

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

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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.

Keywords: responsible research and innovation; incentives; industry; corporate social responsibility; stakeholders

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 [1]. 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 [2].

While policy-makers and academics apply and promote RRI, companies do not recognise the concept [3,4]. Other papers in this Special Issue also confirm this observation (see, e.g., Lubberink et al. 2017 [5], Stahl et al. 2017 [6]). 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 and Kramer

2006 [7], 2011 [8], Schiederig 2012 [9], Karakaya et al. 2014 [10]), because social and environmental innovations can create economic benefits and business opportunities [11]. 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 [12]. 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 [3,13].

The remainder of the paper is structured as follows. In section 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 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 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) [13].

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 3.

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 [14]. 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 [15].

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)” [1]. 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” [1].

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 and Pedaste 2017 [16]). 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 [17]), 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 [17].

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 and Macnaghten 2013 [18]; Taebi et al. 2014 [19]). 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 and Pariotti 2017 [20]). 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 [1,18,21–23]. 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 [4]. The European Commission defines CSR as “the responsibility of enterprises for their impacts on society” [24].

The findings of the Responsible Industry Project suggest that companies lack knowledge about the concept of RRI [25]. However, this does not necessarily mean they conduct R&I in an irresponsible way [4]. 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 [4]. 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) [4]. 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 [4]. 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 [25]. Thirdly, CSR is generally applicable to all company activities, and thus also R&I, but is not specifically designed to affect R&I [4].

In recent years, RRI has been used extensively for publicly funded research. RRI projects [25], not only in RRI but also RRI used in different scientific fields (e.g., RRI in nanotechnology) [26], have stimulated greater stakeholder involvement, better consideration

of ethical issues, better anticipation of social and environmental impacts of 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.

3. Defining Incentives and Our Approach

In general, incentives can be defined as a motivating force and a stimulus to incite for action [27]. Grant (2002) explains that we reach for them when we wish to bring about change [28], therefore incentives help to steer people's choices in certain directions [28]. 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 [28]. Incentives are not an objective, per se; they are a tool to achieve strategic goals and objectives [27].

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) [29]. Other authors divide incentives using the terms direct and indirect assistance (Bernstein 1985 [30]; Miller 1999 [31]). Some authors perceive these two categories as identical (Lim et al. 2016 [32]), 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 [12]). Others emphasise the voluntary character of actions by all parties, meaning both the offering party and the responding party (e.g., Grant 2002 [28]). Furthermore, in the psychology and marketing literature, researchers classify incentives as either outcome- or behaviour-based (Anderson and Oliver 1987 [33]; Cravens et al. 1993 [34]). 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 [35]. 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 [36]. 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 [37]).

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 [38], 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 [39]. Some other authors analyse a question of rationality of one's behaviour (North 1990 [40]; Sen 1997 [39]; Thaler and Sustein 2008 [41–43]). 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 [44]. 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” [45]. 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 [45]. 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) [40,46]. The effective

design and implementation of incentives is contingent on the context [45], therefore, it is crucial to fit the correct institutional rules to each specific social-ecological setting [46].

Considering the variety of classifications, in this paper, we develop our own approach to analyse the incentives of RRI in an industry context (Figure 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 [47]) and RRI (science with and for society [48]; public engagement in RRI [48]). 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 [49] requiring large companies to publish regular reports on the social and environmental impacts of their activities [50] 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 [50]. 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.

