Deliverable 1.1

Systematic Review: Benefits, Incentives and the Business Case for RRI in industry

RESPONSIBLE INNOVATION COMPASS

Grant agreement number	710543
Project acronym	COMPASS
Project website	www.innovation-compass.eu
Deliverable number	1.1
Version/last editor	1.0/Josephina Antoniou
Work package number	1
Lead	UCLan Cyprus
Nature	Report
Dissemination level	Public
Author(s)	Josephina Antoniou
Tel	+357 24 694094
Fax	+357 24 812121
Email	jantoniou@uclan.ac.uk
Project Coordinator	a.Prof Dr. André Martinuzzi Institute for Managing Sustainability Vienna University of Economics and Business (WU Vienna) Welthandelsplatz 1, A-1020 Vienna/Austria http://www.sustainability.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Table of Contents

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Executive Summary

Deliverable 1.1 is a systematic literature review. It aims to uncover benefits of the practical application of Responsible Research and Innovation (RRI) in Research and Development and Innovation (R&D&I) processes, outcomes for businesses and SMEs within selected key innovation fields, as well as cross-sectoral benefits and incentives. The process of a systematic literature review will contribute to the investigation of how existing research and practice has progressed towards identifying these benefits, mainly through the presentation of relevant initiatives, selected through specific criteria. The criteria for including a study or initiative in D1.1 consider metadata as well as semantics, especially when it is possible to identify inter-linkages with RRI implementation in SMEs.

This Deliverable investigates research and case studies within different areas of innovation informed by RRI aspects. It considers new forms of research and innovation (particularly social innovation); sustainable development and its effect on business sustainability; open innovation (considering how the evolution of communication technology is shifting the dynamics of the provider-customer relationship); open access (as a core R&I concept increasingly beneficial for businesses and SMEs in particular); environmental and ethical considerations; organisational development and corporate responsibility policies and standards; gender and diversity issues, and workplace equality.

The selected RRI aspects are based on the conclusions of similar investigations. For example, one of the main outcomes of the RESPONSIBLE INDUSTRY project elaborates the idea of "RRI core pillars", focusing particularly on SMEs. The RESPONSIBLE INDUSTRY core pillars of RRI are: engagement, gender equality, science education, open access, ethics, and governance (Soraker, et. al., 2017). These pillars are contained in the RRI framework provided by the European Commission. However, it is evident from the RESPONSIBLE INDUSTRY project's outcomes that not all core pillars can be useful in all possible corporate scenarios, especially where SMEs are concerned.

The Deliverable investigates these pillars through the presentation of selected initiatives. The initiatives are categorised by type of innovation, instead of a per-sector or per-company-size list of initiatives. Investigating RRI dimensions that naturally correspond to types of innovation allows the investigation to take place in a more horizontal manner, i.e. without focusing on one business sector, or a type of business in terms of size. Thus, a discussion of how RRI *fits* in industry, but specifically in SMEs, can be undertaken in a more generic way, focusing on key initiatives and case studies, which present incentives for RRI implementation by showing benefits in the adoption of *responsible* practice in business. The Deliverable aims to complement the rest of WP1 activities by exploring key lessons learned from available implementations of RRI-relevant models in industry for different types of innovation, and in particular SMEs, where such information is available. The Deliverable aims to provide a set of incentives and corresponding benefits that could be used to support a business case for RRI.

As RRI is a relatively new topic, scarce literature exists, especially where particular sectors are concerned. The COMPASS (710543) project is exploring three specific sectors as its key innovation fields; biomedicine, nanotechnology, and cybersecurity. Given that the information available may not always pertain to these sectors, initiatives featured may be drawn from a wider range of business sectors; where possible, a short discussion of relevance to the sectors of interest to COMPASS (710543) is elaborated for each RRI horizontal aspect discussed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

The core sections of this Deliverable explore the aforementioned RRI aspects within specific types of innovation, and present some key initiatives which can serve as incentives for the implementation of RRI in SMEs. A summary of these incentives reinforces the business case for RRI. By inspecting the summary of RRI incentives, several conclusions regarding benefits for SMEs can be drawn. Specifically, such benefits include but are not limited to: financial gains, including direct profit; indirect financial gain through RRI-related structures and initiatives; increased productivity and reduced costs; enhanced business reputation both to customers and potential collaborators through the alignment with local and global policies and standards. Some initiatives demonstrate beneficial access to resources that can improve business quality, e.g. through training or collaborative practice.

Section 1 introduces the Deliverable and describes the context in which the systematic review has taken place, focusing on how evidence-based research and practice is used to support the presentation of results.

Section 2 presents the results under different innovation types according to specific RRI aspects presenting initiatives to support the identified business benefits, and describing the inclusion and exclusion criteria for concluding on a set of initiatives that can support the business case for RRI.

Section 3 offers discussions and conclusions on the benefits and incentives that could potentially support a business case for RRI in SMEs. A summary of these benefits is offered in this section for easy access.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

1. RRI Overview

1.1. Introduction

This Deliverable aims to present a business case for Responsible Research and Innovation (RRI), by undertaking a systematic review of relevant literature, case studies, projects and initiatives, and adopting key lessons reached by preceding projects, e.g. RESPONSIBLE INDUSTRY, an EU funded project, which explores how private businesses can conduct their activities responsibly[1]. The aim of the systematic literature review is to gain a better understanding of benefits that are linked with the implementation of *responsibility* in business through various types of responsible innovation initiatives.

1.1.1. Approach

The purpose of a systematic literature review is to become informed by the best available research evidence and practices. Systematic reviews aim to identify, evaluate and summarise the findings of relevant studies, therefore, focusing on the collective findings of a particular single issue. This Deliverable focuses on presenting benefits for the use of RRI in SMEs through this process. Combining the results of several studies gives a more reliable argument towards the effectiveness of RRI use. The reviewed material has been evaluated under focused inclusion and exclusion criteria, which inform the final analysis and synthesis of the selected studies.

The first criterion deals with the selection of studies that present evidence-based research and practice. The purpose is to identify and collate the evidence towards identified benefits and incentives. In addition to research articles the systematic literature review will present several case studies and relevant policies. Evidence-based research and practice enables the development of specialised guidelines that cover specific domains of knowledge that are directly linked to the Deliverable's central question on RRI benefits.

The second criterion is to carefully identify the context of the reviewed studies, since the systematic literature review must be cross-disciplinary, spanning more than one field of study, e.g. Social Science, Business and Management, Ethics, etc. Attempting to apply a systematic literature review across disciplines is not straightforward:

> *There are a number of challenges to be overcome: poorly defined topics; inconsistent use of keywords and controlled vocabulary; abstracts that do not effectively communicate the content of the paper or are not accessible in bibliographic databases and resource and technology problems*. (Curran, et. al., 2007)

The third criterion is to clearly specify the processes in question; RRI mainly refers to research and innovation approaches that consider **ethical acceptability**, **sustainability aspects** and **societal aspects.** Thus**,** D1.1 focuses on these RRI aspects as they relate to specific dimensions of innovation, i.e. they are presented per innovation type for business, and

[1] *http://www.responsible-industry.eu/*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

specifically for SMEs where such information is available. RRI is discussed by looking at specific aspects related to innovation types, namely, **social innovation** as a new form of research and innovation; **open innovation** and its contribution to **business sustainability** and to **open access** (as a core R&I concept increasingly beneficial for businesses and SMEs in particular); responsible innovation relevant to **environmental considerations**; **ethical considerations** for responsible innovation; **policies, standards and codes of conduct**; **gender and diversity issues, and workplace equality**. The topic of RRI in industry, specifically in SMEs, is discussed in this Deliverable, focusing on key initiatives and case studies which present incentives for RRI implementation by demonstrating benefits in the adoption of *responsible* practice.

Additional criteria to complete the systematic literature review, include an adequate and appropriate search strategy; selecting without bias the studies and initiative to be included; evidence on the quality of the selected studies and study designs; and overall sufficient evidence to allow this Deliverable to offer some conclusion that accurately reflect the evidence that was reviewed, in response to the initial question set to be answered by D1.1.

As scarce literature exists from the particular sectors that the COMPASS (710543) project is exploring as its key innovation fields, (biomedicine, nanotechnology and cybersecurity), the initiatives featured may be drawn from a wider range of business sectors or research and innovation initiatives. For each RRI horizontal aspect discussed, a short discussion on any relevant effects to the three sectors of interest to COMPASS (710543) is elaborated.

1.1.2. Defining RRI

To complement the rest of WP1 activities, the discussion of relevant literature and key lessons learned from the implementation of RRI models in industry, and in particular SMEs, will ultimately provide a set of benefits and incentives that could be used to support a business case for RRI. Each section tabulates a number of selected initiatives for easier access, and a discussion of incentives and resulting benefits is offered in Section 3. Such incentives will inform the rest of the COMPASS (710543) project, to better promote and motivate additional activities in the remaining Work Packages.

