact Assessment of Research and Innovation (SATORI)).

in SCM. Furthermore, the study provides the outline of recent endeavours, policies and actions to mitigate the undesirable and unethical consequences of the SCM.

To identify potential solutions for responsible and sustainable SCM, the paper derives its findings from the literature review and the empirical studies about responsible and sustainable supply chain conducted for the purposes of the SATORI Project. Two empirical methods were used, namely a stakeholder dialogue and a case study. Studies were conducted to verify the preliminary literature review results, to determine and structure the effective conditions of responsible and sustainable supply chain.

Firstly, a stakeholder dialogue session about responsible supply chains was held in June 2015 as one of the sessions at the SATORI Project's conference titled 'Policy and Legal Options for Developing Ethics Assessment for Research and Innovation Within the Context of Globalisation'. The stakeholder dialogue involved twenty participants representing industry, academia, policy makers and civil society organisations (CSOs). A stakeholder dialogue is a commonly accepted method to develop solutions acceptable to all parties, by incorporating public values and concerns into decision making (Gurzawska, Mäkinen, & Brey, 2017). Therefore, the session brought together stakeholders to enable discussions and gather concrete feedback on the preliminary literature review studies disseminated among the participants beforehand. The ultimate goal was to develop potential policy, legal and/or other options for responsible and sustainable supply chains. The dialogue enabled deliberation on challenges within supply chain that have arisen due to globalisation practices and proposed mechanisms to address the lacunae which exists presently. As a result, the stakeholder dialogue paired with a literature review allowed for the identification of three potential solution that participants agreed are typically effective or have a potential to enhance responsibility and sustainability in supply chains.

The second empirical method – the case-study, was conducted to test the findings of the literature review and stakeholder dialogue. This research extends the objective of identifying potential solutions by providing an empirical validation based on a case-study of Sedex, where focus was placed on specific incidents, actions, and policies. The case study employed an in-depth interview with Jo Webb (Head of Stakeholder Relations at the time of the interview) and an online information exchange with Sedex employees from the departments of Stakeholder Relations and Marketing Communications. Furthermore, the content analysis of the secondary data was conducted, including Sedex documents, policies and tools provided by the

organisation members as well as available online. As a specific example of responsible supply chain network organisation – Sedex, its structure and operations represent a response to SCM challenges and implementation of the proposed underlying solutions for responsible and sustainable supply chain. This research examines Sedex by applying a conceptual framework developed explicitly for the purposes of this paper.

6.3 Theoretical background

In order to identify conditions under which supply chain can be perceived as responsible and sustainable, firstly a question of what makes supply chain responsible and sustainable needs to be addressed. This section provides a theoretical account for understanding and analysing responsible and sustainable SCM.

In terms of the scientific endeavours to tackle this question, a considerable body of literature examining various aspects of SCM has been produced. Carter and Jennings (2002) and Murphy and Poist (2002) were one of the first to connect supply chain issues to a broader concept of corporate social responsibility (CSR) placing environmental as well as social activities within the context of social responsibility (Carter & Liane Easton, 2011). Under the CSR framework, responsibility in the supply chain falls into the conceptual discussion about the nature and, thereby, the definition of CSR. Broadly speaking CSR refers to responsibility, thereby duties and obligations or motivation and opportunities of the companies towards society (Rangi et al., 2015). There is a great number of theories and a wide array of understanding of the responsibility of a company. According to a comprehensive review of CSR definitions by Dahlsrud (2008), CSR can be characterised by five dimensions, namely environmental, social, economic, stakeholders and voluntarism (Dahlsrud, 2008). Garriga and Melé (2004) group CSR theories into instrumental, political, integrative, and ethical theories (Garriga & Melé, 2004). Firstly, CSR when understood instrumentally is about a company's responsibility for wealth creation, where economic objectives are achieved through social activities (e.g. Friedman, 1962). Secondly, CSR can be understood as a responsibility in the political arena related to a company's political power and relationship with society (political theories) (e.g. Matten & Crane, 2005; Scherer, Rasche, Palazzo, & Spicer, 2016; Scherer, 2018). Thirdly, a company's responsibility focuses on the integration of social demands and operating according to social values (integrative theories) (e.g. Carroll, 1979; Wood, 1991). Finally, social responsibility can refer to ethical obligation to achieve good society, reflected in such approaches as universal rights and sustainable development.

Regardless the perception of a company's responsibility nature as either economic, political, integrative or ethical, CSR concerns two aspects: the relationship between business and the larger society, and a company's activities in the area of environmental and social issues (Andersen & Skjoett-Larsen, 2009). CSR refers to all company's activities and therefore also SCM as one of them.

Much of the supply chain research pertains to the CSR literature, however the last decade has seen a growing body of a standalone research on the theory and practice of sustainable supply chain management (SSCM) (Svensson, 2007; Carter & Rogers, 2008; Seuring & Müller, 2008a, 2008b; Carter & Liane Easton, 2011; Wolf, 2011; Wu & Pagell, 2011). Carter and Liane Easton (2011) argue that even though previous work on supply chain in the context of CSR addresses environmental and social issues, it fails to connect SCM with the economic performance (Carter & Liane Easton, 2011). Therefore, they advocate for a separation of SSCM from the CSR framework. Carter and Rogers (2008) link sustainability in the SCM context to Elkington's (1998) triple bottom line (TBL) based on the integration of social, environmental, and economic aspects of SCM (Seuring & Müller, 2008a, 2008b; Carter & Liane Easton, 2011). In other words, sustainability practices help to unfold opportunities and manage economic, environmental and social risks resulting in a long-term value creation (López, Garcia, & Rodriguez, 2007). Moreover, Carter and Rogers (2008) claim that while corporate responsibility is perceived as discretionary, the engagement in sustainability, particularly SSCM, is a requirement for any company. Nevertheless, similarly to CSR, the term 'sustainability' has been inconsistently defined and applied in the literature (Carter & Rogers, 2008). A recent review of the literature on the state of sustainability and CSR in supply chains literature by Quarshie et al. (2016) found significant differences between SCM and BE fields. According to their study, while a vast amount of the SCM literature stream focuses on environmental dimensions of SCM using sustainability as an umbrella term; the BE literature stream is centred around social and/or ethical aspects of SCM, with a main reference to CSR (Quarshie, Salmi, & Leuschner, 2016). Furthermore, while social responsibility and sustainability have been addressed in both SCM and BE research, it has been often done from a narrow perspective dealing with specific issues such as product safety, fair labour practices, modern slavery, child labour, environmental stewardship focused on climate change, carbon and water footprints or other issues that relate to socially and environmentally desirable outcomes (Ferrell, Rogers, Ferrell, & Sawayda, 2013). Most of the SCM research has focused on specific topics – and in this sense has been fragmented.

This discrepancy is also reflected in practices of companies, industry associations and governmental organisation (Rangi et al., 2015). For instance, the International Chamber of Commerce (ICC) refers to 'supply chain responsibility' (also understood as responsible sourcing), as 'a voluntary commitment by companies to manage their relationships with suppliers in a responsible way' (ICC, 2008). On the other hand, United Nation Global Compact (UNGC) calls for 'supply chain sustainability' to 'create, protect and grow long-term environmental, social and economic value for all stakeholders involved in bringing products and services to market' (UNGC, 2015). While the first definition emphasises the voluntary character of companies' commitment to undertake responsible approach to supply chain (Rangi et al., 2015), the second definition focuses on management of impacts that a company may have on its stakeholders and strives for a proactive approach to incorporating good societal, environmental and governance practices into supply chains (UNGC Australia, n.d.). The inconsistency in definitions and approaches could be caused by the fact that the field of SCM is relatively new, both in the context of CSR and sustainability. Overall, the varying interpretations of the terms 'CSR' and 'sustainability' make it difficult to delineate exact boundaries and linkages around them, but certainly the concepts overlap considerably (Quarshie et al., 2016). Unquestionably, both concepts are now well established in the academic research as well as in the business lexicon. One can conclude that there is a need for integration of various approaches.

This research continues to leave unresolved fundamental antecedent questions concerning the ultimate definitions of CSR and sustainability, and takes a holistic understanding of responsible and sustainable SCM, drawing from the crucial aspects of both concepts. The paper takes a comprehensive view, where responsible and sustainable SCM is about the management of material, information and capital flows, cooperation among companies along the supply chain while combining three sustainability goals i.e., economic, environmental and social goals, which are derived from customer and stakeholder requirements (Seuring & Müller, 2008a, 2008b). These goals should be taken due to the corporate social responsibility resting with companies, in the forms of responsibility for wealth creation, a responsible use of business power in the political arena, integration of social demands and acting according to ethical values (Garriga & Melé, 2004). Despite differences in terminology, as well as in focus, between different researchers, there is a growing consensus around the crucial elements of responsible and sustainable SCM. Deriving from Beske et al. (2014), these elements include the equal consideration of all three dimensions of sustainability (economic, environmental and social), the cooperation of

the partners in the chain (Seuring & Müller, 2008a, 2008b), strengthening long-term relationships (e.g. Sharfman, Shaft, & Anex Jr, 2009) and legitimate requirements of the stakeholders of a supply chain, including customers, NGOs, suppliers or legal authorities (e.g. Johnston & Linton, 2000; Coe, Dicken, & Hess, 2008).

From this section we have learned that responsible and sustainable SCM should consist of two elements. Firstly, it should include socially responsible SCM and SSCM. Secondly, the key elements of responsible and sustainable SCM should be taken into consideration, namely all sustainability dimensions (economic, environmental and social), cooperation and strong relationships between the partners of supply chain, as well as proactivity and responsiveness towards various stakeholders and their needs. These, then, are two elements of the theoretical account which define responsible and sustainable SCM and its crucial elements.

6.4 CSM Challenges

In order to specify and understand avenues for a responsible and sustainable SCM, we need to understand what challenges they should respond to. Therefore, potential solutions are determined by the challenges for both, the management of supply chains and for incorporating responsibility and sustainability into SCM.

Storey and Godsell (2006) point out that the main issue related to SCM, is the very idea of ‘management’ of the supply chain, and the question of who could and should be responsible for it. The formula for assigning the responsibility is a challenge, because of an unambiguous definition of the ‘scope of responsibility’ including the duration and severity of the impact (van Opijnen & Oldenziel, 2011). According to Amaeshi et al. (2008) a company should not bear indefinite responsibilities for the actions of the suppliers, nevertheless should strive for a positive influence on their suppliers. Except the assignment of responsibility, a successful SCM requires strategy and measuring key parts to understand and take control of the supply chain, which involves processes, people and technology (Bala, 2014). In this regard, effective management of supply chains raises further questions, such as transparency of information and knowledge (Abeyratne & Monfared, 2016), the formation of appropriate relationships, and the design and use of appropriate measurements (Storey & Godsell, 2006).

Nevertheless, Pagell and Wu (2009) emphasise that best practices and managerial systems traditionally associated with well run supply chains may support, but also hinder sustainably and responsibility of SCM. Therefore, responsibility and

sustainability goals, practices and cognitions require changes in the management style and integration into day-to-day SCM (Pagell & Wu, 2009). This raises two main challenges, namely a reconceptualisation of the chain to include non-traditional members such as NGOs, community members and even competitors, as well as a proactive approach of managers that understand that responsibility and sustainability are an organisational commitment (Pagell and Wu, 2009). In the context of responsible and sustainable SCM challenges, Seuring and Müller (2008a, 2008b) determine a number of challenges by dividing them between factors that are external and factors that are internal to the supply chain. The external challenges involve legal demands/regulation, customer demands, response to stakeholders, competitive advantage, environmental and social pressure groups and reputation loss. The internal factors relate to costs associated with the increasing complexities of supply chains, monitoring, communication and information exchange. Barbosa-Póvoa (2009) highlight the difficulties in establishing measures for sustainability within the sustainable supply chains; facilitation of collection, refurbishment, recycling or disposal of returned products; uncertainty and risk modelling; and trading-off the different issues in supply chain. Van Opijnen and Oldenziel (2011) discuss a level playing field related to power relations (e.g. MNCs versus SMEs or small farmers) and transparency with regard to disclosure and monitoring of sustainable practices further down the supply chain. Beske et al. (2014) identify five categories of practices, both strategic and operational, which remain a challenge for responsibility and sustainability within SCM: a strategic orientation following sustainability strategy; continuity of relationships among supply chains' partners (long-term); collaboration in terms of logistics and organisation; risk management in order to mitigate risks related to stakeholder pressures; pro-activity for sustainability including actively engaging stakeholders. Boström et al. (2015) capture this variety of challenges to achieve responsible and sustainable global supply chains in six comprehensive groups, namely (1) geographical distance between the consumption of commodities and their production related to complexity of the supply chain, issues with communication with suppliers, traceability and generic standards; (2) information and knowledge gaps diminishing transparency; (3) collaboration and communication along the chain; (4) compliance or implementation gaps; (5) power gaps due to the fact that responsible and sustainable supply chains require power symmetry or more equal distribution of power among actors in the chains; (6) a credibility or legitimacy gap related to unsustainable activities under the name of 'sustainability instruments'. These six challenges reflect the key elements of responsible and sustainable SCM defined in the

previous section. On the one hand, they address strategic, operational and technical challenges for the arrangement of well-functioning management systems for supply chains. On the other hand, they raise a question of the nature and scope of companies' responsibility and the elements of sustainability. They focus on the dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and legitimate requirements of the stakeholders of a supply chain.