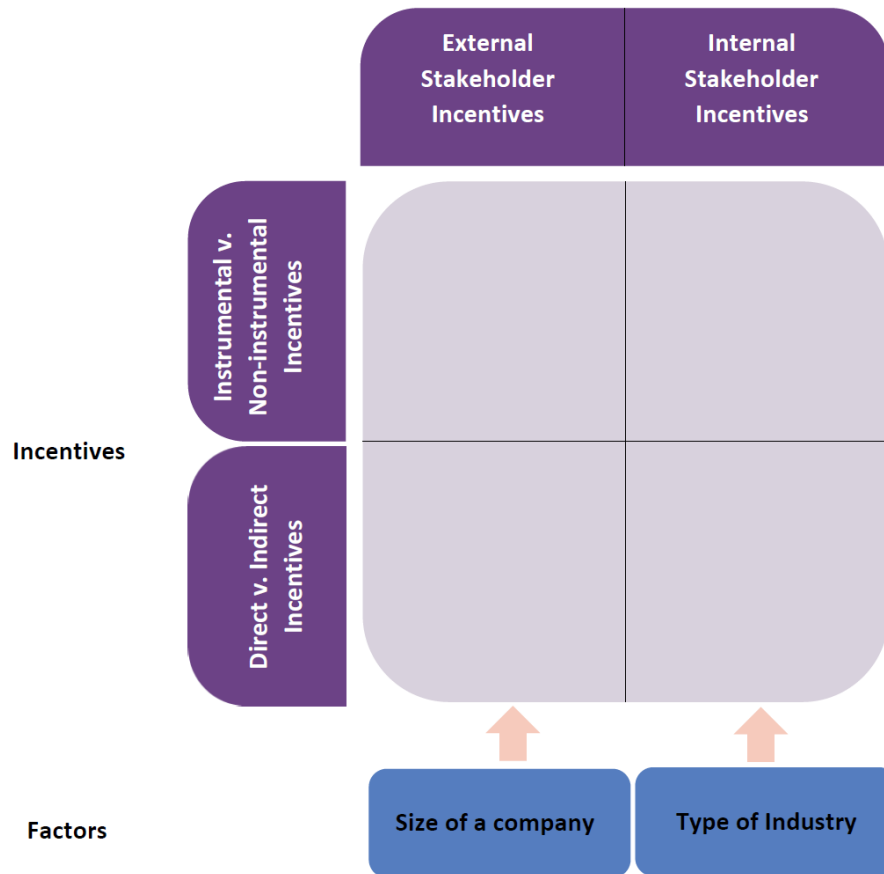


Figure 1. Matrix: categories of incentives and factors.

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. 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 [51]. 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 [52], 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 [52]. For this reason, the causal loop diagram (Figure 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 [53]. 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 [54], 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 [54–56], recruitment quality [55] and customer satisfaction [55,57]. 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 [55,56]. 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 [58].

Sales are the other key determinant of profit. Traditionally, marketing has been the method to increase sales. However, positive word of mouth is usually more effective because the marketing comes from a trustworthy source, e.g., from a friend or relative. Furthermore, word of mouth does not generate costs for the company, but instead requires engaged customers. Customer loyalty is another favourable customer attribute because loyal customers are more profitable [59] 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 [57,60,61]. 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 [57,59,62] and customer engagement [57].

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 [53]. 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.