> It is important to define RRI for the purposes of the following discussion. The European Commission's Definition of RRI from the *Responsible Research and Innovation* report (2012) published under the Science in Society initiative is ***Responsible Research and Innovation*** *means that societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of European Society [..] an ambitious challenge for the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches*

According to (Soraker, et. al., 2017):

> *RRI is a recent expression that is being used by the European Commission to denote part of its research and innovation strategy […] used in EU policies, funding programs,*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

> *funded research projects, and increasingly also in the academic literature, both in Europe and abroad*.

One of the main outcomes of RESPONSIBLE INDUSTRY elaborates the idea of "RRI core pillars", which have provided a direction for RRI aspects, which the current Deliverable considers in terms of incentives and benefits, focusing particularly on SMEs. The RESPONSIBLE INDUSTRY core pillars of RRI are: engagement, gender equality, science education, open access, ethics, and governance (Soraker, et. al., 2017). These pillars are contained within the RRI framework provided by the European Commission.

1.2. Corporate Innovation Management and RRI

Investigating the RRI core pillars, it is evident that they cannot be useful in all possible corporate scenarios in the same way, especially where SMEs are concerned. This conclusion was also identified by RESPONSIBLE INDUSTRY, where it was highlighted, for instance, that open access and science education are not viable options for an SME (Soraker, et. al., 2017). COMPASS (710543) will pursue its investigation of the significance of science education in subsequent project activities, understanding it as a core aspect of RRI that can be useful for the implementation of RRI in SMEs within the selected business sectors.

According to the literature, incentives for an SME should directly reflect profit, or profit potential, and thus Soraker et. al. (2017) emphasize the need to demonstrate that RRI can result in:

> *strengthening links with customers and end-users, enhancing the company reputation, decreasing business risks and unintended consequences, strengthening public trust in the safety of products, adopting an environmentally friendly profile*.

The COMPASS (710543) project seeks to show through ongoing activities that while profit-oriented incentives are certainly viable, a business's contribution to solving societal challenges is also an overarching benefit.

This Deliverable investigates aspects of RRI that are aligned with the above targeted results, where benefits have been evident and tackled by relevant research and discourse. Each section discusses the importance of the specific innovation aspect and provides a list of initiatives and success stories to demonstrate the beneficial use of the particular aspect in industry, and more specifically, to SMEs.

Corporate innovation management has been addressed within many corporate strategies, to provide a solution for the challenge of any corporate business; that the workforce is eventually trapped within a certain routine without ever thinking outside the box (Mitra, 2016). Corporate innovation management aims to support ways of encouraging creativity and innovation. Sramana Mitra (2016), the founder of *One Million by One Million,* a virtual incubator helping one million entrepreneurs, globally, reach one million dollars, has repeatedly emphasized the importance of corporate innovation management and how the workforce should be trained to identify and validate innovation opportunities.

RRI is closely linked to this concept, as it is a process, "by which societal actors and innovators become mutually responsive to each other with a view to the acceptability, sustainability and societal desirability of the innovation process" (Von Schomberg, 2012). Implementing an RRI framework within a company, whether this is a large corporation or an SME, ensures the desired corporate innovation management that will provide a platform for evolution and

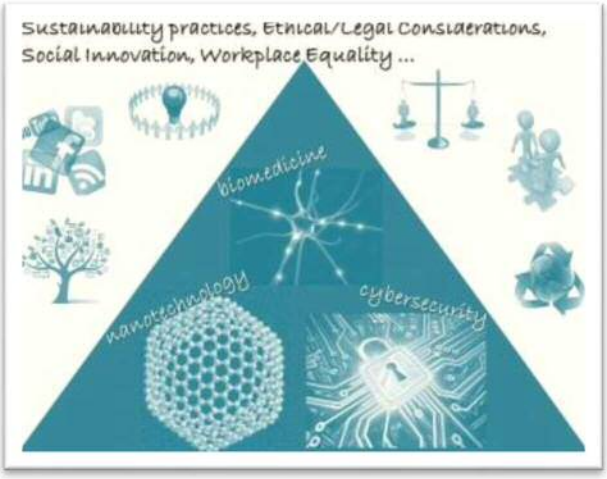
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

creativity through innovation; ensuring that it is explored *responsibly*, i.e. ethically and transparently in sustainable, highly reputable ways.

1.3. RRI in SMEs

RRI can be a tool that provides a business with "guidance on how to move from an abstract concept to a more concrete approach" (Davalli, 2017), so that entrepreneurs and business decision-makers can identify and take advantage of the new potential that RRI can offer. This potential may vary between SMEs in different sectors, a fact explored in the COMPASS (710543) project through the exploration of the key business sectors of biomedicine, nanotechnology, and cybersecurity. However, SMEs practicing in different sectors may also share common *horizontal* aspects of RRI, which is particularly significant for SME innovation management across the set of business sectors.

According to Mwangi and Namusonge (2014), and based on Annual Reports from the United Nations Industrial Development Organization (UNIDO), SMEs constitute more than 90% of enterprises worldwide; therefore, it is significant to target cross-sectoral aspects and opportunities for added value. Overall, cross-sectoral aspects of innovation and responsibility have been targeted by Corporate Social Responsibility (CSR) literature, a concept quite closely related to RRI. However, the concept of RRI is concerned with carrying out research and innovation responsibly, with consideration for the potential impacts for society; CSR is a more industry-driven concept, incorporating responsible strategies such as community philanthropies (Soraker, et. al., 2017) to strengthen the business' profile, or the corporation's role in the market.



It is important to note that studies have shown CSR is associated mostly with large companies and not SMEs. Larger companies are more concerned with their public profile because they attract more media attention and they are "particularly concerned to protect and enhance their reputation with the broader public as well as key stakeholders" (Smith, 2013). Nevertheless, *responsibility* should concern companies of all sizes, especially when SMEs have obvious advantages, such as commitment by the management, personal relationships among employees, and less-obvious advantages such as comparatively fewer resources, all of which can help elevate business profitability potential by engaging with RRI (Smith, 2013*).*

The following sections focus on selected aspects of RRI that target cross-sectoral issues, and emphasize any added value for the **biomedicine, nanotechnology**, and **cybersecurity** sectors. Benefits are drawn from selected initiatives and success stories presented under each RRI aspect explored, with special focus on the relationship with SME success.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2. Incentives and Benefits from RRI Implementation

2.1. Important Aspects of RRI Implemented in Industry

The need to define common processes of implementing an RRI framework in industry was highlighted early on by the European Commission (2009). Given that RRI is still a work in progress, the identification of relevant initiatives in this section aims to ultimately evaluate potential benefits from the implementation of RRI in industry in general. Where applicable, it is attempted to turn the highlighted benefits towards SMEs in the specific sectors explored by the COMPASS (710543) project; biomedicine, nanotechnology and cybersecurity.

The initiatives and highlighted success stories presented provide examples of the implementation of RRI in industry, according to the criteria for this systematic literature review outlined in Section 1. The presented initiatives attempt to best represent the *atmosphere* of RRI's current implementation in industry categorised by type of innovation. The initiatives presented should not be used as a set of solutions to the RRI implementation process in industry, but more as a guide to relevant successful practices. The selection of initiatives attempts to emphasize the underlying benefit in each case, and thus examples from geographical regions outside Europe are presented. The geographical range of a specific initiative is highlighted in brackets in the tabularised examples. In such cases the Deliverable attempts to link lessons learned to the European context.

RRI literature mostly refers to RRI discourse, which has "predominantly been designed to be applied to publicly funded research and innovation activities" (Soraker and Brey, 2014). The COMPASS (710543) project aims to shift focus towards industry, e.g. the aim to be inclusive in the implementation process, considering all stakeholders, in order to involve a range of expertise and perspectives (Stilgoe, et. al., 2013). Therefore, it becomes significant to focus on core aspects of RRI and explore the applicability of these aspects in industry.

Consequently, this Deliverable investigates innovation aspects that are aligned with industrial targets in order to direct RRI implementation towards benefits that can inform the business case, as these aspects have been tackled by relevant research and discourse. Each of the following sub-sections discusses the importance of a specific aspect and further provides a set of initiatives and success stories to demonstrate the beneficial use of the particular aspect in industry, and to SMEs. The selected RRI aspects include discussion on: **social innovation** as a new form of research and innovation; **open innovation** and its contribution to **business sustainability** and to **open access** (as a core R&I concept increasingly beneficial for businesses and SMEs in particular); responsible innovation relevant to **environmental considerations**; **ethical considerations** for responsible innovation; **policies, standards and codes of conduct**, **gender and diversity issues, and workplace equality**.

Innovation management is the management of such activities as idea generation, and development of technologies, products or processes, so there is a benefit in incorporating contributions from relevant field experts, such as scientists, engineers, psychologists, etc. Innovation can be understood as novelty brought to (economic) use, so R&D management can also be innovative.