With the focus on the establishment of responsibility and sustainability within SCM, this section does not directly contribute elements to the theoretical account, but rather defines the challenges that solutions proposed in section 5 respond to. Therefore, the next section applies a theoretical account for responsible and sustainable SCM to provide solutions that address the SCM challenges, identified in this section, from a responsibility and sustainability point of view.

6.5 Solutions for Responsible and Sustainable SCM: A Proposal

Taking into consideration the characteristics of modern supply chains (the theoretical account including the responsible SCM and SSCM, as well as the challenges for establishing responsibility and sustainability in SCM), this section identifies and discusses potential avenues for managing supply chains in a responsible and sustainable way. These solutions consist of three interdependent provisions, that is to say: innovation; multi-stakeholder approach; and supra-agent responsibility and governance of supply chains. This study argues that these solutions serve as an effective response to SCM challenges discussed in the previous section and have the potential to enhance responsibility and sustainability in SCM.

6.5.1 Innovation

Increasingly, companies are facing disruption and change in managing their supply chains. Global competition, frequently shifting markets, rapidly changing customer requirements and new continuously emerging technologies force major changes in SCM. The dynamic and complex nature of supply chain urges companies to innovate in SCM. SCM is on the cusp of major technological transformation, which is already altering how businesses exchange and share information and assets. Traditional linear supply chains are insufficiently flexible in responding to highly dynamic conditions and to the ever-changing ecosystems (Deloitte, 2017). Therefore, SCM strategies shift to support global competitiveness, new products, process and service innovation and

introduction, in addition to, rapid market responsiveness (Shen & Norrie, 1999). The next generation supply chains should then be strongly time-oriented, while still focusing on cost and quality. Furthermore, growing stakeholder pressure to realising more responsible and sustainable paths in SCM requires changes of behaviour and organisational, as well as technological, innovations (Isaksson, Johansson, & Fischer, 2010). As shown by Chakrabarty and Wang (2012) high research & development (R&D) intensity provides a positive platform for the development and long-term sustenance of sustainability practices bringing both financial returns and a positive impact on the natural environment, society, and economy. R&D, which is a part of innovation situated at the front end of the innovation life cycle, equips companies with technologically innovative capabilities and skills to fulfil the sustainability requirements (Chakrabarty & Wang, 2012). New technologies expand and bring new forms of work and collaboration, like virtual networks (Zink, 2008). According to Deloitte (2017), next generation technologies will allow for new and more advanced collaboration, that ultimately will enhance efficiency, transparency and data sharing. As the result, supply chains are managed, largely, in a digital way.

Technology, research and innovation offer the necessary solutions for efficiency, accountability and governance of supply chains. At the same time technological advances help to address and reduce negative societal and environmental consequences that a company may cause, while still maintaining economic competitiveness (Lee et al., 2006; Golicic & Smith, 2013). Quickly developing technologies such as internet of things (IoT), smart sensor networks, business intelligence, smart distribution techniques, information sharing, robotics and 3D printing bring opportunities for more responsible and sustainable supply chains. Nevertheless, to take advantage of the possibilities created by digitisation in supply chains, the business community, government and scientists will have to utilise ICT opportunities together (Dutch Blockchain Coalition, 2018a, 2018b, 2018c). The next subsections discuss two examples of innovative technologies, namely big data and online platforms and blockchain technology, which have a potential to revolutionise supply chains and contribute to robust responsibility and sustainability.

Big Data and Online Platforms

Big Data is increasingly becoming a vital factor and resource for companies in the innovation of products, processes, services, and business models. The definition of 'big data' refers to the size or volume of the organisation's data, but also to the variety and velocity (Hazen, Boone, Exell, & Jones-Farmer, 2014). Big data is perceived as an

emerging competitive area that will transform the way in which supply chains are managed and designed (Manyika et al., 2011; Cecere, 2013; Waller & Fawcett, 2013; Zhou et al., 2014). Companies struggle with the question how to deal with massive amounts of data, and how to leverage and apply predictive analytics (Schoenherr & Speier-Pero, 2015). The widespread use of digital technologies and an increasing amount of data has led to the emergence of big data business analytics (BDBA) that enables companies to make better decisions (Muhtaroglu, Demir, Obali, & Girgin, 2013), particularly in SCM (Wamba, After, Edwards, Chopin, & Gnanzou, 2015).

While Big Data is still in its infancy, it already provides several promises for SCM. Big data responds to a number of challenges for responsible and sustainable SCM identified in section 6.4. Real-time risk management and dynamic resource optimisations (Schoenherr & Speier-Pero, 2015) improve the visibility, flexibility, and overall integration of global supply chains processes (Wang, Gunasekaran, Ngai, & Papadopoulos, 2016). Therefore, big data analytics could help to facilitate the geographical distance, the complexity of the supply chain and communication with suppliers by filling the information and knowledge gaps. This would lead to enhanced transparency and traceability supporting monitoring and auditing. Furthermore, big data analytics could enable strategic planning in terms of sourcing and supply chain network design, as well as product design and development. Such enhancements would lead to improved compliance and stakeholder relationship, since these activities are based on collaboration and communication along the chain (Wang et al., 2016). Increasingly 'data' is perceived as an important driver of innovation and a significant source of value creation and competitive advantage (Tan, Zhan, Ji, Ye, & Chang, 2015). Using advanced analytics, companies can study big data to understand the business environment (Russom, 2011) and then connect these insights directly into their business processes in real time. The smart collection, analysis and use of data can provide unique insights into maintenance cycles, ways of lowering costs and enabling more targeted business decisions as well as provide feedback into market trends and customer buying patterns (Wang et al., 2016). These attributes of big data respond to the key elements of responsible and sustainable SCM. Big data could ensure the realisation of economic goals, while putting attention to environmental and social objectives. At the same time, it could facilitate collaboration among supply chain actors enhancing stakeholder relationships. Big data is particularly useful when applied in the digital platforms known as platform business models. Such platforms use technology to connect people, organisations, and resources in an interactive ecosystem and exchange value (Parker, van Alstyne, & Choudary, 2016).

Academic research into big data in SCM has been scarce (Schoenherr & Speier-Pero, 2015), nevertheless practitioners and consultancy companies have already started using big data analytics to improve SCM. One example is a full-service Big Data cloud platform created by the SAP Ariba (SAP), one of the world's largest platform business models, which supports over 3.3 million companies in over 190 countries (CIO, 2018). The platform uses enabling technologies and trends such as artificial intelligence (AI), IoT and blockchain technology to analyse a companies' data and enhance their operations (SAP). SAP has placed a large emphasis on 'procurement with purpose'. Data from commerce transacted on the platform and suppliers on the network, is used to enhance responsible and sustainable supply chains, particularly regarding corruption, child labour, slavery/forced labour, conflict minerals, human trafficking and poverty (CIO, 2018). The SAP Ariba is doing so in two ways. Firstly, a supplier risk module makes risk due diligence a natural part of the procurement process (CIO, 2018). The module is fed by syndicated data from more than 600,000 sources and uses continuous monitoring and machine learning techniques to analyse over 200 environmental and social factors that companies can use to profile their suppliers against (CIO, 2018). Secondly, to help clients gain real-time, actionable insights into their supplier network, SAP teams up with several partners such as Made in A Free World (CIO, 2018; <https://madeinafreeworld.com>). The organisation is a supply chain risk management software provider, which built the world's first ever Slavery Footprint platform (Made in Free World).

Despite great promises of big data, there are significant challenges in its application. Firstly, Tan et al. (2015) argue that despite a variety of analytical techniques that companies can use to mine and analyse unstructured data (i.e. predictive analytics, data mining, case-based reasoning, exploratory data analysis, business intelligence, and machine learning techniques), we lack 'analytical tools and techniques to assist firms to generate useful insights from data to drive strategy or improve performance' (Tan et al., 2015). Secondly, as emphasised by Hazen et al. (2014) 'management decisions informed by the use of these data analytic methods are only as good as the data on which they are based' (Hazen et al., 2014). Therefore, while the technological solutions might work perfectly, the data quality problem may occur in terms of accuracy, timeliness, consistency and completeness (Hazen et al., 2014). Since BDPA is a relatively new area, a responsible application of Big Data requires training of next-generation data scientists (Schoenherr & Speier-Pero, 2015) and further research and testing to ensure their robustness.

Blockchain Technology

Recently, distributed computing platforms, also known as blockchain technology, are increasingly being touted as an answer to ongoing challenges in a whole range of disciplines. Blockchain is a decentralised online database that permits a master ledger of data and transactions to be accessed securely by multiple stakeholders (Pilkington, 2016). Blockchain has been much in the news because of the cryptocurrency market and Bitcoins, however one of the most promising application of blockchain is for SCM. As claimed by Dickson (2016), it has a potential to ‘transform the supply chain and disrupt the way we produce, market, purchase and consume our goods’. This technology can offer various opportunities to transform products, services and processes into digital supply chain networks and platforms, particularly through safer and more efficient ways to connect with business partners (Deloitte, 2017). It serves as a database for recording transactions and events, which are then shared through a peer-to-peer community.

Blockchain technology has a potential to address a number of responsible and sustainable SCM challenges. Blockchains could enable the tracking and tracing of products as well as components (Dutch Blockchain Coalition, 2018a). Therefore, it responds to the call for responsible and sustainable SCM regardless of the geographical distance and complexity of the supply chain, through improved communication with suppliers, traceability, covering the information and knowledge gaps strengthening transparency. As emphasised by Abeyratne and Monfared (2016), blockchain allows for collection, storage and management of key product information of each product throughout its life cycle. All members of the network can verify the transactions in the block (Hackius & Petersen, 2017). This approach ensures more equal distribution of power among actors in the chains. Since every member of the network has access to the same data, blockchain provides a single point of truth (Tapscott & Tapscott, 2016). This technology involves peer-to-peer interactions based on the digital signatures, thereby it enables communication and trust among the involved parties (Anjum, Sporny, & Sill, 2017). Therefore, blockchain improves relationships with stakeholder, firstly, among suppliers, contractors, and joint-venture partners resting on information sharing and collaborative partnerships; secondly, among customers, governments and the society thanks to reduced information and power asymmetry. Blockchain also enhances responsibility within the tiers of supply chain. It ensures the quality and safety of a product by reducing counterfeits (e.g. in the pharmacy supply chains) (Apte & Petrovsky, 2016; Hackius & Petersen, 2017). Blockchain serves as a tool for identifying misconduct from any part of the supply

chain's tier, and reduces supply chain carbon footprints addressing the environmental dimension of responsibility and sustainability in SCM (Dutch Blockchain Coalition, 2018a). Blockchain provides a full audit trail of record along a supply chain thanks to real-time data and deep insights into a production process means (Beck, Avital, Rossi, & Thatcher, 2017). As a result, blockchain technology has a potential to enhance compliance with responsibility and sustainability requirements and objectives. Since blockchain transactions are timestamped and tamper-proof, they provide a single source of data integrity and therefore allow for greater oversight and control. One of the blockchain applications is smart contracts, which execute commercial transactions and agreements automatically and enforce the obligations of all parties in a contract without intermediaries (Deloitte, 2016). Furthermore, blockchain could ensure credibility of responsibility and sustainability standards (e.g. Fair Trade and Organic) by verifying the integrity of the claims made by these certifications (Abeyratne & Monfared, 2016). Blockchain technology can result in greater levels of performance generating economic benefits. At the same time, it is also expected to enhance environmental and social goals through improved collaboration and relationships with stakeholder.

Over recent years, there has been a proliferation of projects applying blockchain technology to strengthen SCM. One of them is the Blockchain Supply Chain Traceability Project using digital technology in the fresh and frozen tuna industries of the Western and Central Pacific region (WWF Global, 2018). The objective is to improve tuna traceability to help stop illegal and unsustainable fishing practices in the Pacific Islands tuna industry (WWF Global, 2018). The World Wildlife Fund (WWF) pilot project tracks fish from vessel to the supermarket, using a combination of radio-frequency identification (RFID) tags, e-tags/quick response (QR) code tags and scanning devices to collect information about the journey of a tuna at various points along the supply chain (WWF Global, 2018). The information is automatically uploaded to the blockchain. Tuna industry struggles with illegal and environmentally dubious fishing practices, as well as forced labour. Blockchain technology is expected to improve traceability, compliance, flexibility and stakeholder management of tuna supply chain and enable consumers to shop ethically, legally-caught, sustainable tuna with no slave labour or oppressive conditions involved (WWF Global, 2018).