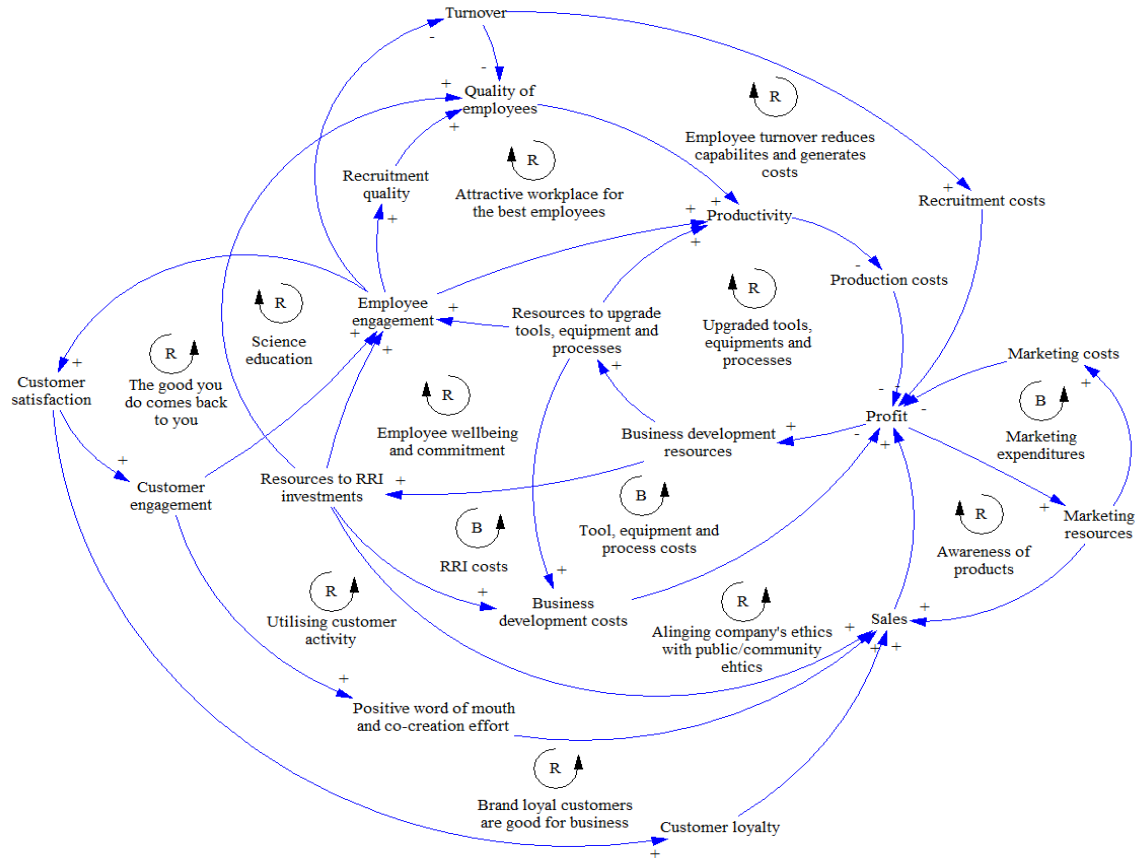


Figure 2. Causal loop diagram for internal RRI incentives. Blue arrows represent an influence from one variable to another. The plus sign at the head of an arrow represents a positive influence and a minus sign a negative influence. B represents a balancing feedback behaviour and R represents a self-reinforcing feedback behaviour. Balancing feedback behaviour tries to keep the system in equilibrium (e.g., in mechanics, after compressing or stretching a spring, it will generate an opposing force to return the spring to its resting position). Self-reinforcing feedback behaviour instead tries to amplify the change in the system (e.g., a snowball falling from the top of the mountain will have continuously increasing size and velocity).

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 4.1. In subsection 4.2, we explore external stakeholder incentives, and in subsection 4.3 internal stakeholder incentives. In the last subsection 4.4, we study the role of governance in the RRI incentives.

4.1. RRI Stakeholders

The stakeholders should be identified in a structured and exhaustive way [63] derived from the stakeholder theory [64]. 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 [63]. 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 [63].

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 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.