Cross-sectoral aspects of innovation and responsibility have been targeted by corporate social responsibility literature, a concept quite closely related to RRI. However, the concept of RRI

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

is more concerned with carrying out research and innovation responsibly, rather than engaging corporations in responsible practices such as community philanthropies (Soraker, et. al., 2017). Overall, it is important to understand that "RRI is still very much a work in progress" (Soraker and Brey, 2014). However, there is a need to offer more concrete translation of the RRI concept into business practice and move away from theoretical conceptualisation and consequent ambiguity (Owen, et. al., 2012).

2.2. Social Innovation

RRI aims to support a refinement of the roles and responsibilities of stakeholders in R&I in business; social innovation becomes an important dimension of an innovation form that business stakeholders can assume within the context of RRI. Social innovation strengthens the RRI concept beyond the ethical aspect, often linked directly to responsibility. Furthermore, it is significant for the COMPASS (710543) project to emphasize the benefits of a business's contribution towards the solution of societal challenges in order to highlight emerging social innovation as a contributor to RRI and hence evaluate some of its features.

2.2.1. Social Innovation as a New Form of R&I in SMEs

Given that RRI mainly refers to research and innovation approaches that consider ethical acceptability, sustainability aspects and societal aspects, this section will address responsible innovation as it relates to **societal aspects**. Overall, innovation is paramount to the survival and growth of any business (Mwangi and Namusonge, 2014); however, SMEs are not always able to support *responsible* innovation fully. However, SMEs can adapt responsible innovation, like other organisations, based on their contextual preconditions. Incorporating innovation, and more specifically responsible innovation processes, should therefore be approached differently in SMEs than when incorporating innovation in large organizations (which often support dedicated CSR departments), because of the ability and willingness to consider the trade-off between immediate profit, and RRI support mechanisms for non-immediate value in terms of profit.

Nevertheless, SMEs have several advantages over large organisations that could elevate innovation management. SMEs usually have good internal communication and foster dynamic management styles (Jones and Rowley, 2011). In particular, process innovation (i.e. adaptation / improvement of production processes), may ultimately help improve the company's productivity (Chesbrough and Crowther, 2006).

Companies within the nanotechnology sector are expected to promote and support a high level of innovation that relates to society, as it is a sector "impacting modern social life and economies" (Galatsis et. al., 2015). Recently the sector has been transformed by information technology. This transformation was caused by a rapidly growing technological sector, and has resulted in challenging social issues that need to be addressed, such as job losses, or gender equality and diversity in technical sectors. There is an eminent need for *responsible* practices to address these social issues, in addition to many others that fall under the umbrella of *responsibility*, such as environmental issues, and new policies, which are discussed in detail in subsequent sections.

Social innovation aspects are further observed in the sectors of cybersecurity and biomedicine. Specifically, social innovation is addressed within the context of cybersecurity, where it is often related to protecting social infrastructure from security threats. The new technological threats often relate to the increasingly popular *Internet of Things* concept, where

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

devices and people are all connected together and supported by the same networking infrastructure, with cybersecurity companies providing tools to protect this all-accessible infrastructure against *non-responsibly acting* malicious attackers (Miyao, 2016). The cybersecurity effort needs to consider both the technological and the organizational level, and a wider implementation of RRI can act as an ally to this effort. In addition, innovation and growth has been promoted within the area of biomedicine, which relates to "the changing relationship between the private and public sector in the use of human genomics and personal medical information" (Martin and Hollin, 2014). The relationship is transforming into a collaborative one, offering a better foundation for *responsible* practices in the private sector that will be encouraged by the public sector. Martin and Hollin (2014) recognize that the sector is moving towards this direction since *"throughout the 2000s a series of UK and EU public policy initiatives were taken to promote innovation and growth of the […] commercial development of biotechnology in particular"*.

2.2.2. Relevant Initiatives and Success Stories

The following initiatives have been selected to demonstrate social innovation within and for business that have resulted in the following benefits: support structures for social innovation (e.g. incubators and additional job opportunities), and increased business productivity and lower costs.

The corresponding success stories begin with two European projects, which developed new social incubators for new socially innovative SMEs; BENISI and TRANSITION. Both BENISI & TRANSITION are socially innovative projects launched by the European Commission that are mandated to help social entrepreneurship and innovation in Europe in local, regional and international contexts. BENISI[2] is a project for building a European network of incubators for social innovation, where local social enterprises are supported in scaling up and growing beyond their locality. In addition to supporting the scaling up of social enterprises across Europe, TRANSITION[3] also provides learning output on which scaling methodologies are most effective in a given region. Statistics from the EBN Annual Observatory and Impact Hub Network on the success stories of BENISI and TRANSITION show social innovation across Europe. Specifically, incubated companies (i.e. socially innovative SMEs) show a **90% survival rate** after three to five years, post-incubation phase. In 2014, 3000 SMEs have been developed in 150 incubators and innovation centres, **creating 13000 jobs** with an average contribution of 8000 Euros per job (Davalli, et. al., 2016).

An interesting initiative comes from Nigeria, although it was implemented in a very different setting from European SMEs. The small and medium scale industries equity investment scheme (SMEIES) is an **initiative of the bankers' committee in Nigeria**. The commercial and merchant banks have agreed to set aside 10% annually of their profits before tax as their contribution to the development of SMEs, **encouraging meaningful employment generation and the development of indigenous technology**, (Mohammed and Abimiku, 2015). These new financing approaches recognized the inherent weakness of SMEs in terms of resources, and the need to design finance schemes and products that are unique to them. These features and needs are observed to different degrees in SMEs globally. There are lessons to be extracted here, since one of the demotivating factors for SMEs implementing RRI is usually the lack of resources (Soraker and Brey, 2014). External support could be

[2] *www.benisi.eu*
[3] *www.transitionproject.eu*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

sufficient motivation to engage SMEs with the RRI implementation process, but external support need not always be financial; it, can exist in the form of support for **training** (European Commission, 2009a), **clustering** (Organisation for Economic Co-operation and Development, 2000), etc.

Additional success stories for social innovation come from initiatives of the Rapid Results Institute, a non-profit organisation; specifically the TenSquared initiative in Turkey, and the Integrated Social and Health Care project in the UK.

In 2015, Rapid Results Institute, with the generous support of the Walt Disney Company, launched a programme named TenSquared, to enable factories in Istanbul and Iskenderun, Turkey, to improve occupational health and safety through worker engagement. This initiative resulted in: reduced exposure time to dangerous substances by 70.4%; reduced absenteeism due to accidents by 60%' **increased productivity by 12%,** with improved communication channels helping improve the workers' perceptions of management's commitment to health and safety.

In 2013, Rapid Results Institute partnered with Nesta Social Innovation Foundation in an attempt to accelerate the pace of **integrating social and health care** for elderly and at-risk populations in Essex. Challenges were overcome when the multiple stakeholders committed to finding creative ways to reduce the pressure on acute care services without compromising the quality of care. This effort resulted in a **12% decrease in unplanned hospital admissions** among the at-risk population, with the most important impact being the **emerging culture of collaboration and coordination between social and health care organizations**, and between primary and secondary health care organizations. The program was extended to other UK locations in subsequent years, achieving a sustained, **long-term impact**.

Table 1 summarises the above initiatives and success stories regarding innovation in general, and responsible innovation specifically, giving emerging benefits:

Table 1 – Initiatives that showcase new forms of research and innovation

Initiative Name	Summary and Outcomes
BENISI & TRANSITION projects (EU)	**Benefit: Support for Social Innovation e.g. provision of additional job opportunities** **Support structures** for Social Innovation, e.g. Benisi & Transition; incubated companies show a **90% survival rate** after three to five years, post-incubation phase: **Benisi** ***www.benisi.eu*** is a European project for building a European network of incubators for social innovation, where local social enterprises are supported in scaling up and growing beyond their locality. **Transition** ***www.transitionproject.eu*** is a European project which, in addition to supporting scaling up social enterprises across Europe, also provides learning output on which scaling methodologies are most effective in a given region.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Small and Medium Scale Industries Equity Investment Scheme – SMEIES (Nigeria)	**Benefit: SMEs can benefit through external aid (in financial or other form)** **Innovation** (development of indigenous technology) in SMEs can find **financial support** – need to design financing for SMEs that are unique to them: The commercial and merchant banks in Nigeria have agreed to set aside 10% annually of their profits before tax as their contribution to the development of SMEs.
TenSquared (Turkey)	**Benefit: Increased Productivity** TenSquared enabled factories in Istanbul and Iskenderun, Turkey, to improve occupational health and safety through worker engagement. One of the many benefits of this social initiative was the **increased productivity** of the workers. *http://www.rapidresults.org/*
Integrating Social and Health Care (UK)	**Benefit: Reduced business costs** The project accelerated the pace of **integrating social and health care** for the elderly and at-risk populations. Multiple stakeholders committed to finding creative ways to reduce the pressure on acute care services without compromising the quality of care. This effort resulted in **major reduction of cost** since there was a **12% decrease in unplanned hospital admissions** among the at-risk population. *http://www.rapidresults.org/*

2.3. Open Innovation

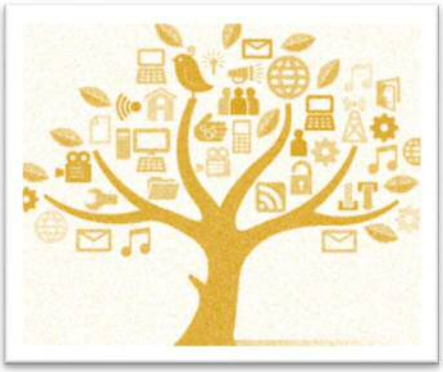
According to the European RRI-TOOLS project[4], "Open Innovation is about sharing the knowledge of many different players to co-develop products and services that better meet society's needs" (RRI-TOOLS, 2014). The concept relates, on the one hand, to business sustainability through directly involving customers in the business strategy, and on the other hand, uses concepts such as Open Science and Open Data to support new methods of doing research and non-traditional ways of communicating through knowledge sharing. The uses of open innovation paradigms in business are demonstrated in the following subsections; benefits such as enhanced reputation with customers, and use of additional resources through knowledge sharing, are demonstrated in the selected initiatives.