Another example of the blockchain application in the SCM is a Responsible Cobalt Initiative in Congo, which has been joined by tech giants such as Apple and Samsung. The initiative aims to ensure that cobalt, one of the minerals used in electronics, come through supply chains free of rights abuse, especially child labour

(Reuters, 2018). The electronic sector is a highly competitive, and companies' existence and a success depends on innovations (Rangi et al., 2015). The complexity of links in the supply chain that include extraction, production and disposal, have spurred sectoral initiatives such as Ethical Trading Initiative (ETI), Conflict-free Tin Initiative or Conflict Free Sourcing Initiative. Nevertheless, Responsible Cobalt Initiative is different in this regard, because of the blockchain application. Blockchain technology is already used in the diamond industry, where gems are given a digital fingerprint, which is then tracked by blockchain (Reuters, 2018). Nevertheless, tracking cobalt is far more complex since cobalt is being processed in the supply chain. Therefore, the pilot project experiments with already proven approaches from other industries, especially from the food industry, e.g. a mass balance approach used for Fairtrade certification of products like cocoa, indelible marks that survive the refining process, or bolting blockchain onto computer technology (Reuters, 2018). Despite the enthusiasm about great opportunities that the blockchain technology may generate, it also raises concerns (Yi-Huumo, Ko, Choi, Parl, & Smolander, 2016; Xu, 2016; Anjum, Sporny, & Sill, 2017). According to the Dutch Blockchain Coalition, large-scale blockchain applications can only be realised if all relevant stakeholders are willing to collaborate and appropriate political, administrative, legal, economic and social conditions are in place (Dutch Blockchain Coalition, 2018b). These conditions are necessary to reduce risks related to the use of the technology, including regulations and the creation of markets, legal liabilities, privacy, consumer protection, conflict mediation and arbitration and contract law. Such conditions are also needed in the establishment of new roles of trusted third parties, roles of identifying and certifying parties, functioning of smart contracts, the right to erasure (former "the right to be forgotten"), and new possibilities and roles for compliance and audit functions (Dutch Blockchain Coalition, 2018c). As emphasised by the World Economic Forum (2018), blockchain technology is at relatively early stage; 'anchoring on blockchain without consideration of associated risks, including, among others, cost, security and the relevant industry's regulatory environment, can be detrimental.'

Therefore, even though technological advances could enhance responsibility and sustainability of SCM, issues such as conflicts, climate change, and modern slavery – are political questions and they cannot be resolved without political, social, ethical and economic solutions. Technological answers alone are unlikely to be sufficient. Ferrell et al. (Ferrell et al., 2013) argue that 'the unbalanced focus on technological innovations requires oversight by supply chain members to develop programs that inform about mutual ethical risks and to address solutions to ethical and social issues.

This makes it necessary to have communication and coordination about ethical decisions throughout the supply chain' (Ferrell et al., 2013). Therefore, despite technological solutions, responsible and sustainable SCM requires the engagement of various stakeholders. The next section discusses the second potential avenue for responsible and sustainable supply chain, thereby multi-stakeholder approach.

6.5.2 Multi-stakeholder approach

Research, innovation and technology can improve efficiency and sustainability of supply chains e.g. reduce resource utilisation (empty miles) through smart logistics. Nevertheless, without the intensified coordination and cooperation between the tiers of supply chains, technological innovations cannot improve the impact on the society and environment by itself. The main characteristic of supply chains is their multi-tier nature, engaging various stakeholders from manufacturers, intermediaries, and end users, to a host- and home country's government and local community. Increasingly, collaboration in the forms of stakeholder engagement and multi-stakeholder approaches in SCM, also known as cross-sector social partnerships (CSSPs) (Doh, Husted, Matted, & Santoro, 2010; Van Huijstee & Glasbergen, 2010; Ritvala et al., 2014), is considered as the most effective way to achieve more responsible and sustainable SCM. Multi-stakeholder approaches are expected to overcome the limitations of top-down approaches toward promoting responsibility and sustainability (Vurro, Russo, & Perrini, 2009). Now we observe the proliferation of such initiatives as the Ethical Trading Initiative (ETI), an alliance of companies, trade unions and NGOs that promotes respect for workers' rights, and the Initiative to improve the Food Supply Chain, the European Commission's initiative to improve the governance of the food supply chain with regard to unfair trading practices, producer cooperation and market transparency. The engagement of various stakeholders in the discussion about responsibility and sustainability of supply chains was a response to disillusionment with previous CSR initiatives and codes of conduct. As pointed out by Utting (2002), they were designed and implemented exclusively by companies, and as a result they were ineffective and often aimed at marketing purposes rather than substantial improvements in societal and environmental performance (Utting, 2002). Multi-stakeholder approaches encourage stakeholder dialogue and 'social learning' (Utting, 2002). The success of working towards more responsible and sustainable management of supply chains heavily depends on the involvement and contribution of other actors, such as governments, suppliers, NGOs and communities (Van Opijnen & Oldenziel, 2011).

The multi-stakeholder approach is rooted in the stakeholder theory and a relational view, where companies' success depends on building and maintaining sustainable and durable relationships with the members of its stakeholder network (Tencati & Zsolnai, 2009). The widely used definition by Freeman (1984) describes stakeholders as 'those groups who can affect or are affected by the achievement of an organisation's purpose' (Freeman, 1984). The identification of stakeholder should be structured and exhaustive (Achterkamp & Vos, 2008). The multi-stakeholder approach in the SCM derives from the concept of collaboration and collaborative enterprise, where companies 'seek to build long-term, mutually beneficial relationships with all stakeholders and want to produce sustainable values for their whole business ecosystem' (Tencati & Zsolnai, 2008). Collaboration enhances companies' relationships with stakeholders through better coordination of the company with its suppliers, customers, or other stakeholders to jointly improve social outcomes (De Bakker & Nijhof, 2002) and try to generate long-lasting 'win-win' solutions (Tencati & Zsolnai, 2009). Thus, the sustainability of the company depends on the sustainability of its stakeholder relationships (Tencati & Zsolnai, 2009). This understanding of the multi-stakeholder approach clearly addresses responsible and sustainability challenges in terms of collaboration and communication along the chain as well as equal distribution of power among actors in the chains.

Through engaging in collaborative multi-stakeholder initiatives, companies may be better equipped to monitor and trace supply chain activity, while an individual company may not have the resources to consider the societal and environmental impacts of its activities (Clarkson, 1995). Nevertheless, multi-stakeholder collaboration requires deeper relationships which might need a much longer time horizon to develop, implement and yield performance benefits and monitoring capabilities (Klassen & Vereecke, 2012). The role of NGOs is crucial, as they bring 'on the ground' knowledge and experience from working with a particular group of stakeholders e.g. consumers or local communities. This knowledge provides companies with data allowing for more accurate decisions and adaptation in the dynamic SCM context. Furthermore, the engagement of various stakeholders ensures greater credibility of company operations. Multi-stakeholder collaboration encourages companies to participate in initiatives setting societal, environmental, ethical and human rights standards. Such collaboration also encourages monitoring compliance, promoting social and environmental reporting and auditing, and certifying good practice (Utting, 2002). Furthermore, the interaction with various stakeholders assists in risk management, e.g. local NGOs can help companies to identify and understand the

risks and opportunities in a particular country, develop plans for mitigating those risks, conduct outreach to local communities, and assess compliance with laws and responsibility and sustainability requirements. This learning process is not unilateral. Through a collaborative approach, working together and sharing information, stakeholders are better equipped to address various supply chain concerns collectively. Shared learning and joint problem-solving enables the development of best practices around SCM challenges. Each group of stakeholders brings their own unique perspective and contribution. The management of responsibility and sustainability along the supply chain is more feasible when a company considers specific stakeholder demands instead of broad societal or environmental issues (Maignan, Hillebrand, & McAlister, 2002). High levels of cooperation and integration between partners strengthens trust and reduces or eliminates abuse of power among companies in the supply chain (Drake & Schlachter, 2008). Studies of the processes by which sustainability is integrated and managed along the supply chain agree that the best performers are able to build and maintain integrated approaches toward SCM, on the basis of long-term cooperation, shared knowledge, and joint development of competence both upstream and downstream (Maignan et al., 2002, Shepherd & Günter, 2006, Strand, 2009). Stakeholders are the agents that bring broad societal, environmental, ethical and human rights demands to the attention of individual company's (Maignan et al., 2002). A multi-stakeholder approach incorporates elements of responsible and sustainable SCM by allowing the equal consideration of all three dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and responding to requirements of the stakeholders of a supply chain.

Multi-stakeholder approaches to SCM are co-produced by multiple stakeholders, public and private, and increasingly change the notion of governance and regulation, as well as the traditional understanding of business and politics (Hofferberth, 2011).

6.5.3 Effective Governance and Supra-Agent Responsibility

It is increasingly recognised that responsible and sustainable SCM requires effective governance. Nevertheless, modern supply chains are characterised by the fact that they involve many distinct stakeholders operating in various countries and across many legal jurisdictions. Ideally, all agreements up and down a supply chain, and across borders, should be subjected to the same governing law provisions and have the same court jurisdiction, however in practice companies deal with a tangle of law and regulation at multiple levels (Haufler, 2001). This situation raises a question of

responsibility for maximal positive supply chain impacts and adverse effects such as unfair wages, disregard of occupational health and safety standards, violation of privacy, product quality and product safety or deforestation. The multi-tier nature of supply chains deepens the problem of responsibility by creating a vacuum of responsibility. The problem of ‘many hands’ may lead to a situation when no one is responsible for either preventing and mitigating negative impacts or exercising a positive influence.

Over the past decades, a number of efforts have been made to answer these needs at national and international levels. At the national level, states have expanded the nature and scope of their legislative control and changed the nature of regulation, mostly through extending national law into extraterritorial jurisdiction in order to impose some form of corporate liability (Backer, 2012). Furthermore, states have transformed their policies from corporate charity to concrete policies addressing the need to change the legal regulation of corporations (Backer, 2012). At the international level the UN ‘Protect, Respect and Remedy’ Framework for Business and Human Rights and Guiding Principles on Business and Human Rights (UN, 2008) provide the first global standard for preventing and addressing the risk of adverse impacts on human rights linked to business activity (OHCHR). This rests on three pillars: The State duty to protect against human rights abuses by third parties, the corporate responsibility to respect human rights (to act with due diligence) and greater access by victims to an effective remedy (UN, 2008). Nevertheless, these responsibilities are seen as complementary, rather than shared (Wettstein, 2015). Clapham suggests that companies’ responsibility to respect human rights is conceived as a moral rather than legal responsibility. Companies’ responsibilities are understood as a negative responsibility ‘not to infringe on the rights of others’, in other words ‘to do no harm’ (Pogge, 2008; Wettstein, 2012). However, Wettstein (2015) argues that silent complicity, a situation that does not involve an active contribution by the corporation to a specific wrongdoing, may challenge the effectiveness of the Framework, because positive obligations are not included (Wettstein, 2015). Furthermore, companies cannot be held responsible in cases ‘in which they were not a causal agent, direct or indirect, of the harm in question’ (Ruggie, 2004). In complex supply chains the attribution of harm to specific tier of supply chain becomes increasingly difficult (Green, 2012). As Louise Arbour, a former United Nations (UN) High Commissioner for Human Rights, points out ‘the growing recognition that the private sector has responsibilities to respect human rights is also welcome. But means

of holding States and non-States actors accountable for their actions in relation to human rights are still wanting' (Clapham, 2006).

Globalisation of markets, rapid growth of transnational corporations, and new technologies require us to rethink some of the certainties of the Westphalian age and state-dominated order to come up with new normative visions and concepts to deal with the new problems with which we are faced in a transnational world (Backer, 2012). This changing state of affairs brought up the question of international governance framework that would guide and regulate the activities of companies, and therefore ensure responsibility and sustainability of supply chains. In the absence of effective national and international intergovernmental organisational regulation, nowadays we observe an expansion of 'private' alternatives, such as voluntary, self-regulatory initiatives and shared governance by non-state actors where responsibility lies at the supra-agent level (Howlett, 2000; Haufler, 2001; Gunningham et al., 2003; Ruggie, 2004; Bernstein & Cashore, 2007; Haufler, 2013). These initiatives are also referred by some authors as Transnational Private Regulation (TPR) (Bartley, 2007; Bomhoff & Meuwese, 2011; Scott et al., 2011; Cafaggi, 2013). Supra-agency takes the form of 'coalitions of non-state actors which codify, monitor, and in some cases certify firms' compliance with labour, environmental, human rights, or other standards of accountability' (Bartley, 2007). Regulation increasingly becomes co-produced by public and private actors and occurs on different levels (Hofferberth, 2011). These private governance mechanisms involve companies, NGOs, and sometimes other actors, such as governments, academia or unions, networks of companies and industry associations, epistemic communities and technical experts to tackle societal and environmental challenges across industries and on a global scale (Utting, 2002; Gilbert & Rasche, 2007; Bütte, 2010; Mena & Palazzo, 2012). There is a variety of models engaging businesses, associations of companies and NGOs, sometimes in hybrid form and often including governmental actors (Scott et al., 2011). These initiatives in the majority embody the multi-stakeholder approach (as discussed in the previous section) creating multi-stakeholder initiatives (MSIs). They reflect the idea that it is possible to regulate behaviour without doing so (Bomhoff & Meuwese, 2011), thereby direct intervention and enforcement are replaced with 'allegedly lighter demands on economic actors to institutionalise processes' (Jordana & Levi-Faur, 2004). Although, companies adopt TPRs voluntary, these regulations may be supported with a variety of formal and informal enforcement mechanisms, such as codes of conduct (Haufler, 2001). Hutter (2006) identifies two main types of non-state actor regulations, either by the economic actors, or civic actors. Three main sources of regulation in the economic

sector include: (1) industry or trade organisations; (2) companies themselves; and (3) those whose business is selling regulatory and risk management advice or cover to companies (consultancies); while the civic sector consists of NGOs and standards organisations (Hutter, 2006).