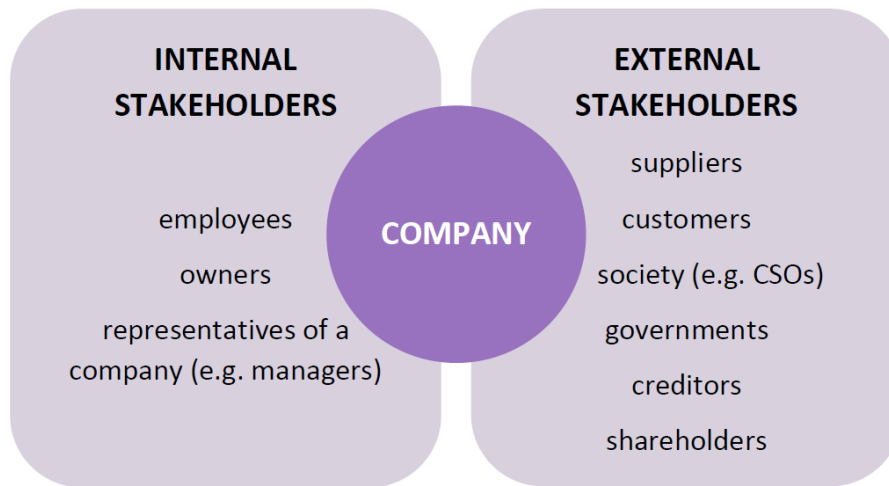


Figure 3. Internal vs External Stakeholders (examples) (Based on: Jones 1995 [65], Brem and Viardot 2015 [66], Cardwell et al. 2017 [67]).

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 [63]. 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 [68], which are the markers that groups use to define and distinguish themselves from others [69], as well as the different interests, ideologies, values, and expectations these identities bring forward in relation to the company [68]. In the next subsection, we discuss the first category of incentives: external stakeholder incentives.

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.

4.2.1. 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 [70]. 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 [71]. A number of studies (e.g., Bhattacharya and Sen 2004 [72]; Du et al. 2010 [73]; Melo and Garrido-Morgado 2012 [74]) have shown that companies benefit from engaging in responsible corporate activities [75]. 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 [75]. Several researchers have found that the perceived fit between firm and responsible activities have a positive effect on consumer response (Becker-Olsen et al. 2006 [76]; Menon and Kahn 2003 [77]; Sen and Bhattacharya 2001 [78]). 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 [79] 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 [80]. 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 [81]. 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 [82]. 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 [83]. Corporate governance scandals diminish trust in business in the eyes of the public and therefore consumers [83]. 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" [84]. 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 [85] 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 [86]. Another example is Ethical Consumer [87], 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 [88]. 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 [88]. The tool also has a mobile-friendly version of the website to ensure easy access for users. Our final example is the GoodGuide [89], 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 [89]. 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 [90]. 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 [89]. 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 4.2.2., we discuss how certification can serve as an effective incentive for RRI implementation in industry.

4.2.2. 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) [91] focusing on workers' rights and workplace conditions; OHSAS 18001 [92] regarding health and safety of employees and minimising the risk of accidents; ISO 14001 and Eco-Management and Audit Scheme (EMAS) [93] on environmental management, as well as the EU Ecolabel (or "EU Flower") or B Corporation certification [94]. 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 [71], Wu and Wang 2014 [95], Arikan et al. 2016 [96], Gauttier et al. 2017 [25]).

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 [97]. Therefore, there is a risk that some companies may strategically apply certificates to manipulate such information spillovers [97]. More and more companies are engaging in practices misleading consumers about their environmental performance or the environmental benefits of a product or service [98]. These practices are known as "greenwashing", defined as "the intersection of two firm behaviours: poor environmental performance and positive communication about environmental performance" [98], or in other words "the practice of making unwarranted or overblown claims of sustainability or environmental friendliness in an attempt to gain market share" [99]. 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 [98]. Companies illegitimately purporting to be environmentally friendly lead to the situation when companies true to their environmental mission lose their competitiveness [100]. 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 [101]. Other problems that certification may cause are the increase of costs, additional bureaucracy, and variance in standards [25]. 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 [94]. B Corp Certification is tailored to the size (number of employees), type (sector) of business and its location [94]. Fees are annual and they vary depending on a company's annual sales within the range \$500 to \$50,000 [102]. Furthermore, to ensure validity of the certificate, the certification term is two years. After the two-year term, a company must recertify [94]. 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" [94]; 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 [94]. Furthermore, thinking about the affordability of certification particularly for SMEs, it is in fact the case that most B Corporations are privately held SMEs [103]. According to Suntae and Schifeling (2016), there are two underlying reasons for companies to seek out B Corporation certification [104]. 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 [104]. They emphasize 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" [105]. 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 [103]. 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 [106,107]. The EU Ecolabel experience shows an increase in Ecolabel sales when promotional actions are carried out [106]. 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 [106].