[4] *https://www.rri-tools.eu*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.3.1. Open Innovation Contribution to Business Sustainability

Business sustainability can be enhanced by the use of open innovation strategies, particularly through consideration of how evolving communication technology is shifting the dynamics of the provider-customer relationship. Open innovation offers the opportunity to customers to support or not a particular business and its practices.



For instance, environmental awareness in business is an element often addressed through open innovation by external stakeholders, e.g. customers. Thus, sustainable development in a business can be significant to the future business sustainability. According to the *Brundtland Report* (1987), sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This report of the United Nations World Commission on Environment and development was communicated in the 1992 Rio World Conference on environment and development. Specifically it emphasized aspects of the environment, society and economy that must be considered for sustainability. In particular, it is significant that there are mechanisms in place so that (a) diversity, energy and natural resources are preserved, (b) needs in terms of health, education, living conditions, employment, and the prevention of exclusion are met, and, (c) wealth is created and material life conditions are improved. In 2002, the European Commission supported these views by formally stating that “businesses need to integrate the economic, social and environmental impact in their operations”.

Sustainable development is becoming more and more significant as the world of media diversity and information openness allows stakeholders to interact with a company more directly. SMEs can be as popular (or not) as much larger corporations, since the world of media, and in particular, social media is more easily accessible; nevertheless a consideration of the socio-economic standing and knowledge of social media users still reveals a gender and age gap (Di Gangi and Wasko, 2016). Furthermore, RRI appeals to customers, and implementation of such concepts can bring an SME much closer to its external stakeholders. Several examples of the use of **social media in relation to *responsible* practice**, which can strengthen or weaken a company’s reputation, and consequently the potential for its future business sustainability, are presented next.

Although the following examples are not specific to the sectors of biomedicine, nanotechnology and cybersecurity, there has been evidence that sustainability is significant in these sectors. Kaloyeros (2014), one of the participating speakers in the *Practicum in Innovative Sustainability Leadership* at Columbia University, and the Senior Vice President and Chief Executive Officer at the College of Nanoscale Science and Engineering, emphasized the importance of sustainability for successful technological innovation with an emphasis on nanotechnology. O’ Hare (2010) claims that “sustainability and cybersecurity are two sides of the same coin […] each depends on the other”, while Berg (2013) discusses the need for an enterprise’s stakeholders to “engage in serious and thoughtful self-examination”, and presents the example of the American Society for Biochemistry and Molecular Biology Public Affairs Advisory Committee, which focuses on “moving toward a sustainable biomedical research enterprise”.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.3.2. Relevant Initiatives and Success Stories

Companies can use open innovation tools to generate new ideas and invite the world to solve problems together. Several articles, referenced in Table 2, have addressed such initiatives, which have developed from a local effort to a global campaign in several examples. The main benefit that emerges from engaging with such tools is the enhanced reputation of the business with its customer base.

Unilever, a leader in corporate sustainability, according to *The Guardian* (2014), has used an online open forum to hold an open discussion on sustainability issues, and posted a list of "challenges and wants" requesting ideas for solving big issues, receiving more than one thousand ideas from the public[5]. InnoCentive, EMC and EDF[6] ran an **Eco-Challenge** seeking solutions for tracking shipments of used electronic components and subsystems and ensuring that they are disposed of in a responsible manner. Another notable open innovation model included Heineken's $10000 sustainable packaging contest[7], asking the public to propose ideas for sustainable beer packaging, which yielded numerous quality ideas from designers around the world based mainly on innovativeness and feasibility.

Consumers can act around a green issue and pressure companies to change their behaviour. Some notable campaigns have challenged specific companies. In the initiatives discussed here the companies took action to rectify the relationship with their customers as well as reinforce a *responsible* reputation once the social media movements broke out. Companies affected by such campaigns include Universal Pictures, Crayola and Dunkin' Donuts.

Universal Pictures was singled out by the public on social media about adding environmental education to *The Lorax* movie, especially the movie website. The campaign was started by students and was completed successfully in 2012. Crayola featured in social media as a company that should enhance its recycling practices, especially for markers. This campaign was started by an elementary school's class video, which got the attention of the company. Crayola responded by committing to helping reduce waste and pollution. Dunkin' Donuts was asked to replace its styrofoam cups, with a petition signed by more than three hundred thousand people, which gained recognition in national USA news. The company committed to the change.

Table 2 summarises several of the above-mentioned initiatives and success stories across the globe regarding the effect on sustainability of open innovation, and the significance of social media and online campaigns for a company's **reputation and relationship with its customers**:

[5] *https://www.greenbiz.com/blog/2012/06/07/how-unilever-crowdsourced-creativity-meet-sustainability-goals*
[6] *https://www.innocentive.com/emc-edf-and-innocentive-launch-new-eco-challenge-for-crowdsourced-solutions-to-key-e-waste-issue/*
[7] *http://www.sustainablebrands.com/news_and_views/articles/heineken-launches-open-innovation-challenge*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Table 2: Initiatives that showcase new sustainability solutions

Initiative Name	Summary and Outcomes
Open innovation (Global)	**Benefit: enhanced reputation with existing and potential customers** Articles have addressed open innovation initiatives, which can develop **from a local effort to a global campaign**. Instances of consumers' **successful use of social media** towards sustainability, helping companies **enhance their reputation** include Unilever's *challenges and wants*, InnoCentive's *Eco-Challenge*, and Heineken's *sustainable beer packaging call.* *Relevant Articles:* *https://www.greenbiz.com/blog/2012/06/07/how-unilever-crowdsourced-creativity-meet-sustainability-goals* *https://www.innocentive.com/emc-edf-and-innocentive-launch-new-eco-challenge-for-crowdsourced-solutions-to-key-e-waste-issue/* *http://www.sustainablebrands.com/news_and_views/articles/heineken-launches-open-innovation-challenge*
Green Issues on Social Media (Global)	**Benefit: enhanced reputation with existing and potential customers** Some notable social media campaigns challenged the following companies, which took action to rectify the relationship with their customers and reinforce a ***responsible*** **reputation**; Universal Pictures, Crayola and Dunkin' Donuts: *Relevant Articles:* *http://www.ecowatch.com/fourth-graders-ask-universal-pictures-to-let-lorax-movie-speak-for-the-1881577971.html* *http://www.mnn.com/family/family-activities/blogs/kids-convince-crayola-to-recycle-markers* *https://www.change.org/p/dunkin-donuts-stop-using-styrofoam-cups-and-switch-to-a-more-eco-friendly-solution*

2.3.3. RRI and Open Access

Open access is a research principle, promoting openness, transparency, and integrity, which aims to allow access to knowledge for all, enabling the participation of society and improving research collaborations. The goal is open access to peer-reviewed literature. This research and innovation principle appears at first glance to be contradictory to the private nature of enterprises participating in a competitive market, where it is not expected to share and collaborate. The goal is to find a common ground between the two worlds, in a way that will be beneficial for companies to adopt the principle of openness, without compromising their competitive edge in the market.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Where companies receive funds, e.g. through **Horizon 2020**, they must participate in open access publications. Moreover, initiatives such as **Science 2.0** and **Open Science**, **Open Data**, and **Communication 2.0** complement **open access** and motivate this paradigm further.

2.3.4. Relevant Initiatives and Success Stories

Open access to scientific peer reviewed publications is an underlying principle for any funded project under Horizon 2020, and forms part of the *Rules and Regulations* for participation, outlined in documentation such as the Horizon 2020 Annotated Model Grant Agreement, which is publicly available. Horizon 2020, in a large proportion of its calls, aims to finance *innovation in SMEs*; several calls pertain to activities that target industrial and commercial success with high SME participation. This funding opportunity respects the principle of *Responsible Research and Innovation*, and thus, open access.