In terms of enhancing supply chain responsibility and sustainability, non-state actor regimes offer a number of advantages addressing SCM challenges. Non-stake actors regimes may have an advantage in information gathering, hence collation and provision of information about policy issues and problem areas (Hood, Rothstein, & Baldwin, 2001; Hutter, 2006). Therefore, they address the problem of complexity of the supply chain, communication with suppliers and traceability, as well as information and knowledge gaps diminishing transparency. Hutter (2006) draws on Hood et al.'s (2001) work on risk regulation regimes, and argues that economic non-state regulators may have higher level of expertise and technical know-how, e.g. compliance officers may be better trained than the state inspectors (Hutter, 2006). Moreover, compared to the public sector, businesses have higher level of financial capacity which impacts levels of expert knowledge and training (Hutter, 2006). Nevertheless, there is a risk that companies may be reluctant to share information due to competition and risk of revealing business secrets. The majority of non-state initiatives use innovative technologies to improve information and data sharing, for instance through networks of online platforms. Combining non-state actors initiatives with technological advances, such as big data analysis and blockchain, enables real-time monitoring and decision-making ensuring improved compliance and implementation. Regarding compliance and implementation of responsible and sustainable SCM requirements, non-state regimes have a triple role to play. Firstly, they can serve as standard settings processes aimed at setting goals through standards and targets, particularly because non-state actors regulation is more flexible and sensitive to the market and technological innovation than traditional state regulation (Hutter, 2006). Secondly non-state actor regimes could play a significant role in behaviour modification of companies and individuals e.g. deterrence or mixed enforcement (Hood et al., 2001). A positive motivation comes from the idea of a 'brace to the top' and becoming a leader in the sector. Since non-state actors regimes are composed of various organisations, control emerges from both cooperation and competition (Scott et al., 2011). As emphasised by Scott and his colleagues (Scott et al., 2011) 'these networks stimulate mutual control the competition for members or, more broadly, regulatees can increase the standards to the extent that information is adequate to support the making of choices. The use of public oversight and procedural

rules is one among the many potential strategies that TPR can use to increase accountability without reducing effectiveness' (Scott et al., 2011). Self-regulation has the potential to generate compliance through so-called 'regulation-by-information', where the compliance of one member is monitored by another member. As a result, the network creates an informal feedback and sanctions mechanisms. Lastly, non-state actor regimes are to a great extent risk regulation regimes, that Hood et al. (2001) define as 'the complex of institutional geography, rules, practices, and animating ideas that are associated with the regulation of a particular risk or hazard' (Hood et al., 2001). Nevertheless, one of the crucial concerns is a potential lack of enforcement, which is related to the question of the effectiveness of collective actions ensuring that all companies participate and eliminate 'free riders' (Brunsson & Jacobsson, 2000).

Non-state actors regimes question the traditional legal order of norms creation and their enforcement. They are part of a broader discussion about better regulation (Bomhoff & Meuwese, 2011) and good governance. These new governance models reflect the shift from hierarchical to heterarchical governance and recognise the need to reconceptualise the bases of legitimacy for such regimes at both national and supranational level (Teubner, 1997; Scott et al., 2011). Curtin and Senden (2011) investigate an accountability perspective of TPRs and propose two distinct alternatives for the top down approach to the control and accountability of TPRs. Firstly, the advantage of 'choice' of regulators who regulates them and of consumers which self-regulatory regimes protect (Curtin & Senden, 2011). Secondly, networks of mutuality, rooted in the interdependence of actors, not only between regulatees but also between regulators and those protected by the regime (Scott et al., 2011). Non-state actors regimes have a potential to improve collaboration and relationships with stakeholder, and become a realisation of two key elements of responsible and sustainable SCM – meaningful multi-stakeholder relations and stakeholder engagement where preferences of all stakeholders and the varieties of perspectives are addressed (Scott, 2010). As a consequence such an approach may lead to novel forms of democratic governance, at transnational level, which are not tied to national electoral politics (Scott et al., 2011). These changes into outsourcing and privatisation of public management functions reflect changes in broader patterns of social control (Cohen, 1985; Hutter, 2001).

These regimes can serve as powerful governance mechanisms. Nevertheless, they are unlikely to govern effectively if they are based exclusively on companies' strategic interests for compliance (Meidinger, 2017). While the responsibility of companies in the form of accountability and legal liability is broadly discussed in the literature as

well as among practitioners, non-state actor regimes are not accountable to states. As a result, organisations leading non-state actor systems cannot be held responsible either for its own misconduct or misconduct of its members. In order to be effective they must establish 'political legitimacy' uniting companies, NGOs, and other SCM stakeholder into a community that accepts 'shared rules as appropriate and justified' (Bernstein & Cashore, 2007).

6.5.4 Summary of the Proposed Solutions

Section 6.5.5 identifies three potential solutions for challenges to responsible and sustainable SCM taking into consideration the theoretical account for responsible and sustainable SCM. This consists of the concepts of CSR and SSCM with three key elements of responsible and sustainable SCM, namely the equal consideration of all three dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and legitimate requirements of the stakeholders of a supply chain. Moreover, the potential avenues are determined by the challenges for responsible and sustainable SCM. Firstly, innovative technologies, such as big data and blockchain, offer solutions for the enhancement of positive and reduction of negative societal and environmental consequences that a company may cause, while still maintaining economic competitiveness. Through digitalisation of supply chains they enable communication and collaboration among supply chains stakeholders leading to deeper relationships. Secondly, a multi-stakeholder approach ensures inclusion of various supply chains stakeholders and their legitimate requirements. Thirdly, non-state actor regimes provide new governance models for more responsible and sustainable SCM. These solutions address the claim, that companies should be responsible for issues of public concern not only within their company boundaries, but also along the complex and dispersed supply chains (Scherer, 2018). Since companies' responsibility may have a different nature, the solutions address this diversity. Innovative technologies serve as a technological instrument enabling realisation of responsibility and sustainability within SCM. Multi-stakeholder approach has a political character, focusing on a company's political power and relationship with society. Supra-agent responsibility and effective governance responds to the call for the ethical responsibility of companies and building a good society.

This paper argues that there is a potential interplay between the technological, political and ethical solutions. Innovative solutions, such as big data and blockchain, could be used to facilitate multi-stakeholder initiatives and non-state actor regimes by

providing a forum for the involvement and collaboration of various supply chain actors. Many non-state actor initiatives use innovative technologies to support information and data sharing among various stakeholders, particularly through multi-stakeholder digital platforms connecting people, organisations, and resources. This approach enhances compliance and implementation through mutual control. Digital platforms applied in the context of multi-stakeholder non-governmental initiatives, enable transparency leading to cooperation and integration between partners strengthens trust and reduce or eliminate abuse of power. At the same time, technological innovations require oversight by multiple supply chain stakeholders to enable communication and coordination about ethical decisions throughout the supply chain (Ferrell et al., 2013). Moreover, non-state actor governance models should be based on multi-stakeholder collaboration and mutual control to ensure a credibility and legitimacy of the initiative. Lastly, a combination of technological, political and ethical solutions involving the development of sound, multi-stakeholder business and governance models supported by innovative technologies, have a potential to address a variety of challenges in SCM from a responsibility and sustainability point of view.

6.6 Case study: Sedex

To illustrate the application and effectiveness of solutions for responsible and sustainable SCM (innovation, multi-stakeholder approach, and effective governance and supra-agency), this section presents the case study of Sedex. Formed in 2004, Sedex (The Supplier Ethical Data Exchange) is a not for profit membership organisation working with buyers and suppliers worldwide to deliver improvements in responsible and ethical business practices in global supply chains (Sedex Global, n.d. a). Sedex is the world's largest collaborative platform providing leading-edge services for managing and sharing ethical supply chain data, which multinational companies use to understand, monitor and manage supply chains risks and improve standards (Sedex, n.d. a). Sedex brings together more than 38,000 companies (buyers, suppliers and audit firms) from across 28 sectors (e.g. chemicals, engineering, IT, telecom & electrical, drugs and pharmaceutical products) in over 150 countries (Sedex, 2015).

6.6.1 Innovation

Sedex offers a secure, online database that allows members to store, share and report on information in four key areas: labour standards, health & safety, the environment, and business ethics (Sedex, n.d. a). Sedex has three groups of members that reflect the different levels of functionality available in the Sedex system – Buyer membership, Buyer/Supplier membership and Supplier membership (Sedex, n.d. b). Sedex's electronic system collects and analyses information on ethical and responsible business practices in the supply chains (Sedex, n.d. c). Moreover, Sedex offers a variety of reporting tools that enable buyers to keep track of their suppliers' performance, in addition to an advanced Risk Assessment Tool (Sedex, n.d. c). Suppliers, who participate in the Sedex network, can share information with multiple customers in an efficient and cost-effective way (Sedex, n.d. c). By enabling sharing the same data with many customers, Sedex helps reduce the need for multiple audits. As a result, the Sedex online system may enable greater traceability, transparency and flexibility of supply chains with improved stakeholder relations and communication. With regard to the main ethical risks in the supply chain, Sedex notes that the key risks can be very varied. Common non-compliances in social audits include health and safety issues as well as non-compliance related to wages and working. Other issues such as discrimination, bullying and bonded labour can be harder to tackle, because they are not always as easy to find through the audit process. Data from a briefing by Sedex shows that fire safety non-compliances make up a 1/3 of all health and safety non-compliances globally (Sedex, 2013). This level of data mining helps companies understand global trends and scale of issues. Sedex works to ease the burden on suppliers facing multiple audits, questionnaires and certifications; but at the same time, it drives improvements in the ethical performance of global supply chains (Sedex, n.d. a). At the time the case study was conducted, Sedex was working on increasing the capacity within its technology team to help support the quality and timings of delivery. In addition, Sedex has been researching an online extranet that will allow members to collaborate and continue discussions more efficiently (Sedex, 2017).

6.6.2 Multi-Stakeholder Approach

Sedex aims to drive collaboration, increase transparency and build the capacity that is needed to raise standards across all tiers of the supply chain (Rangi et al., 2015). The Sedex Stakeholder Forum (SSF) (previously known as the Associate Auditor

Groups (AAG)) brings together leaders from across the ethical trade and responsible sourcing industry to discuss the challenges they face and solve them collaboratively (Sedex, 2017). SSF's mission is to drive convergence and best practice in auditing (Sedex, 2017). The Forum is based on a participation of multiple stakeholders (brands, retailers, suppliers, NGOs, industry experts, associations and monitoring firms) significantly involved in ethical trade auditing (Sedex, 2017). The SSF is composed of a collection of dynamic working groups (Sedex, 2017). The SSF working groups cooperate to develop responsible sourcing content and methodologies solutions that are 'fit for purpose' (Sedex, 2017). These solutions are designed for all users and stakeholders (Sedex members, non-members, workers and their communities) with the aim of improving business performance and workers' lives (Sedex, 2017). Moreover, SSF provides guidance and direction to Sedex staff. They helping develop the products and services to manage responsible sourcing in the supply chains (Sedex, 2017). Through SSF, Sedex seeks to engage a more global audience to help develop and review effective responsible sourcing solutions (Sedex, 2017). The SSF wants to be seen as inclusive, global and interactive.

6.6.3 Governance and Supra-Agency

Sedex is not a standard setting body; it does not have a code of conduct and does not provide certification. Sedex's role is rather to enable companies to effectively share and manage supply chain information, with the aim of driving continuous improvement (Sedex, n.d. a). Nevertheless, Sedex advocates for applying Ethical Trading Initiative (ETI) provisions in two areas: labour & health and safety standards, and additionally environmental standards and business ethics (Sedex, 2013). Sedex is code neutral; therefore, it does not require prospective members to adhere to specific criteria in order to become members. Sedex membership is about showing the commitment to drive improvements in a company's supply chain. Sedex allows companies to decide themselves how they want to proceed and assists companies in this process by providing them with a number of tools to facilitate the assessment. The assessment consists of six key steps leading to greater traceability, transparency, flexibility, legal compliance and stakeholder management, namely:

1. Supply chain mapping – Sedex helps companies to understand who their suppliers are, allowing them to map their suppliers down to multiple tiers.
2. Sedex on-line member only Self-Assessment Questionnaire (SAQ) – Through the questionnaire, Sedex asks members common questions regarding internationally accepted Labour Standards, Health & Safety, The

Environment and Business Ethics requirements. Members also provide input through addressing key indicators of risk and maturity in terms of managing social, governance and environmental issues. Sedex is a cross-sector/ multi-sector organisation, therefore while there is only one SAQ, depending on the suppliers profile the questionnaire filters questions that are relevant for that specific profile. At the time the case study was conducted, Sedex was working on introducing a new modular functionality to provide greater specification for certain customers or sectors.