The Responsible Industry Project [13] 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 [108]. 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 [25]. 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 Teysier (2016) [109]. The authors compared the market effect of third-party certification and the free incorporation of CSR attributes into brand-building strategies through unsubstantiated claims [109]. Their findings conclude that it will be difficult to bring about CSR development if companies use CSR claims without being certified [109]. The authors emphasise that CSR must be incorporated into brand-building strategies through third-party certification [109]. 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 et al. 2014 [110], Waldman and Kerr 2014 [108]). 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. [110] According to Roe et al. (2014), consumers’ willingness to trust a certificate can be associated with the entity certifying the label [110]. 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 [111–113]? 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) [108]? 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 [111–113].

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.

4.3.1. 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 [114]. 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” [115]. “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” [115]. Furthermore, it encompasses a number of workplace factors, such as efficient application of work, employee retention, creativity, business outcomes and engagement [25,116]. According to Suff and Miller (2016) employee well-being consists of five interrelated domains: health, work, values/principles, collective/social and growth [117]. 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 [118]. 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” [118]. 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 [116]. 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” [116]. 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 [105]. 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 (Markos and Sridevi 2010 [56], Cook 2008 [55], Huselid 1995 [119], Gauthier et al. 2017 [25]). High turnover causes high recruitment costs because employees that leave the company must be replaced to preserve current production or service levels [25]. 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 [86]. 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 [120]. 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 [121]. 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 [25,121]. 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 [116]. 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. 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 [122]. 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 [123]. 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 [122]. 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 [122]. 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 [122]. Management also influences the adoption of voluntary governance tools to support the strategy implementation [122]. 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 [124]. 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 [125]. 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 [126]. This is because it provides actors with a means to instantiate normative values [126]. However, the binding character of hard-law entails legal consequences, restricts actors' behaviour and even their sovereignty [4]. 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 [4]. 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 [126]. 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 [126]. 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 [126]. Thirdly, in many cases, soft-law regulation emerges as a quick reaction for existing problems [4].

Our findings show that industry stakeholders wish to see incentives for the uptake of voluntary RRI tools and practices [25]. However, they also reject the idea of legally binding obligations, because they perceive RRI as more than compliance with the law [25]. Moreover, SMEs do not have enough resources to dedicate to complex legal procedures [25]. Voegtlin and Scherer (2017) point out a number of advantages of soft-law regulation in the context of innovation [11]. 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 [11]. 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) [11]. Thirdly, soft-law can cover a wide range of innovation processes and types of innovation [11]. 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” [127]. 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 [11]. 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 [122].

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” [11]. 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 [11]. 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 [128]). It could also enhance responsible leadership by the facilitation and moderation of the dialogue among different stakeholders [129], reduce costs [128], and help generate new initiatives and consolidate existing initiatives [129]. Moreover, following the concept of the standardisation cycle (Brunsson et al. 2012 [130]) 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 [125]. Lastly, the successful governance of RRI in industry lies in the recognition of RRI as an investment, and not as a cost [122].

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.

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 [131], 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 [132]. 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 [132].

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 [133]. Commercialisation of innovations is also threatened due to limited resources [134]. Resource constraints drive the goals of SMEs to be relatively short-term and profit-oriented [133].

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 [135]. MNCs also have better recognition, credibility and stability, as well as more power and influence over their partners [133]. 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 [133].

Table 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 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 1 is not meant to be a comprehensive list of SME incentives. Instead, Table 1 presents the discovered SME problems and exemplar incentives for SMEs to adopt RRI principles.

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 [136]. Sectoral studies have shown that industries have differences in knowledge base, actors involved, links and relationships among actors and relevant institutions [124]. 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 [53]. They further suggest that for companies operating in sectors that have pervasive social impacts corporate responsibility and competitiveness are naturally aligned in driving innovation [53].

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 [54] research (2014) has shown that co-worker relationships are one of the key determinants of employee engagement. The causal loop diagram (Figure 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 [137], 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.

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.

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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