The concept of **Business Communication 2.0** addresses how the process of communication in business has been affected by, and needs to be further adjusted to certain technology advancements that are rapidly becoming the new communication norms. Social media and social networking technologies point to just one example of such new communication norms, however, the underlying principles of the new communication pathways focus on the **lack of geographical boundaries, a sense of community, openness, and transparency**.

The use of new communication and networking paradigms has already begun to affect how business is done. Given the continuous evolution of virtualization, contextualization, and novel ways of data mining in the information world, then it should be expected that this information-sharing trend will continue to penetrate the business communication world even more strongly, through the use of more media and **reaching more stakeholders**.

The definition for the concept of **Open Data** is taken from the *Open Data Handbook* promoted by *Open Knowledge International,* a global non-profit organization focused on realizing open data's value to society. According to the *Open Data Handbook,* which is a set of guides, case studies and resources mainly for government and civil society on why and how to use open data, data must be both *technically open* and *legally open*.

The question of how Open Data is useful to SMEs is addressed in *Open Data: A twenty-first century asset for small and medium-sized enterprises (*Verhulst and Kaplan 2015). The report emphasizes that the open and shared data trend has "*the power to fuel economic growth, job creation and new business opportunities"*. The report presents 354 case studies of companies (SMEs and start-ups) that are using open data and how this can help contribute ultimately to each company's **economic growth**.

Finally, the concepts of **Science 2.0** and **Open Science** promote scholarly sharing assisted by technology, especially new technologies like *Web 2.0*. Examples may include scientists using collaborative technology to share ideas, data or findings. Collaborative web technology provides several tools to achieve such collaborations, for instance, wikis, blogs and video journals (Waldrop, 2008). Overall, open innovation achieved through science 2.0 and open science concepts and tools, and further supported by Web 2.0 technologies, offer **new opportunities for collaboration, research and education** through harnessing collective intelligence (Tacke, 2010). This can be a **powerful asset for SMEs**, which are usually under-

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

resourced in terms of a wide variety of **scientific expertise**. This is especially applicable in **highly technical sectors** and corresponding SMEs, such as the COMPASS (710543) key sectors of biomedicine, nanotechnology and cybersecurity.

Table 7 presents initiatives relevant to open access, a concept core to responsible research and innovation, offering a summary of how each initiative relates to enterprises overall, and SMEs where applicable:

Table 7 - Initiatives that showcase use of open access

Initiative Name	Summary and Outcomes
Horizon 2020 Open Access Requirements (EU)	**Benefit: better funding opportunities** Open access to scientific peer reviewed publication is an underlying principle for any funded project under Horizon 2020 calls, included in the Rules and Regulations for participation but also in documentation such as the Horizon 2020 Annotated Model Grant Agreement. *http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf*
Business Communication 2.0 (Global)	**Benefit: collaborations with other businesses** The concept of business communication 2.0 addresses how the process of communication has been affected by, and needs to be adjusted further to certain technology advancements that are rapidly becoming the new communication norms. The use of new communication and networking paradigms has already began to affect how business is done and given the continuous evolution of **virtualization, contextualization**, and novel ways of **data mining** in the information world, it should be expected that this information sharing trend will continue to penetrate the business communication world even more strongly, through the use of more media and **affecting more stakeholders**.
Open Data (Global)	**Benefit: access to additional resources** According to the *Open Data Handbook,* which is a set of guides, case studies and resources mainly for government and civil society on why and how to use open data, data must be both *technically open* and *legally open*. Open data can eventually help a company's **economic growth**. *http://opendatahandbook.org/*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Science 2.0 and Open Science (Global)	**Benefit: opportunities for new collaborations and education** Overall, open innovation achieved through science 2.0 and open science concepts and tools and further supported by Web 2.0 technologies, offer **new opportunities for collaboration**, **research and education.** This can be a **powerful asset for SMEs**, which are usually under-resourced in terms of a wide variety of scientific expertise.

2.4. Environmental Considerations for Responsible Innovation

In addition to the social impacts discussed in the previous section, it is important that environmental impacts are considered when discussing responsible innovation. Significant progress has been achieved where environmental considerations in business are concerned, including for SMEs. Several initiatives, policies, and reports have been dedicated to aligning responsible environmental practices to several direct and indirect business benefits. Incentives for a business to undertake such responsible practices are motivated by the selected initiatives below, and include external support such as training, additional profit through for example moderation of waste, and reputation within a sector by following widely accepted regulations and standards for environmental practice.

2.4.1. Environmental Aspects in SMEs

SMEs have limited resources but can be profitable through **environmental sustainability actions** as long as these actions pertain to **cost reduction** such as reduction of fuel usage, reduction of paper usage, etc. Examples show that personal interest, experience, and knowledge coming from SME key employees usually drives discussion towards successful environmental strategies in SMEs. However, there is generally a lack of knowledge of environmental sustainability, and thus a need for training, education and access to specialist information for SME employees and management. Several professional bodies, such as the Association of Chartered Certified Accountants (ACCA), promote environmental sustainability in SMEs by providing its members with knowledge and training in relevant standards.

There is evidence of some awareness and good environmental practice among SMEs but they are collectively difficult to influence in that direction. Since business activities end up having an impact upon the ecosphere with consequences of certain current environmental practices that can be detrimental to the natural environment, the collective impact of such effect must be addressed (Spence et al. 2012),

While the individual impact of SME activities is usually small, collectively they are critically important. Given that collectively SMEs comprise the vast majority of private enterprises globally, it becomes imperative that environmental practices towards environmental sustainability are not neglected (Jayeola, 2015). Furthermore, it is significant for SMEs to recognise that they can be accountable environmentally, and that this is important for SMEs because of their very strong linkages to specific stakeholder groups, (employees, local communities, etc.), with those that are closely tied to the SME itself such as employees, clients and suppliers feeling more responsible (Uhlaner et al. 2012).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.4.2. Relevant Initiatives and Success Stories

Environmental sustainability and relevant SME accountability are issues that have hitherto been topics of concern for SMEs, but especially, since the late 1990s and early 2000s.

Although there have not been many specific studies on environmental sustainability specifically for biomedicine-related companies, Gurren and Ruddick (2009) elaborate on how biomedicine and environmental ethics "share common cause", and examine case studies on drug development and food production to identify common ground. However, the environmental sustainability of businesses has been an important dimension for businesses of any size for many years. There have been many initiatives regarding environmental sustainability for a business, including training from professional bodies, tailored to focus on potential profitable solutions.

The Certified Accountants Educational Trust published a report emphasizing the role of the **accountant in environmental sustainability actions**, specifically, how the accountant can offer *"support and advice to their small and medium-sized enterprise (SME) clients on environmental aspects of sustainability"* (Spence, et. al., 2012). The type of advice on environmental issues that accountants can offer to SMEs, the resources that can be drawn upon in the provision of such advice, and the training and knowledge that accountants need in order to support SMEs on the environmental aspects of sustainability are some of the topics addressed in the report.

Specifically, accountants can discuss environmental sustainability in discussions about **costs, profits, budgets, risk management, and strategy**. It is important that topics of environmental sustainability are introduced once there is a trusting relationship between the accountant and the SME representative as such topics are often not viewed as traditional business topics. Nevertheless, the **profitable aspects of such practices** should be emphasized by the accountant.

Additionally, professional bodies such as ACCA offer **information resources** on environmental sustainability (including relevant regulation), as well as **education** on specific environmental sustainability issues for business, such as the implications of resource depletion and energy scarcity. For accountants, **training in specific environmental accounting techniques** involves development of environmental auditing skills; knowledge of carbon costing, etc. (Spence, et. al., 2012).

With regards to environmental sustainability there are already certain standards and policies in place that companies can use. The **ISO 14001** is a standard that a company or organisation can follow to set up an effective environmental management system, without necessarily stating specific requirements for environmental performance.

The **EU Eco-Management and Audit Scheme** (EMAS), has additional and stricter requirements than the management system supported by ISO 14001. EMAS is a voluntary environmental management instrument offered by the European Commission since 1993, for all types of organisations including SMEs. EMAS requirements must be met before an organisation is registered with EMAS. Nevertheless, close to five thousand organisations and eight thousand sites are currently registered.