3. The Risk Assessment tool – Sedex has developed this tool in partnership with global risk experts Maplecroft. The tool analyses hundreds of indices and factors including human rights violations, political risk, corruption risks, and child labour alongside management proficiency and ability to mitigate risk of the individual site (Sedex, n.d. d). The risk assessment is especially important for large companies with complex supply chains, because it can help them to understand where to prioritise their focus.
4. Audit (assessment) – The Sedex Stakeholder Forum developed the Sedex Members Ethical Trade Audit (SMETA),³ as a response to member demand for an ethical audit report format that could be more easily shared (Sedex, n.d. e). SMETA aims to reduce the duplication of effort in ethical trade auditing, thus benefitting retailers, consumer brands, and their suppliers (Sedex, n.d. e). According to Sedex, SMETA is ‘not a code of conduct, a new methodology, or a certification process’ (Sedex, n.d. e). It is an audit procedure reflecting the compilation of good practice in ethical audit techniques (Sedex, n.d. e). Around 10,000 audits are uploaded to the Sedex platform per year. When Sedex first launched the SMETA methodology, 90% of the audits uploaded onto the platform were based on company codes for audits whereas now 90% of the audits are performed against SMETA, demonstrating the success of the initiative. SMETA is now one of the most used audit methods worldwide. According to Sedex, ‘a part of its success is that we included audit companies, brands, retailers and suppliers in its development.’ SMETA consists of three elements: (1) a common corrective action plan format; (2) best practice guidance on conducting ethical trade audits; (3) a common audit report format (Sedex, n.d. f).

³ Note: The case study was conducted between May and August 2015. The latest version of SMETA was launched in April 2017, with an implementation date of June 1, 2017.

5. Reporting – According to Sedex, improving awareness of a company about its supply chain can help to mitigate risk and protect its reputation. In order to enhance a company's supply chain visibility, Sedex offers in-depth, analytical reports that highlight trends, alerts a company to potential risks and help it to prioritise its resources. The huge amount of data stored by Sedex offers not only the ability to address risks but also provides examples of good practices that can inspire and guide change.
6. Capacity building – Sedex offers various capacity building tools, such as the Sedex Supplier Workbook. The workbook is a free, publicly available document offering practical guidance to help suppliers across the world to understand what 'good practice' looks like when working towards the Ethical Trading Initiative (ETI) and other Code requirements. The Workbook also offers advice on how suppliers can reach these requirements. Therefore, Sedex aims to build capacity at the bottom of the extended supply chain.

The SMETA methodology allows the auditor to raise issues regarding non-compliance against both the ETI base code (a measurable version of ILO conventions) and local laws. The first thing is to understand where issues exist against local law versus international frameworks. The next step involves working with a supplier to address and meet the minimum legal standards. However, if a supplier does this already, it can be challenging to move them to aim for an aspirational, higher level standard. Nevertheless, different approaches exist that companies can use. First, it is the purchasing power based on a customer requirement. Secondly, it is about demonstrating the business benefit to the supplier addressing them. Furthermore, cooperation and working with others can bring about great change. Sedex is an example of an organisation in which companies work together on the same aligned framework. The collective effect of a number of companies asking for the same information, may significantly influence the behaviour of an individual company. Nevertheless, according to Sedex, there is a strong need for standardisation around international frameworks. Different legislation and standards in different countries only fragment the issue for the supply chain and can make it more confusing for suppliers. This fragmentation also reduces the willingness of companies and other actors to respond to lots of different standards. Regarding the effectiveness of the current legal framework of corporate responsibility, in the opinion of Sedex, there are a lot of companies and organisations that would say voluntary standards are effective instruments. Some larger companies are in favour of legislation, because they feel it

will level the playing field. However, as emphasised by Sedex, there are clever ways of looking at how legislation works. For instance, there has been quite a lot of debate within the legal profession about the modern slavery bill that was launched in the UK. This discussion focuses on the effectiveness of a disclosure-based rule versus strengthening of existing legislation to expand it to require reporting to cover human rights in the supply chain. The interviewee emphasised that this is a question of the effectiveness of voluntary standards. Legislation has a role to play in levelling the field, however, the additional administration burden placed on the supply chains, and particularly SMEs, should be taken into account. The crucial point is that legislation should be enforced. Many of the supply chain risks are addressed in legislation, however, the legislation is not enforced. There is a strong need of a balance between appropriate legislation combined with effective enforcement. As noted by Sedex, a cross-sector approach to responsible and sustainable supply chain management should be based on collaboration. Furthermore, such an approach should not try to 'reinvent the wheel', but look at different legislation, initiatives, mechanisms and standards that already exist. Supply chain policies should be grounded in implementation, because a policy has to be implemented in order to succeed.

6.7 Conclusions

This study provides an investigation into potential avenues for responsible and sustainable supply chain management (SCM) to extend the domain of ethical decision-making and provide a theoretical account to facilitate future research in this area. To identify the solutions for responsible and sustainable SCM, this study integrates current knowledge on supply chain management (SCM) with recent theoretical and empirical developments in the field. The theoretical account consists of two elements. Firstly, it involves a notion of responsible SCM that is built up out of the concepts of 'responsible supply chain management' and 'sustainable supply chain management'. Secondly, it requires key elements of responsible and sustainable SCM, namely the equal consideration of all three dimensions of sustainability (economic, environmental and social), the cooperation of the partners in the chain, strengthening long-term relationships and legitimate requirements of the stakeholders of a supply chain, including customers, NGOs, suppliers or legal authorities. The theoretical account combined with the stakeholder dialogue allowed the identification of three solutions for challenges to responsible and sustainable SCM that companies face in practice. Firstly, to enhance responsibility and sustainability, supply chains

stakeholders should use innovative organisational and technological solutions that offer greater monitoring and assessment opportunities, efficiency, and communication between tiers of supply chain. The paper provides two examples of technologies that have a potential to revolutionise SCM, namely big data analysis and blockchain technology. Secondly, supply chains should be managed in a collaboration of multiple stakeholders built on trust and mutual learning. Thirdly, this research argues for new SCM business and governance models. These models should be based on shared responsibility and collaboration of multiple supply chain stakeholders supported by innovative technologies. Therefore, this paper offers a unique normative proposal for connecting technological, political and ethical solutions (innovation, a multi-stakeholder approach, a supra-agent responsibility and governance) as the inevitable interdependent solutions for responsible and sustainable SCM. This article underlines the need for research that reflects the interconnected nature of the economic, societal, environmental, and ethical and human rights dimensions of SCM. The case study of Sedex shows how non-state actors governance models may effectively address SCM challenges and ensure SCM responsibility and sustainability. Sedex enhances responsibility and sustainability of supply chains through applying three solutions identified in this paper. Sedex invests in innovative technological solutions helping to share and analyse supply chain data; it brings together multiple stakeholders to develop Sedex functionalities; and it serves as a governance platform encouraging a positive behaviour change among its members.

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7. Conclusion

The main objective of the research presented in this thesis has been to develop a strategic approach to the problem of the responsibility of companies for their technological innovation. The overall research question of this thesis was:

What would be a theoretically sound conception and a viable strategy for Responsible Innovation in business that bridges existing approaches of CSR, CS and RI?

Based on theoretical and empirical research, I connect two discourses, namely business responsibility and responsible innovation (RI), to explore synergies and gaps in the current research and to develop a normative proposal for RI in business.

The overall research question is answered in a series of steps supported by five research sub-questions and corresponding research results demonstrated in previous articles presented in Chapters 2-6. Sub-question 1 (Q1) was about understanding how RI in business is defined and hence it focused on exploring different RI conceptions and approaches in the business context proposed by academics and used by companies. This sub-question was answered in Chapters 2 and 3. Sub-question 2 (Q2) referred to companies' approaches to evaluating their innovation practices taking into account responsibility, ethics and sustainability. Chapter 3 responded to this sub-question. Sub-question 3 (Q3) referred to the motivation of companies for engaging in RI and asked for the most effective ways to incentivise companies to innovate in a responsible, ethical and sustainable way. This sub-question was discussed in Chapter 2 and Chapter 4. Sub-question 4 (Q4) was concerned with the integration of RI into companies' business functions and operations. I explored the answer to this sub-question in Chapter 5. Lastly, sub-question 5 (Q5) concentrated on the integration of RI into companies' global operations, which was addressed in Chapter 6.

In this concluding Chapter, I answer the overall research question as formulated in the introductory Chapter and present the main conclusion of my research, including the limitations of this research and recommendations for further research. I would like to begin this Chapter by summarising the answers to each sub-question, which will lead me to the response to my main research questions. Then, I present the limitations of this research and propose an agenda for future research.

7.1 Answers to research questions

In the introductory chapter, I presented the main research question as follows: what would be a theoretically sound conception and a viable strategy for responsible innovation in business that bridges existing approaches of CSR, CS and RI? To answer this question, let us return to the successive sub-questions.

Sub-question 1 (Q1) was about understanding how RI in business is defined and hence it focused on exploring different RI conceptions and approaches in the business context proposed by academics and used by companies. This sub-question was answered in Chapters 2 and 3, where Chapter 2 contributed with the systematic review of mainstream literature in two business ethics (BE) and innovation management (IM), and Chapter 3 provided empirical element based on interviews with companies (and organisations of companies) and experts in responsible business. It was found that both, in the academic literature (Chapter 2) as well as in practice (Chapter 3) RI is understood and defined in many different ways, from sustainable innovation, environment-related innovation, and social innovation to open innovation and more. While, the term “responsible innovation” is not commonly used neither in the mainstream BE and IM literature (Chapter 2) nor by companies themselves (Chapter 3), interestingly, I found that companies do acknowledge their responsibility for technological innovations, and they place it under the broad umbrella of CSR and CS framework. Furthermore, RI in the business context is heavily focused on the outcome of innovation, namely products, process and services, and their impact on society and the environment and how they contribute to addressing grand societal challenges. RI in business is about innovation that does not harm people and the planet, but at the same time, it moves a step forward (“doing good”), and contributes to sustainable development. RI is thus about companies redefining the purpose of the technologies they develop and ultimately the purpose of themselves doing business. This is an interesting observation because, in comparison to the broad RRI research, there is relatively limited discussion about systematically organising the process of innovation and research and development (R&D) responsibly.

My research shows that companies’ perception of RI in the business context is guided by four main principles, i.e., social responsibility, environmental impacts, professional integrity, and implications for health and/or safety. Nevertheless, neither business research nor business practice specify what those principles mean and how to translate those values into practices. My understanding of RI is based on the pathway of RI: to have the responsible outcome (product, processes, services) we need

to have a responsible process of managing innovation and R&D. On the one hand, regardless of what name “responsibility” gets, whether sustainable, environmental or social, those are all legit forms of RI because they capture different forms of companies’ responsibility towards society and the environment. On the other hand, the lack of a more detailed conception of responsibility for developing innovative products, processes and services may hinder the uptake of RI by companies or put at risk a meaningful implementation of RI, which similarly to CSR and CS may be sensitive to ‘window dressing’ and ‘green washing’.

Based on my findings, I believe that despite growing interest in RI, the RI conception in business is still in a sensitive phase of theory building, with the majority of research in mainstream literature mainly focusing on connecting innovation with responsibility and sustainability. There is therefore a significant gap between how policymakers and scholars define RI, and how companies perceive it. For instance, my empirical research shows a discrepancy between the high importance that companies give to principles of environmental and social impacts that should guide the RI processes and outcomes and a relatively low level of the actual use of those principles in e.g. evaluating such impacts. In my perception, there are several causes for the situation. First and foremost, there is a lack of a better understanding of how those principles and values should be translated into specific solutions, e.g. technical requirements, at which stage of innovation development they should be implemented, who should be translating and implementing them and what methods and approaches should be used. This lack of understanding of RI leads to the second cause, which is the lack of motivation of companies to manage technological innovation in a responsible, ethical and sustainable way. Consequently, the concept of RI is at risk of becoming a controversial marketing tool sharing the same path as CSR and CS, which was originally meant to strategically shape the corporate identity of companies, but currently, it is criticised for mainly focusing on corporate philanthropy (Ofstedal, Foss, & Iakovleva, 2019; Sheehy, 2015). In my view, there is a risk of “misusing” RI for marketing purposes by misleading consumers about the social, ethical and environmental benefits of a product or service (e.g., greenwashing). Consequently, based on the results presented in Chapters 2 and 3, I respond to the first part of the overall research question claiming that the theoretical conception of RI in business should be composed of two aspects considering how technological innovations developed by industry contribute to sustainable development, and how those technological innovations are being developed as part of their innovation and R&D process, which is currently missing.

With the contribution of Chapters 2 and 3 to the first part of the overall research question, with the following sub-questions and Chapters I turn to the second part of the research question, namely a viable strategy for RI.

Sub-question (Q2) referred to companies' approaches to evaluating their innovation practices taking into account responsibility, ethics and sustainability. Chapter 3 responded to this sub-question. With the research presented in Chapter 3, my intention was to empirically investigate how companies evaluate and control their technological innovation to ensure it is responsible. Even with good intentions, how does one know that someone innovates responsibly without evaluating and monitoring their innovations? To respond to this question I drew on the empirical material collected from the sampled companies and experts interviewed as part of the SATORI project. My findings indicate that evaluation and control of innovation can be generally divided into three categories, namely (1) assessment; (2) guidance; and (3) dissemination and awareness raising. The first two evaluation approaches are oriented towards the evaluation of projects and practices on the one hand, and professional conduct on the other hand. The third category involves engagement in networks and training. From the organisation's point of view, generally, companies evaluate and control their innovation activities using CSR and CS assessment tools, such as legal compliance assessment, impact assessment (IA), ethics assessment (EA), and health and safety assessment. Moreover, their evaluation and control are guided by various external and internal guidelines, codes of conduct and standards. I also find that building a culture of responsibility within a company (e.g. employees, executives) and its eco-system (e.g. business partners, supply chain) plays an important role. Training and multi-stakeholder and sectoral initiatives serve this purpose.

Currently, companies apply well-known assessment tools, such as those focused on compliance, ethics, impact and safety, helping in decision-making and informed evaluation of the economic, social, and environmental effects. Despite this variety of initiatives, companies lack strategic CSR or CS tools explicitly devoted to innovation activities that would be integrated within a broader responsibility framework. This is a challenge because general approaches are ineffective as they may not capture specificities of new and emerging technologies such as data-driven policing tools, cellular senescence and life extension, or 3D printed molecules, and potential impacts that may go beyond the immediately obvious applications. I generally agree with the claim that companies do not need new tools; however what they need is the integration of currently existing tools to avoid overlap and provide a clear, fully compatible and flexible responsible business framework. At the same time, I claim

that what business needs is adapting well-known evaluation approaches to the needs of the fast-changing world, especially among companies that are heavily engaged in R&D. For instance, commonly used impact assessment methods (e.g. ELSA), could be enriched by eTA, eIA, anticipatory technology ethics (ATE), value-sensitive design (VSD), socially responsible design (SRD), privacy by design, ethics-by-design or human centred or human rights-by-design etc. By bridging CSR, CS and RI, companies may develop more strategic innovation management through cooperation and communication between technology developers and CSR/CS/ethics and human rights actors. The discourse on RI enriches the concept of business responsibility by looking at responsibility from not only backwards-looking responsibility (traditionally used in the business responsibility literature and practice) but also forward-looking (e.g. Van de Poel, 2011).

Consequently, the concept of evaluation and control of responsibility should be recognised as a multiplicity of evaluation and control mechanisms, some are top-down (related to legal compliance) and others are bottom-up (e.g. responsibility by-design, voluntary initiatives, codes of conduct, peers and community building). They may serve as a reactive but also pro-active approach, for instance as part of the compliance and impact assessment (IA). One example of such an adaptation is the European General Data Protection Regulation (GDPR) which imposes specific requirements regarding privacy and data protection rights and obligations, and companies adapted their practices to comply with the law. At the same time privacy impact assessment and privacy-by-design have gained popularity among companies to ensure compliance with the regulation on the one hand, and pro-actively enhance the privacy of their operations and solutions on the other hand. Taking into account the fast-changing world of emerging technologies and developments in the legal and political sphere e.g. a new framework for European Digital Rights, AI Act, European Green Deal, Corporate Sustainability Due Diligence Directive and Corporate Sustainability Reporting Directive placing sustainability reporting on an equal footing with financial reporting, an adaptation of currently existing approaches seems logical and necessary. The findings of Chapter 3 constitute the first element of the viable strategy for RI.

Sub-question 3 (Q3) referred to the motivation of companies for engaging in RI and asked for the most effective ways to incentivise companies to innovate in a responsible, ethical and sustainable way. This sub-question was discussed in Chapter 2 and Chapter 4.

I fully agree with Mazzucatto (European Commission, 2018) who argues that asking why companies should innovate responsibly is old thinking because assumes

that companies are a special category of international relations and legal actors. The research presented in this thesis puts responsibility in a broader picture of mission-oriented innovation (European Commission, 2018), where RI is not an option but a must condition for the current and future generations. However, we should not be naïve that all companies will act responsibly just because “it’s the right thing to do”. Even with the stringent legal framework, such as GDPR and AI Act in the context of the EU, there is a risk that companies will move their ethically controversial R&D to other countries where legislation is absent, or less stringent, or not enforced (Floridi, 2022). We need to understand the logic of business and accept a variety of motives, drivers and incentives of RI. This diversity is reflected in the thematic analysis of the BE and IM literature presented in Chapter 2, showing that RI value is considered in terms of balancing economic, social and environmental benefits and creating shared value. This perspective could be extended to the context of the ‘Business Case for CSR’, where responsibility is a source of corporate competitiveness and economic and financial performance.

To deepen my answer to sub-question 3 (Q3), in Chapter 4, instead of focusing on the moral and legal obligations of companies to innovate in a responsible way, which has been extensively investigated in the literature (see. e.g. Pettit, 2007), I wanted to understand the business logic why companies would innovate in a responsible, ethical and sustainable way and how RI can be stimulated in industry. Through empirical research, I have learnt that creativity in tailoring the right set of incentives and appropriately aligning them to the business context is crucial because companies are truly diverse and therefore there is no magic recipe “one size fits all”. Instead of one formula, I developed a matrix of incentives and factors that can affect their implementation in business. The incentives were divided into three categories: (1) external stakeholder incentives and internal stakeholder incentives; (2) instrumental and non-instrumental incentives; and (3) direct and indirect incentives. Given that companies vary in size, each will face its distinct challenges. Different incentives should, therefore, be created and applied to large enterprises and SMEs as well as different sectors. Those are factors that affect choices of the appropriate incentives for stimulating RI in business. This approach reflects the complexity of companies and how different types of their activities are interlinked. Based on my findings, I claim that RI is also about acknowledging that companies are part of a large ecosystem, interconnected and interdependent with other stakeholders, including governments, partners, customers, employees and broadly understood society. Therefore, RI and steps for planning, implementing and evaluating it should be shaped not only by

companies themselves but in collaboration with a variety of stakeholders who have an enormous power to shape directions of technological innovation. Findings related to Q3 presented in Chapters 2 and 4 contribute to a viable strategy for RI as the second element of the strategy.

Sub-question 4 (Q4) was concerned with the integration of RI into companies' business functions and operations. I explored the answer to this sub-question in Chapter 5. In connection to the findings of Chapters 2 and 4, a specific contribution of this Chapter was to develop a better account of how companies may create economic and social value by integrating responsible innovation into their strategies. In this Chapter, I claim that RI is a multi-dimensional concept, crossing units and functions within the company, and therefore I propose a new strategic approach to RI in business leading to sustainable outcomes for both business and society called strategic responsible innovation management (StRIM). This study explains how the link between innovation and CSR may assist in improving a company's competitiveness, value creation and stakeholder management. In this chapter, I connect innovation and CSR to foster the responsible development of product, process, organisation and marketing innovation. This analysis allows me to provide recommendations for ways in which companies can develop strategies for responsible corporate innovation management. My proposal for StRIM is based on the following arguments. First, I claim that the concept of CSR enriches the innovation process by emphasising the interdependence of business and society. Second, especially for highly innovative companies their CSR and CS activities are tightly linked to innovation functions that might ensure a competitive advantage and therefore might be more profitable than those oriented toward public relations, marketing and human resource management.

Consequently, I propose a new approach, called StRIM, that is intertwined with companies' social responsibility and sustainability. This approach is intended to redefine companies' perceptions of a 'successful innovation' by shifting the focus from a company's short-term financial success to sustainable outcomes, for both business and society in a long run. A strategy is unique for an organisation, therefore StRIM can help to develop strategies best suited to the company's continuous success. In this way, RI will create and generate revenue, not just minimise costs and risks. The conceptual framework developed in this chapter may support companies to reflect on their relations with other parts of society. The framework may also be helpful to answer questions on CSR strategizing. Nevertheless, there will be further questions on the deep-rooted values and beliefs in companies, which are responsible for the

acceptance (and non-acceptance) of an organisational engagement. Hence, the conceptual framework serves as a first attempt to arrange patterns of organisational behaviour in responsible innovation strategising. The contribution of Chapter 5 to the overall research question is that it brings together findings of previous Chapters, i.e. Chapters 2, 3 and 4 and places them in the logical framework of a company's strategy for RI.

Lastly, sub-question 5 (Q5) concentrated on the integration of RI into companies' global operations, which was addressed in Chapter 6. In addition to the RI strategy that could be developed and implemented by individual companies identified in Chapter 5, it is crucial to note that companies operate in complex environments being part of the worldwide ecosystem of partners, clients, customers, employees, governments, etc. All those actors are connected through dynamic and complex networks of businesses known as supply chains. Therefore, taking as an example a specific type of business operation, namely supply chain management (SCM) I demonstrate how technology can support business responsibility and contribute to sustainable development and addressing grand societal challenges.

Responsible and sustainable SCM requires innovative technological solutions. Innovative organisational and technological solutions may offer greater monitoring and assessment opportunities, efficiency, and communication between tiers of the supply chain. By providing two examples of technologies that have the potential to revolutionise SCM (big data analysis and blockchain technology), this research illustrates that RI may support companies' responsibility and sustainability serving as a "business case" providing social, environmental and economic benefits and transforming companies to becoming part of the solution. At the same time, issues such as conflicts, climate change, and modern slavery – are political questions and they cannot be resolved without political, social, ethical and economic solutions. In my perception, RI offers a richer and more sensitive perspective than pure techno solutionism, because it combines engineering with social sciences and humanities and gives a forum for reflection on political questions. Therefore, in Chapter 6 I also claim that companies' responsibility and sustainability necessitate political solutions in the form of multistakeholder collaborative partnerships and cooperation along, as well as across, supply chains. Lastly, ethical solutions in the form of responsibility of various tiers of supply chains are crucial, thus in the research presented by this thesis, I propose to include the responsibility of organisations of companies in the form of supra-agency.

While multistakeholder partnership and supra-agency governance in this research refer to a broader companies' responsibility for SCM, I claim that these arguments extend to RI which must take a systemic approach. Without the intensified coordination and cooperation between the tiers of supply chains, technological innovations cannot improve the impact on the society and environment by themselves. The globalisation of markets, the rapid growth of transnational corporations, and new technologies require us to rethink some of the certainties of the Westphalian state-dominated order and formulate new normative visions and concepts to deal with the new problems of the transnational world and global social and environmental challenges (Backer, 2012). Multi-stakeholder approaches to companies' responsibility are co-produced by multiple stakeholders, public and private, and interestingly they change the notion of governance and regulation, as well as the traditional understanding of business and politics (Hofferberth, 2011). Such multi-stakeholder non-state actor governance models should be based on mutual control to ensure the credibility and legitimacy of the initiative.

Having discussed the subsequent sub-questions, we can now turn to the overall research question, which I formulated as follows: what would be a theoretically sound conception and a viable strategy for responsible innovation in business that bridges existing approaches of CSR, CS and RI?

Regarding the first part of the research question, namely a theoretically sound conception of RI in business, I build my answer on results presented in Chapters 2 and 3. Based on my theoretical and empirical findings, I claim that the theoretical conception of RI in business should be composed of two aspects considering how technological innovations developed by industry contribute to sustainable development, and how those technological innovations are being developed as part of their innovation and R&D process. This claim is valid for any type of company, regardless of their size, sector or country they conduct their innovation and R&D and which part of the world they provide their innovative products, services and processes. At the same time RI, for buy-in and co-ownership of this concept in the business context should be linked to well-known concepts, practices and approaches to CSR and CS and use business language. Furthermore, the RI framework proposed by policy-makers and scholars, referring e.g. to anticipation, reflection, inclusion, mutual responsiveness of societal actors and innovators, ethical acceptability, sustainability and societal desirability of the innovation process and its marketable products (Stilgoe, et al., 2013; von Schomberg, 2013) is relevant for the business context and could enrich the conception of RI in business. Nevertheless, it needs to be translated into

business language and specific business functions, including CSR and CS, innovation and R&D, as well as overall business management. As emphasised by Visser (2021), we are currently experiencing a new phase of companies' responsibility with the responsibility being of the business' DNA, built around the four elements of value creation, good governance, societal contribution and environmental integrity and five principles of creativity, scalability, responsiveness, glocality and circularity. RI, CSR and CS are inevitably intertwined and therefore need to be connected through the conception of RI in business.

As far as the second part of the overall research question is concerned, which was about a viable strategy for RI in business, Chapters 2, 3, 4, 5 and 6 provide elements of the answer and the proposal for such a strategy. With findings related to companies' evaluation approaches to RI (Chapter 3), motivations and drivers for RI (Chapters 2 and 4), a strategic approach to RI (Chapter 5), and integration of RI in companies' global operations, I claim that a viable strategy for RI in business requires two levels of RI: responsible innovation management in individual companies and governance within a broader ecosystem. First, at the company level, RI in business should be tied to business strategies and performance, through a systematic approach involving planning, implementation, evaluation and control considering the companies' internal and external environment. Second, at the eco-system level, RI requires new RI governance models that involve not only companies but a variety of actors and stakeholders to build shared ownership of responsibility towards technological innovation. This strategy for RI acknowledges that companies are actors in global policy and global governance, sustainable development and grand societal challenges. As such, RI functions as the ultimate goal of doing business as well as a means to achieve responsibility and sustainability.