McKeiver and Gadenne (2005) studied several factors that could influence the implementation of an environmental management system and claimed that **SMEs are often engaged in informal environmental management systems** without engaging in formal systems such as EMAS or ISO14001. Table 3 summarises the above-mentioned initiatives regarding environmental considerations in SMEs.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Table 3 - Initiatives that showcase responsible consideration of environmental aspects

Initiative Name	Summary and Outcomes
Biomedical and Environmental Ethics Alliance (USA/Global)	**Benefit: potential profitable solutions** The focus of this initiative is on how **biomedicine and environmental ethics "share common cause"** - case studies on drug development and food production are examined. *http://link.springer.com/article/10.1007%2Fs11673-009-9198-6*
Environmental Aspects of Sustainability, published by **Certified Accountants Educational Trust** (UK/Global)	**Benefits: access to additional resources, possibilities for profit** The report emphasizes how the accountant can support SME clients on environmental aspects of sustainability, e.g. **the training and knowledge** that accountants need. It is important that topics on environmental sustainability are introduced once there is a **trusting relationship**, between the accountant and the SME representative. The **profitable aspects of such practices** should be emphasized by the accountant. http://www.accaglobal.com/content/dam/acca/global/PDF-technical/small-business/rr-128-001.pdf
Professional Training (UK/Global)	**Benefit: additional access to information resources and education possibilities** Professional bodies such as ACCA offer **information resources** on environmental sustainability (including relevant regulation) as well as **education** on specific environmental sustainability issues for business, e.g. resource depletion and energy scarcity. http://www.accaglobal.com/content/dam/acca/global/PDF-technical/small-business/rr-128-001.pdf
EU Eco-Management and Audit Scheme – EMAS (EU)	**Benefit: enhanced reputation within sector** **EMAS Regulation** is a voluntary **environmental management instrument** by the European Commission for all organisation types, including SMEs.: *Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC* Statistics on EMAS Registration from the EMAS Helpdesk *ec.europa.eu*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

ISO14001 (Global)	**Benefit: enhanced reputation within sector** This is a standard that a company or organisation can follow to set up an effective environmental management system, without necessarily stating specific performance requirements. *http://www.iso.org/iso/catalogue_detail?csnumber=60857*
Informal Environmental Management Systems (EU/Global)	**Benefit: reputation with internal stakeholders and customers** **SMEs are often engaged in informal environmental management systems** without engaging in a formal EMS such as the EMAS or ISO14001.

2.5. Ethical Considerations for Responsible Innovation

In research it is significant to produce outcomes that abide by area-specific ethical codes of conduct, so that the work is appropriately morally grounded. Responsible innovation implemented in business needs to abide by the same principles, and the current section explores the core ethical issues often found in business practices, and identifies the benefits of such ethical practices, such as enhanced business reputation, both within a specific business sector and within the local and global business community.

2.5.1. Ethics & SMEs

Core ethical issues must be targeted when attempting to enhance workforce skills and knowledge, especially in SMEs, where RRI implementation will most likely require some sort of employee training; minimal RRI training would imply that the required new skills and knowledge are already present within existing human resources, which is often unlikely due to the size and consequent lack of a breadth of expertise across the smaller-sized SME workforce. The success of such attempts in an SME is based on the following ethical aspects that must be taken into account: *truth and transparency* (on behalf of the management in order to maintain the significant personal relationships which are core for SME success); *trust and loyalty* (especially on behalf of the workforce, in response to truth and transparency), (O' Regan and Sims, 2010).

In addition to a trusting relationship between management and employees, in SMEs trust needs to span relationships between the SME and customers, suppliers and the community (Business Ethics Briefing, 2007). Smaller companies are often asked to demonstrate social and environmental credentials and ethical risk management, such that ethical values and principles guide business decisions. Benefits can be almost immediate for SMEs, such as for example increased employee loyalty and decreased employee turnover, which is a significant issue for SMEs, as well as attracting high quality new staff and a favourable view from the community. Moreover, such decisions lead to the support of ethical employees, and the SME runs reduced integrity risks (Business Ethics Briefing, 2007).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.5.2. Relevant Initiatives and Success Stories

Regarding ethical aspects relevant to services and products in the biomedicine industry, it is often expected that ethical dimensions will need to be considered, due to the data-sensitive and even intrusive nature of some of these services and products. In addition to biomedicine-related companies, the nanotechnology and cybersecurity sectors also have strict ethical guidelines. Examples of initiatives on ethics in these fields are described here.

The Nanoethics anthology, *Nanotechnology & Society: Current and Emerging Ethical Issues* published in 2008, addressed the most significant issues of nanotechnology at the time of publication, but also predicted future issues through a collection of papers written by researchers, policy experts and nanoethics scholars. The papers addressed ethical risks and ethical issues relevant to several aspects of nanotechnology.

The USA National Cybersecurity Institute (2015) reiterates several items from a list of ethical behaviours as these relate to cybersecurity. Specifically, the behaviours outline computer and technology usage in a way that does not cause harm to hardware, software or people, as well as the social consequences of these behaviours.

The importance of ethically acceptable behaviour for a company is acknowledged by organizations like Forbes. Forbes has created a relevant initiative, *the List of Most Ethical Businesses*[8]*,* and announces the most ethical businesses within an annual ranked list, with the help of Scottsdale, an organisation monitoring ethical business practices. In 2016, the list included 131 companies from 21 countries representing 45 industries.

Ethical practices in business have been highlighted by several articles on the accountability of businesses for socially responsible and ethical practices. *Fortune* ranks Global 500 companies annually on ethical accountability both globally and per company, with companies such as Vodafone and Carrefour making the list and experiencing a consequent **reputation boost**. Inversely, companies that have been highlighted by the media as unethical have suffered with regards to their reputation, resulting in the collapse of many of these companies because of the extent of the highlighted corporate scandals. Such companies include Enron, WorldCom, Tyco and Lehman Brothers.

Table 4 summarises these initiatives and success stories and demonstrates how ethical principles can successfully guide business decisions, offering a summary of how each initiative relates to SMEs, where applicable:

[8] *http://www.forbes.com/sites/karstenstrauss/2016/03/09/the-worlds-most-ethical-companies-2016/#1e6142b773dc*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Table 4 - Initiatives that showcase ethical considerations in business

Initiative Name	Summary and Outcomes
Nanoethics Anthology by Springer (Global)	**Benefit: enhanced reputation in sector** The Nanoethics anthology, *Nanotechnology & Society: Current and Emerging Ethical Issues* (2008), addressed the **most significant issues of nanotechnology** at the time of publication but also predicted future issues through a collection of papers addressing ethical risks and ethical issues relevant to several aspects of nanotechnology. http://www.springer.com/gp/book/9781402062087
The Computer Ethics Institute (USA)	**Benefit: enhanced reputation in sector** The USA National Cybersecurity Institute (2015) reiterates several items from **a list of ethical behaviours** as these relate to cybersecurity. Specifically, the behaviours outline computer and technology usage in a way that does not cause harm. http://computerethicsinstitute.org/home.html
Forbes List of the World's Most Ethical Businesses (Global)	**Benefit: enhanced reputation in community** Forbes announces an **annual list** of the most ethical businesses. In 2016, the list includes 131 companies from 21 countries representing 45 industries. *http://www.forbes.com/sites/karstenstrauss/2016/03/09/the-worlds-most-ethical-companies-2016/#1e6142b773dc*
Ethical Behaviour and companies' reputation (Global)	**Benefit: enhanced reputation in community** *Fortune* ranks Global 500 companies annually on **ethical accountability** both globally and per company, with companies such as Vodafone and Carrefour making the list, and experiencing a **consequent reputation boost**. http://beta.fortune.com/global500/ Inversely, **companies that have been highlighted by the media as unethical have suffered**, resulting in the collapse of several of these companies, like Lehman Brothers for instance.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.6. Innovation in Policies, Standards and Codes of Conduct

The need for support of RRI in policy is evident and attempts are being continuously made towards that effect. The policies, standards and codes of conduct discussed here have been selected to demonstrate incentives of the adoption of such schemes in business, as they can bring sufficient benefits in terms of boosting consumer / client confidence in a business, as well as enhanced reputation within the international business community.

2.6.1. Introduction and Overview

Policies, standards and codes of conduct are well-known tools for enabling responsibility in companies from RRI-relevant domains, such as CSR. Soraker et. al. (2017), claim that such tools *"can significantly assist in the implementation of RRI since they are developed much more explicitly with private industry in mind"*. Policies and standards addressing ethical acceptability, risk management related to social, ethical and environmental issues, and human wellbeing, could evolve into relevant tools to enable an RRI framework for companies (European Commission, 2013). Lessons from past RRI projects have shown that it is expected that *"if an RRI-certification was implicitly or explicitly required in order to engage in certain projects […], companies dependent on such collaborations would have a very concrete and important reason to do so"* (Soraker, et. al., 2017).

According to Francois Ewald (1991), the link between responsibility and ethics has deteriorated over the last century because of introducing legislation around responsibility and the consequent separation of the concepts of fault and responsibility, so that the moral motivation for *doing the right thing* often needs to be supported by further means. Although it may be due to the judicial evolution of responsibility that the concept has deteriorated (Gorgoni, 2006), it is increasingly evident that a formalisation of responsibility in terms of policy, standards or codes of conduct is necessary in companies, and especially in SMEs, to promote the implementation of concepts such as RRI.