Regarding the viable strategy for RI at the company level, particularly for companies that heavily engage in innovation and R&D, RI is strongly connected to the organisational sensemaking and dwells as an intrinsic part of a company's character, because it touches upon the theoretical and practical question of companies' responsibility towards society and the environment. While, it is argued that human rights, ethics and responsibility hinder innovation (European Commission, 2018a), first and foremost, RI should be recognised as an opportunity not as a burden. Based on my theoretical and empirical research findings, I claim that RI requires a strategic approach within a company that connects its different functions, units and departments, management teams and individual employees, but also resources and capabilities that form the company, supported by strong leadership

from executives creating a positive organisational culture among team members and stimulating RI. Consequently, I propose a new approach, called StRIM (Strategic Responsible Innovation Management), that is intertwined with companies' social responsibility and sustainability. RI requires companies to take upon the strategic process of embedding RI in their organisations involving three components: (1) planning; (2) implementation; and (3) evaluation and control; and integrating them into everyday routines and processes in three main areas: (1) the company's internal environment, including organisational culture and employee engagement, leadership, management of knowledge resources and capabilities; (2) the external environment within which the organisation operates such as e.g. stakeholder engagement; and (3) the company's ability to add value to what it does.

I think that embedding RI into the business context does not have a simple formula or tool that would work for all companies and in all contexts without paying attention to the circumstantial particularities. Nevertheless, a high-level model for a strategic approach to RI management at the company level (StRIM) may serve as an umbrella approach to integrating RI in the company with a toolbox of RI methods and approaches that can be adapted to a specific context. Furthermore, as discussed above regarding the RI conception, the RI process elements developed by scholars and policy-makers can be translated under this umbrella to specific strategy elements and business functions integrating them with the well-known approaches to strategy, CSR, CS, and innovation management. For instance, reflexivity related to RI becomes part of the planning, and should become an integral part of everyday internal routines and processes of the company, e.g. through the company's identity and mission, business model, organisational culture practised by employees and leaders by reflecting on the company's values and beliefs; as well as value creation. Anticipation can play a role in all three steps of the strategy, from planning and implementation to evaluation and monitoring, because it plays a crucial role in assessment at an early stage in innovation and R&D of benefits and risks of technological innovation, so that informed choices can be made and mitigation actions put in place. Anticipation relates to both areas internal as well as external, with mutual learning from internal and external stakeholders through (1) assessment; (2) guidance; and (3) dissemination and awareness raising. Anticipation can be translated into commonly used impact assessment methods (e.g. ELSA) but could be also enriched by more technology-oriented assessment methods such as eTA, eIA, anticipatory technology ethics (ATE), value-sensitive design (VSD), socially responsible design (SRD), privacy-by-design, ethics-by-design or human centred and human rights-by-design etc.

In terms of the second aspect of the viable strategy for RI, namely new RI governance models, current practices of companies need to reflect the complex and multifaceted reality of modern research and innovation ecosystems. As stated by Floridi (2015) in the context of AI developments, the difficulty now is not digital innovation but rather digital governance, leading to a new morphology of power (Floridi, 2015). Furthermore, as explained by the report prepared for the European Commission (2018a) “analyses of R&I performance must become attuned to cater for the changing nature of innovation dynamics and the new ways through which innovation is spurring productivity growth and generating socio-economic impact” (p. 8). I think that RI can only be embedded in the business if it is recognised that RI in business is part of a global policy and governance with companies playing an important role in conceptualising the economic, social, environmental and political transformations in world affairs.

Taking lessons learnt from the last six decades of CSR and CS development, I believe that while RI needs to be adaptive to the context, companies should not be left alone in the process of RI conceptualisation and implementation. Therefore, the process of institutionalisation of RI, which we are currently observing, should include a bargaining process, actors engaged in the discussions, leadership forces, an advocacy level, timing and the politics surrounding these matters. These elements are crucial for perceiving RI as a shared responsibility owned by all RI stakeholders, including companies, civil society organisations (such as NGOs, responsible investors and consumers), researchers and policy-makers. Consequently, as proposed in Chapter 6, RI requires new governance models with the role of multistakeholder partnerships, supra-agency governance, and technological solutions that can support companies’ responsibility and sustainability.

7.2 Limitations and further research

As with every research, this thesis aims at giving answers, at the same time, raises questions for further research. In this last section, while I acknowledge the limitations of this study, I also propose areas of further research that arose in my investigation that specifically deserve closer attention.

The first limitation is related to the potential for generalizability of this study. This study addresses the current and actual problem of companies’ responsibility for their technological innovation. However, when basing one’s conclusions on empirical findings, such as case study or interviews, the following question is of course an

important one: To what extent can the empirical results be generalized and transferred to all types of companies, sectors and contexts? It should be noted that the question of the implementation of RI is immensely complex due to substantial conceptual overlap and lack of precision in the empirical research. This research was unable to investigate a whole range of factors that may play a role in, for example, choosing the right incentive or evaluation and monitoring methods and taking into account the location of a company, its age, sector or size. Further data collection would be needed to determine in what circumstances specific aspects of RI strategy are viable, e.g. depending on the circumstance which types of incentives are likely to be effective, or which RI practices related to planning, implementation and evaluation and control work best in a specific situation. Additionally, in-depth case studies of various companies involving interviews or surveys with different units and departments may reveal the level of RI implementation, coherence and, ultimately a strategic approach to RI.

The second limitation is related to the scope of this research. This investigation focuses on a specific topic of responsible innovation in business. It draws from a certain body of literature on RRI, business ethics, law and human rights, innovation management, applied ethics and research ethics. However it does not investigate in details and thus does not exclude the possibility that research in other bodies of literature, especially those related to specific topics such as industry sectors, specific type of business operations or types of technology, provide research in the conception and implementation of RI in business. According to findings in Chapter 2, such innovative sectors as health and pharmaceuticals and ICT, which also raise major ethical and human rights challenges, received limited or no attention in the mainstream literature on BE and IM. Therefore, it would be extremely interesting to investigate whether and to what extent domain-specific literature discusses RI in business, e.g. RI in the context of legal or moral responsibility of companies for their technological innovations; or whether and how companies in specific sectors related to new and emerging technologies perceive and practice RI (e.g. when developing AI-based tools supporting law enforcement in investigating and prevention of crime, doctors in early detection of cancer, or human resources teams in the recruitment process).

Third, this research focuses mainly on the high-level strategic approach to RI in business providing a viable strategy for RI in business consisting of two levels of RI, i.e., RI management by individual companies and RI governance as part of a broader ecosystem. Nevertheless, this strategy would benefit from further granularity

regarding specific methods and tools for practising RI. As shown in Chapter 3, while RI principles are intuitively known among companies, we lack clarity on how RI should be translated into specific solutions, e.g. technical requirements, at which stage of innovation development they should be implemented, who should be translating and implementing them and what methods and approaches should be used. Consequently, current business practices, tools and approaches to responsibility such as impact assessment methods (e.g. ELSA), could be enriched by eTA, eIA, anticipatory technology ethics (ATE), value-sensitive design (VSD), socially responsible design (SRD), privacy for design, ethics-by-design and human centred or human rights-by-design etc. We need more empirical research, such as case studies, which would help to test currently existing RI tools and methods for business, as well as develop new approaches adapted to specific needs and complexity of nowadays innovation and R&D. For instance, such a case study could investigate collaboration on RI strategy implementation between different business functions across the company including CSR/CS officers, R&D team, and top management.

Fourth, we are exploring a transformation of ways of conducting research and innovation, through public-private partnerships, multi-stakeholder collaborations, and many more. This research explored only one case study of such type of collaboration related to RI, i.e. Sedex. Further research could showcase other examples of new modes of collaboration in research including collaboration with other industrial partners or working in multi-stakeholder consortia such as EU-funded or international research projects.

Despite the above-discussed limitations, I believe this work provides a theoretically sound conception and a viable strategy for Responsible Innovation in business that could be the basis for further investigations and actions. This brings my dissertation to the end.

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Dutch Summary

VERANTWOORD INNOVEREN IN HET BEDRIJF EEN KADER EN STRATEGISCH VOORSTEL

Het bedrijfsleven speelt een cruciale rol in Europees onderzoek en innovatie (O&I) als de grootste financier van Europese O&I en de belangrijkste vertegenwoordiger van nieuwe technologische oplossingen. Echter, in een snel veranderende wereld die steeds meer afhankelijk wordt van technologie, en met de enorme macht van het bedrijfsleven, kan men zich afvragen hoe ervoor moet worden gezorgd dat de impact van technologie op mens en samenleving leidt tot verbeterde technologieën, die duurzaam, ethisch aanvaardbaar, en sociaal wenselijk zijn. De belangrijkste uitdaging die in dit proefschrift wordt aangegaan, is het probleem van een gebrek aan verantwoordelijkheid van bedrijven voor hun technologische innovatie, wat terug te voeren is op de voortdurende discussies over de aard van de verantwoordelijkheid van bedrijven tegenover de maatschappij en het milieu.

De focus van dit proefschrift ligt op verantwoorde innovatie in een zakelijke context. Het doel van dit onderzoek is een brug te slaan tussen twee vertogen die momenteel los van elkaar staan, namelijk bedrijfsverantwoordelijkheid en verantwoord innoveren, en om een conceptie van verantwoord innoveren voor bedrijven te ontwikkelen op basis van bestaande opvattingen over maatschappelijk verantwoord ondernemen, duurzaam ondernemen en verantwoord innoveren. Een dergelijke opvatting moet theoretische onderbouwing, evenals praktische strategieën bieden voor het implementeren van verantwoorde innovatie in bedrijven. Dit proefschrift houdt zich bezig met de volgende onderzoeksvraag: **Wat zou een theoretisch deugdelijke conceptie en een levensvatbare strategie zijn voor verantwoorde innovatie in het bedrijfsleven die een brug slaat tussen de bestaande aanpak van maatschappelijk verantwoord ondernemen, duurzaam ondernemen en verantwoord innoveren?** Deze onderzoeksvraag wordt beantwoord in een reeks stappen ondersteund door vijf deelvragen:

(V1) Wat zijn, in de context van het bedrijfsleven, de verschillende verantwoorde-innovatieopvattingen en -benaderingen die door academici worden voorgesteld of door bedrijven worden gebruikt?

- (V2) Hoe evalueren bedrijven hun innovatiepraktijken door rekening te houden met verantwoordelijkheid, ethiek en duurzaamheid?
- (V3) Wat zijn de meest effectieve manieren om bedrijven te stimuleren om op een verantwoorde, ethische en duurzame manier te innoveren?
- (V4) Hoe kunnen bedrijven verantwoorde innovatie integreren in hun bedrijfsfuncties en -activiteiten?
- (V5) Hoe kan verantwoord innoveren worden geïntegreerd in de wereldwijde activiteiten van bedrijven?

Deze vragen komen aan de orde in vijf op zichzelf staande maar onderling verbonden discussies (artikelen) die bijdragen aan het debat over verantwoord innoveren in het bedrijfsleven.

Hoofdstuk 2 beantwoordt deelvraag V1 met betrekking tot de verschillende opvattingen en benaderingen van verantwoorde innovatie in de bedrijfscontext, zoals voorgesteld door academici en gebruikt door bedrijven. In dit hoofdstuk analyseer ik de relatie tussen bedrijfsverantwoordelijkheid en verantwoorde innovatie. Door middel van een systematisch literatuuronderzoek, ontdek ik welke verschillende verantwoordelijkheidsconcepten en -benaderingen worden onderscheiden in de literatuur over bedrijfsethiek en innovatiemanagement, en in hoeverre deze convergeren of verschillen van de beleidsvorming en het academische begrip van verantwoorde innovatie. De bevindingen van dit onderzoek tonen aan dat verantwoord innoveren in de bedrijfscontext sterk gericht is op de uitkomst van innovatie, namelijk producten, processen en diensten, en hun impact op de samenleving en het milieu, en hoe ze bijdragen aan het aanpakken van grote maatschappelijke uitdagingen. Er is echter relatief weinig discussie over het systematisch organiseren van het innovatieproces op een verantwoorde, ethische en duurzame manier. Ondanks de groeiende belangstelling bevindt het concept van verantwoord innoveren in het bedrijfsleven zich nog steeds in een gevoelige fase van theorievorming, en blijft het een niche-onderwerp in de reguliere literatuur over bedrijfsethiek en innovatiemanagement.

Hoofdstuk 3 behandelt twee deelvragen, namelijk V1 met betrekking tot de concepties en benaderingen in de bedrijfscontext, en V2 over de evaluatie door bedrijven van hun innovatiepraktijken. Deze studie draagt bij aan kennis over de implementatie van verantwoord innoveren in de bedrijfscontext, door inzichten te combineren uit maatschappelijk verantwoord ondernemen en duurzaam ondernemen, ethiek, en innovatiemanagement van nieuwe en opkomende

technologieën. Deze empirische studie is gebaseerd op interviews met bedrijven en bedrijfsexperts, om te begrijpen hoe principes en praktijken van verantwoorde innovatie, en evaluatie van innovatie voor bedrijven verschillen. De interviews illustreren de perceptie van bedrijven over verantwoorde innovatie, de rol ervan in hun strategieën en praktijken, en evaluatie- en controlestrategieën en -methoden. In dit hoofdstuk onderzoek ik ten eerste hoe bedrijven het concept van verantwoorde innovatie waarnemen en integreren; en ten tweede, hoe bedrijven hun innovatiepraktijken evalueren door rekening te houden met verantwoordelijkheid, ethiek en duurzaamheid.