There is a need for RRI in industry and this is well-understood, however there are barriers to industry engagement (Soraker, et. al., 2017), especially where SMEs are concerned, mainly due to constrained resources. Therefore, it is important to allow the adoption of RRI practices without imposing them, within structured frameworks that can be presented in the form of policies, standards, or codes of conduct. Moreover, policy and industry should discuss the issues related to RRI, avoiding a top-down approach for RRI in industry (Soraker, et. al., 2017).

Biosci (2016), claims that foresight and values are necessary as part of a responsible research and innovation framework in order to modernize biomedical regulation. This is due to a new paradigm in biomedicine, and healthcare in general, which promotes more personalized and responsive methods for healthcare due to recent technology advancements. Changes do not come with regulatory issues, and as these are identified, the article further claims that RRI can *"facilitate the design of value-based regulation that is more 'future-proof' than many examples on which we currently rely"*.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.6.2. Relevant Initiatives and Success Stories

There is a wide tendency in private companies towards self-regulation to address RRI-related issues, especially to ensure consumer confidence through "*developing and applying codes of professional ethics*" (Castro, 2011). Aspects such as environmental controls, safety regulations, and advertising requirements are addressed under self-regulation, and the article explains how self-regulation actually can work successfully. Self-regulation (standards, codes of ethics, and even self-policing) is often required to replace either the lack of government regulation or excessive regulation. Thus, industry-specific *Self-Regulation Organizations* are formed, and collaborate with many stakeholders, including those representing consumers, as well as the public interest. Relevant certifications can hence aid in **boosting consumer confidence** in a company, which can make it **stand out in a competitive market**.

Significant policies, standards and codes of conduct to assist with the implementation of responsible practice that can be used by SMEs include: ISO 9000, ISO 26000, UN Global Compact, OECD Guidelines for Multinational Enterprises, and the European Commission guidelines for public procurement.

ISO 9000 is one of the most widely used set of standards for ensuring that products meet customers' requirements. It deals with quality management and quality assurance and it is significant to note that ISO 9000 does not only apply to specific industry sectors, and is appropriate for SMEs as it does not specify a specific company size. According to Meera (1998) this standard is especially applicable and significant to service industries, for instance information and communication technology industries, and the cybersecurity sector.

ISO 26000 is a set of standards developed to help companies regulate issues related to social responsibility, with special consideration for the company's stakeholders such as customers and employees, as well as regulations relevant to the company's environmental impact. ISO 26000 recognizes the complexity of applying social responsibility but emphasizes the significance of applying seven principles of socially responsible behaviour, namely: accountability, transparency, ethical behaviour, respect for stakeholder interests, respect for the law, respect for international norms, and human rights (Frost, 2011).

The United Nations Global Compact is an initiative based on commitments from company CEOs to implement universal sustainability principles, including environmental, social and governance goals. Currently, the *UN Global Compact Initiative* has recruited over nine thousand companies in more than 160 countries. The initiative provides opportunities for local engagement through action platforms and supports a library of its own publications in many languages.

The set of guidelines from the Organisation for Economic Co-operation and Development is not legally binding to participating multi-national enterprises. The OECD is an inter-governmental organisation with 35 member countries, mostly countries with high-income economies and high human development index. The guidelines are revisited every few years, most recently in 2011. Business ethics guidelines include discussions on: employment, human rights, environment, consumer interests, and science and technology.

The EC guidelines for public procurement (European Commission, 2010) could easily be integrated with RRI principles since they foster similar values and expectations. Specifically, the EC guidelines for public procurement outline the process by which public authorities purchase work, goods or services from companies in all sectors, such as health, energy or ICT. The aim of this set of guidelines is to enable transparency, fairness and competitiveness across businesses.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Table 5 summarises these policy-relevant information and initiatives, particularly as they demonstrate RRI-relevant concepts, further offering a summary of how each initiative relates to SMEs, where applicable:

Table 5 - Initiatives that showcase responsible policies, standards and codes of conduct

Initiative Name	Summary and Outcomes
Benefits and Limitations of industry self-regulation for online behavioural advertising (Global)	**Benefit: increased consumer / client confidence** There is a wide tendency in private companies to ensure consumer confidence through "*developing and applying codes of professional ethics*". Aspects such as environmental controls, safety regulations, and advertising requirements are addressed under self-regulation. Self-regulation is often required to replace either the lack of government regulation or excessive regulation. Thus, industry-specific *Self-Regulation Organizations* are formed, providing relevant certifications that **boost consumer confidence in a company**, which can then **stand out in a competitive market**.
ISO 9000 (Global)	**Benefit: enhanced reputation in community** ISO 9000 deals with quality management and quality assurance and is appropriate for SMEs as it does not specify a specific company size. *https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/qmp_2012.pdf*
ISO 26000 (Global)	**Benefit: enhanced reputation in community** ISO 26000 is a set of standards developed to help companies regulate issues related to social responsibility, as well as regulations relevant to the company's environmental impact. ISO 26000 emphasizes the significance of applying seven principles of socially responsible behaviour with regards to accountability, transparency, ethical behaviour, respect for stakeholder interests, respect for the law, respect of international norms, and respect for human rights. *https://www.iso.org/obp/ui/#iso:std:iso:26000:ed-1:v1:en*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

UN Global Compact (Global)	**Benefit: enhanced international reputation** An initiative based on commitments from company CEOs to implement universal sustainability principles, including **environmental, social and governance goals**. The initiative provides **opportunities for local engagement** through action platforms and supports a library of its own publications in many languages. www.*unglobalcompact.org*
OECD Guidelines for Multinational Enterprises (Global)	**Benefit: enhanced international reputation** The set of guidelines from the Organisation for Economic Co-operation and Development is not legally binding to participating multi-national enterprises. Business ethics are included in the guidelines about employment, human rights, environment, consumer interests, science and technology. *www.oecd.org*
The EC guidelines for public procurement (EU)	**Benefit: enhanced reputation among the European market** The EC guidelines for public procurement outline the process by which public authorities purchase work, goods or services from companies in all sectors, such as health, energy or ICT. The aim of this set of guidelines is to enable **transparency, fairness and competitiveness across businesses.**

2.7. Gender Issues and Workplace Equality

RRI is committed to enhancing research and innovation to its full potential. Gender issues and workplace equality are addressed in an attempt to drive teams and organisations towards their full potential, especially in sectors where the imbalance and lack of diversity are more broadly evident, such as technical sectors. Overall, there have been many initiatives to overcome this lack of diversity in research and technology, and the effort is ongoing with several projects currently addressing these issues (EGERA[9], FESTA[10], GARCIA[11], GENERA[12]). This section presents selected initiatives which demonstrate specific benefits for business, such as increased work opportunities, enhanced morale of workers, and productivity improvements.

[9] http://www.egera.eu/
[10] http://www.festa-europa.eu/
[11] http://garciaproject.eu/
[12] http://genera-project.com/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

2.7.1. Introduction and Overview

RRI involves gender equality as one core societal aspect, which also intersects with other dimensions of RRI (Schiffbänker, et. al., 2016). Thus, gender is for example an issue in **open innovation**, addressing the question of *'**Who** is participating in research?'*; in **ethics**, addressing the question of *'**How** is the risk of discrimination tackled?'*; in **policy**, addressing the question of '***Whether** equality standards are implemented*'. In addition, other diversity categories like *age*, *ethnicity* or *disability* may be equally important factors for SMEs for equality reasons, but also for the **quality of research and innovation**. This section addresses the gender dimension of RRI, specifically the current under-representation of women in research and innovation, as well as the benefits of moving towards workplace equality and how this can be applicable for SMEs.

Several barriers have been identified towards achieving gender equality in SMEs in general. For instance, a **lack of female role models in entrepreneurship and management positions**, **perception of issues arising due to childcare and parental leaves issues**, as well as **sector-specific and organizational cultures and structures**. SMEs can learn from good Managing Diversity and Gender Mainstreaming practices and also from CSR practices (Jamali & Dirani 2014).

A World Wide Worx (2014) has published relevant articles stating that *"women are key to SME success"*. There has been an increase in female entrepreneurship, but, having emphasized the importance of innovation for SMEs, there has been a lack of women in the research and innovation process (Busolt and Kugele, 2009), with women forming only 28% of the world's researchers (UNESCO, 2015). However, there has been an increase in female entrepreneurship (VanderBrug 2013). According to ITC News (2016), close to 40% of all SMEs are owned by women, with statistics generated from approximately 20 countries around the world. In addition, recent trends have shifted attention towards cultivating gender-friendly workplace cultures.

It is important to state here that for RRI, *"inclusion of equality issues should not be limited on addressing gender"* (Soraker, et. al., 2017). Therefore, SMEs should also look to issues such as age(ing), migration, ethnicity, religion, disabilities, and sexual orientation, which are part of the European non-discrimination and equality mainstreaming policy (European Commission 2011).