In hoofdstuk 4 beantwoord ik deelvraag 3 (V3) en onderzoek ik hoe de industrie kan worden gestimuleerd om zich bezig te houden met onderzoek en innovatie volgens de toepassing van verantwoorde innovatie. In dit hoofdstuk stel ik een matrix van incentieven voor, die kunnen worden gebruikt om de acceptatie van verantwoorde innovatie in de industrie te motiveren en te stimuleren. De matrix is gebaseerd op twee lagen: stimulansen voor de acceptatie van verantwoorde innovatie binnen de industrie en factoren die dit proces kunnen beïnvloeden. De stimulansen zijn gecategoriseerd in drie categorieën: (1) externe en interne prikkels voor belanghebbenden; (2) instrumentele en niet-instrumentele prikkels; en (3) directe en indirecte prikkels, i.e. financiële of niet-financiële prikkels. Om een effectieve implementatie van verantwoord innoveren te waarborgen, benadruk ik factoren die van invloed zijn op succesvolle stimulansen van verantwoorde innovatie in de industrie. Bovendien erkent dit hoofdstuk de diversiteit van bedrijven en schuwt de matrix daarom een benadering van 'one size fits all'.

Hoofdstuk 5 gaat in op deelvraag 4 (V4) en biedt een conceptueel voorstel voor het integreren van verantwoorde innovatie in de bedrijfsfuncties en -activiteiten. Door middel van dit conceptuele onderzoek beargumenteer ik dat het verweven van innovatie en maatschappelijk verantwoord ondernemen kansen kan opleveren voor zowel het bedrijfsleven als de samenleving. Om duurzame economische, maatschappelijke en ecologische resultaten te boeken, moeten bedrijven een strategische benadering hebben van innovatie en het beheer van maatschappelijk verantwoord ondernemen. In dit hoofdstuk stel ik een nieuwe aanpak voor, genaamd Strategic Responsible Innovation Management (StRIM), die verweven is met de maatschappelijke verantwoordelijkheid van bedrijven. Deze aanpak is bedoeld om de perceptie van bedrijven van een 'succesvolle innovatie' opnieuw te definiëren, door de focus te verleggen van het financiële succes van een bedrijf naar duurzame resultaten, voor zowel het bedrijf als voor de samenleving.

Hoofdstuk 6 concentreert zich op deelvraag 5 (V5) en onderzoekt hoe verantwoord innoveren kan worden geïntegreerd in wereldwijde activiteiten van bedrijven. In dit hoofdstuk worden drie oplossingen voorgesteld voor verantwoord en duurzaam ketenbeheer. Ten eerste moeten toeleveringsketens worden ondersteund door onderzoek en innovatie. Ten tweede moeten toeleveringsketens gebaseerd zijn op de inspanningen van meerdere belanghebbenden van de industrie, gouvernementele en niet-gouvernementele organisaties. Ten derde moet de verantwoordelijkheid niet alleen bij een individueel bedrijf en zijn werknemers liggen, maar ook bij overkoepelende organisaties van bedrijven. Als gevolg vereisen verantwoorde en duurzame toeleveringsketens technologische, politieke en ethische oplossingen, die de ontwikkeling van degelijke, multi-stakeholder bedrijfs- en bestuursmodellen met zich meebrengen.

Dit proefschrift stelt, als antwoord op de algehele onderzoeksvragen, dat een levensvatbare strategie voor verantwoord innoveren in het bedrijfsleven twee niveaus vereist: verantwoord-innovatiemanagement door individuele bedrijven, en verantwoord-innovatiebestuur als onderdeel van een breder ecosysteem. Ten eerste, op bedrijfsniveau, moet verantwoord innoveren worden gekoppeld aan bedrijfsstrategieën en -prestaties, door middel van een systematische aanpak die planning, implementatie, evaluatie en controle omvat, rekening houdend met de interne en externe omgeving van het bedrijf. Ten tweede, op ecosysteemniveau, vereist verantwoorde innovatie nieuwe besturingsmodellen waarbij niet alleen bedrijven, maar ook een verscheidenheid aan actoren en belanghebbenden worden betrokken om een gedeelde verantwoordelijkheid voor technologische innovatie op te bouwen. Deze strategie voor verantwoord innoveren erkent dat bedrijven actoren zijn in mondiaal beleid en mondiaal bestuur, duurzame ontwikkeling, en grote maatschappelijke uitdagingen. In dit geval kan verantwoorde innovatie zowel de rol spelen van het ultieme doel, als dat van een middel, om verantwoordelijkheid en duurzaamheid te bereiken.

English Summary

RESPONSIBLE INNOVATION IN BUSINESS

A FRAMEWORK AND STRATEGIC PROPOSAL

Business plays a crucial role in European research and innovation as the main funder of European research and innovation and the principal agent of novel technological solutions. However, in a fast-changing world increasingly dependent on technology and with business wielding enormous power, one may ask how to ensure that the impact of technology on humans and society will lead to improved technologies that are sustainable, ethically acceptable and socially desirable. The main challenge taken on in this dissertation is the problem of a lack of responsibility of companies for their technological innovation, which can be placed in the context of the ongoing discussions around the nature of responsibility of companies towards society and the environment.

The focus of this thesis is therefore on responsible innovation in the business context. The objective of this research is to bridge two currently disconnected discourses, namely business responsibility and responsible innovation, and develop a conception of responsible innovation for companies based on existing conceptions of corporate social responsibility, corporate sustainability and responsible innovation. Such conception should provide theoretical underpinnings as well as practical strategies for implementing responsible innovation in companies. This dissertation is generally concerned with the following research question: **What would be a theoretically sound conception and a viable strategy for Responsible Innovation in business that bridges existing approaches of corporate social responsibility, corporate sustainability and responsible innovation?** This question is answered in a series of steps supported by five research sub-questions:

(Q1) What are the different responsible innovation conceptions and approaches in the business context proposed by academics or used by companies?

(Q2) How do companies evaluate their innovation practices by considering responsibility, ethics and sustainability?

(Q3) What are the most effective ways to incentivise companies to innovate in a responsible, ethical and sustainable way?

(Q4) How can companies integrate responsible innovation into their business functions and operations?

(Q5) How could responsible innovation be integrated into companies' global operations?

These questions are addressed across five stand-alone but interrelated discussions (articles) that contribute to the debate about responsible innovation in business.

Chapter 2 responds to sub-question Q1 regarding the different responsible innovation conceptions and approaches in the business context proposed by academics and used by companies. In this Chapter, I analyse the relationship between business responsibility and responsible innovation. Through a systematic literature review, I explore which different responsibility concepts and approaches are distinguished in the business ethics and innovation management literature, and to what extent they are convergent or different from the policy-making and academic understanding of responsible innovation. The findings of this study show that responsible innovation in the business context is heavily focused on the outcome of innovation, namely products, process and services, and their impact on society and the environment and how they contribute to addressing grand societal challenges. However, there is relatively limited discussion about systematically organising the process of innovation in a responsible, ethical and sustainable way. Despite growing interest, the responsible innovation conception in business is still in a sensitive phase of theory building and remains a rather niche topic in the mainstream business ethics and innovation management literature.

Chapter 3 addresses two sub-questions, namely Q1 regarding the conceptions and approaches in the business context used by companies; and Q2 about companies' evaluation practices of their innovation. This study contributes to knowledge about the implementation of responsible innovation in the business context by combining insights from corporate social responsibility and corporate sustainability, ethics, and innovation management of new and emerging technologies. This empirical study is based on interviews with companies and business experts conducted to understand how principles and practices of responsible innovation and evaluation of innovation vary for companies. The interviews illustrate companies' perceptions of responsible innovation, its role in their strategies and practices, and evaluation and control approaches and methods. In this chapter I investigate, first, how companies perceive and integrate the responsible innovation concept; and second, how companies

evaluate their innovation practices by considering responsibility, ethics and sustainability.

In Chapter 4, I respond to sub-question 3 (Q3) and investigate how the industry can be incentivised to engage in research and innovation following the approach of responsible innovation. In this Chapter, I propose a matrix of incentives that can be used to motivate and stimulate the adoption of responsible innovation in industry. The matrix is based on two layers: incentives for the uptake of responsible innovation by industry and factors that can affect this process. The incentives are categorised into three categories: (1) external and internal stakeholder incentives; (2) instrumental and non-instrumental incentives; and (3) direct and indirect incentives, hence financial or non-financial incentives. To ensure the effective implementation of responsible innovation, I outline factors that affect successful incentives of responsible innovation in the industry. Moreover, this Chapter acknowledges the diversity of companies and therefore the matrix eschews the approach of ‘one size fits all’.

Chapter 5 addresses sub-question 4 (Q4) and provides a conceptual proposal for integrating responsible innovation into companies’ business functions and operations. Through this conceptual research, I argue that intertwining innovation and corporate social responsibility may bring opportunities for both business and society. To bring sustainable economic, societal and environmental outcomes, companies should have a strategic approach to innovation and corporate social responsibility management. In this Chapter, I propose a new approach, called strategic responsible innovation management (StRIM), that is intertwined with companies’ social responsibility. This approach is intended to redefine companies’ perceptions of a ‘successful innovation’ by shifting the focus from a company’s financial success to sustainable outcomes, for both business and society.

Chapter 6 concentrates on sub-question 5 (Q5) and examines how responsible innovation can be integrated into companies’ global operations. This Chapter proposes three solutions for responsible and sustainable supply chain management. Firstly, supply chains have to be supported by research and innovation. Secondly, supply chains should be based on multi-stakeholder efforts of industry, governmental and non-governmental organisations. Thirdly, the responsibility should lie not only with an individual company and its employees but also with organisations of companies (supra-agency). As a result, responsible and sustainable supply chains require technological, political and ethical solutions involving the development of sound, multi-stakeholder business and governance models.

This dissertation claims, in answer to the overall research questions, that a viable strategy for responsible innovation in business requires two levels: responsible innovation management in individual companies and responsible innovation governance within a broader ecosystem. First, at the company level, responsible innovation in business should be tied to business strategies and performance, through a systematic approach involving planning, implementation, evaluation and control considering the companies' internal and external environment. Second, at the ecosystem level, responsible innovation requires new governance models that involve not only companies but a variety of actors and stakeholders to build shared ownership of responsibility towards technological innovation. This strategy for responsible innovation acknowledges that companies are actors in global policy and global governance, sustainable development and grand societal challenges. As such, responsible innovation can function as the ultimate goal of doing business as well as a means to achieve responsibility and sustainability.

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Simon Stevin (1548-1620)

‘Wonder en is gheen Wonder’

This series in the philosophy and ethics of technology is named after the Dutch / Flemish natural philosopher, scientist and engineer Simon Stevin. He was an extraordinary versatile person. He published, among other things, on arithmetic, accounting, geometry, mechanics, hydrostatics, astronomy, theory of measurement, civil engineering, the theory of music, and civil citizenship. He wrote the very first treatise on logic in Dutch, which he considered to be a superior language for scientific purposes. The relation between theory and practice is a main topic in his work. In addition to his theoretical publications, he held a large number of patents, and was actively involved as an engineer in the building of windmills, harbours, and fortifications for the Dutch prince Maurits. He is famous for having constructed large sailing carriages.

Little is known about his personal life. He was probably born in 1548 in Bruges (Flanders) and went to Leiden in 1581, where he took up his studies at the university two years later. His work was published between 1581 and 1617. He was an early defender of the Copernican worldview, which did not make him popular in religious circles. He died in 1620, but the exact date and the place of his burial are unknown. Philosophically he was a pragmatic rationalist for whom every phenomenon, however mysterious, ultimately had a scientific explanation. Hence his dictum ‘Wonder is no Wonder’, which he used on the cover of several of his own books.

Companies are the main contributors and developers of technological innovation, generating an enormous impact on people's lives. Unrestricted innovation fosters both economic development and inventiveness. Real-world situations, however, pose valid questions about whether science and technology can be left to operate autonomously in the market without regulation and societal guidance. Some headline stories include Volkswagen's emission scandal, misuse of data in the Facebook–Cambridge Analytica case, or the Pegasus surveillance spyware targeting human rights activists, journalists and dissidents.

In a fast-changing world increasingly dependent on technology and with business wielding enormous power, one may ask how to ensure that the impact of technology on humans and society will lead to improved technologies that are sustainable, ethically acceptable and socially desirable. What do our fundamental rights and values look like in the techno- and digital age? Who has the right to decide what the world should look like and how we want to live? And what role and responsibilities do companies have regarding their technological innovations?

The main challenge taken on in this work is the problem of responsibility of companies for their technological innovation, which can be placed in the context of the ongoing discussions around the nature of companies' responsibility towards society and the environment. This work explores and explicates a strategic approach to responsible innovation in business.

*'Wonder en is
gheen wonder'*

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