The benefits associated with Managing Gender and Diversity and the connected aim of workplace equality on the staff level are not only in compliance with European[13] and national equality laws (Klarsfeld et. al., 2014) but also higher employee satisfaction and loyalty, less staff turnover, a reputation as attractive employer, higher standards of collaboration and teamwork and problem solving capacity (Barak, 2016). **Consequently, SMEs should consider gender and diversity as an issue of recruitment and talent management.** The equality objectives can be achieved by implementing equality and labour standards (Council of Europe, 2015, Schiek and Chege, 2008). Considering gender and other diversity dimensions at the product and service levels, leads to **less biased outcomes** and therefore

[13] http://ec.europa.eu/justice/discrimination/law/index_en.htm

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

a **higher quality of products and services** which meet the needs of diverse groups of people (Schiebinger 2008).

Gender and diversity issues are often amplified in companies of smaller population (European Commission, 2013a). Consequently, this Deliverable gives further significance to gender-related issues and consequent benefits, evident in the initiatives presented below.

2.7.2. Relevant Initiatives and Success Stories

One of the most important initiatives addressing gender and equality issues in companies, and especially SMEs, is the *United Nations 2030 Development Agenda*. This initiative deals with trade, gender and SMEs, aiming to encourage an increase of women in SME participation in international trade. The *UN 2030 Development Agenda* has been adopted by 193 countries and focuses on sustainable development goals, especially on the *"transformation of discriminatory norms and gender stereotypes"*. Among the goals of the agenda to be achieved by 2030 is the following:

> *Ensure that all men and women, in particular the poor and the vulnerable, have the equal right to economic resources, as well as basic services, ownership and control over land and other forms of property.* (United Nations, 2015)

The *UN 2030 Development Agenda* discusses the need for enhancing women's economic education and training to support their equal rights and responsibilities, giving special attention to **promoting the economic role of women the economy** in general, and particularly in SMEs.

A 2015 article by the International Labour Organization (ILO), **highlights the contributions of the SCORE project** in contributing to **gender equality in SMEs in developing countries**. The article emphasizes that the *"ILO has long supported the fight for equality in the world of work, through the development and promotion of labour standards, gender focused campaigns – such as the Women at Work Century Initiative"* and that it is important how the project raises "awareness of gender issues among managers and employees" through training and support visits to SMEs.

Another successful initiative comes from the European Small Business Portal, which features success stories from SMEs across Europe. The stories are featured on the European Commission website. An important success story featured in this category is an initiative from a Slovakian SME, Regionfemme, run by entrepreneur Luica Haquel, which provides **consulting and training for women** to start up their business. By 2014, Regionfemme had already made a difference, with 56 out of 107 participants opening their own businesses, thus increasing women entrepreneurs in Europe.

Additional initiatives include: *UKRD Group*, *Gendered Innovations*, *Yellow Window*, and *GenPort*. *UKRD Group* is a multimedia company in the UK; diversity management is central to the company's human resource strategic goals, which include the development of an inclusive and integrated workforce. *Gendered Innovations* is an ongoing website project which collects and documents case studies of research and innovation which highlights the relevance of gender issues. *Yellow Window* provides a toolkit (process model and checklist) for considering gender during the whole research and innovation process. *GenPORT*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

represents a community of practice concerning gender issues in science, technology and innovation.

Table 6 presents a summary of these initiatives and success stories, which demonstrate gender issues and equality in the workplace opportunities, all of them tailored to SMEs:

Table 6 - Initiatives that showcase diversity and gender equality

Initiative Name	Summary and Outcomes
UN 2030 Development Agenda (Global)	**Benefit: increased opportunities for women in trade** This initiative deals with trade, gender and SMEs, aiming to encourage an increase of women in SME participation in international trade. The *United Nations Development Agenda* has been adopted by 193 countries and focuses on sustainable development goals, especially on "transformation of discriminatory norms and gender stereotypes". *https://sustainabledevelopment.un.org/post2015/transformingourworld*
SCORE project: Sustaining Competitive and Responsible Enterprises (Global / Developing countries)	**Benefit: Improvement in productivity** The International Labour Organization (ILO) has supported equality in the workplace and has promoted gender focused campaigns, such as the *Women at Work Century Initiative* and raises ***a*wareness of gender issues** among managers and employees through **training and support visits to SMEs**. *http://www.ilo.org/empent/Projects/score/lang--en/index.htm*
European Small Business Portal (EU / Slovakia)	**Benefits: opportunities for training, increased job opportunities** Several success stories from the **European Small Business Portal** are featured on the European Commission website. An important success story featured in this category is an initiative of a Slovakian SME, Regionfemme, run by entrepreneur Luica Haquel, which provides **consulting and training for women to start up their business**. *ec.europa.eu/small-business/success-stories/2014/*
UKRD Group (UK)	**Benefits: enhanced workforce morale** UKRD Group is a multi-media company in the UK. The company owns and operates a portfolio of websites, a software-licensing firm, and 16 local commercial radio stations. **Diversity management** is central to the company's human resource strategic goals, which include the development of an **inclusive and integrated workforce**. UKRD Group acknowledges the benefits of a diverse workforce, and invests much in ensuring that the work-environment is free from discrimination. Moreover, the company endeavours to promote the principles of

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

	diversity in all its operations with employees, job applicants, suppliers, clients, recruitment agencies, contractors, and the public. *https://writepass.com/journal/2017/01/strategic-benefits-of-effective-diversity-management/*
Gendered Innovations (Stanford University)	**Benefits: increased business opportunities, increased workforce morale** Gendered Innovations is an ongoing website project which **collects and documents case studies of research and innovation which highlights the relevance of gender issues**. It provides practical examples from medicine, science and engineering. *http://genderedinnovations.standford.edu*
Yellow Window (2009)	**Benefit: supportive tools to support workplace equality** Yellow Window provides **a toolkit** (process model and checklist) **for considering gender** during the whole research and innovation process. It also gives examples from nanotechnology and biotechnology. *http:// www.yellowwindow.be/genderinresearch/index_downloads.html*
GenPORT	**Benefit: opportunities for support for workplace equality** GenPORT represents a community of practice concerning **gender issues in science, technology and innovation**. *http://www.genderportal.eu/*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

3. Discussion and Conclusions

This review has scanned current literature and key initiatives to identify clear benefits from using RRI in industry, in order to provide a set of incentives for adopting RRI practices to SMEs in the sectors of biomedicine, nanotechnology and cybersecurity. Examples of such benefits are captured in the initiatives and success stories that have been presented throughout this Deliverable.

The incentives may vary for different stakeholder relationships in an SME, e.g. there are different incentives for managers interacting with employees than for managers interacting with customers. Figure 1 summarizes the set of benefits that have been identified in this Deliverable as possible incentives for an SME to implement RRI. Figure 1 further provides examples from the initiatives and case studies presented in Section 2, relating them to specific RRI aspects.

Several conclusions regarding **benefits for SMEs** can be drawn from the summary of RRI incentives in Figure 1. Such benefits include **financial gains**, including direct profit but also financial support through RRI-related structures and initiatives; **increased productivity** and **reduced cost**; **enhanced business reputation** both to the customers and also to potential collaborators through the alignment with local and global policies and standards; **access to resources** that can improve business quality, e.g. through training or collaborative practice, and **enhanced workforce morale**.

Financial gains have been observed in newly established businesses which participated in incubation initiatives that supported them because they promoted social innovation. These SMEs have demonstrated profitable behaviour in the examples presented, but have also **increased productivity** and **reduced cost** by correcting behaviours and practices that previously resulted in resource waste, all in addition to supporting society and ethical practice. Furthermore, the advance of technology has affected business practices, where the company's online presence is becoming increasingly significant, and the company's practices are continuously under public scrutiny. Aligning with RRI practices can give any company the chance to **enhance its reputation** thus attracting both customers and collaborators. Abiding by the open access paradigm to the extent that it does not interfere with a company's competitiveness can provide a **platform of additional resources**, including information, services and partnerships, eventually improving the quality of a business. Finally, abiding by an ethical code of conduct and supporting diversity and equality can result in **elevated morale** for the workers.

RRI implementation can contribute positively to an SME's business pipeline, and additional gains include *"a better understanding of possible consequences of products or insights into the demand side*" (Soraker, et. al., 2017). Results from the RESPONSIBLE INDUSTRY project have further shown that *"potential economic incentives and competitive advantages should be explained"* to companies prior to the implementation of RRI (Soraker, et. al., 2017). This review has outlined several success stories where RRI in general, but also RRI aspects have been employed resulting in both qualitative and quantitative payoffs.

It has been identified throughout the presented case studies, initiatives, and reports that to motivate RRI implementation, or any aspect of it, there should be a business case for implementation, i.e. a way to project tangible business outcomes or benefits from the implementation. According to Soraker, et. al., (2017), *"the key to successful implementation*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

of RRI in industry is to do so in a way consistent with business success". Towards that effect, the Deliverable has presented selected examples of successful implementation of RRI aspects in business, and has identified useful aspects applicable to SMEs in general, as well as SMEs in the COMPASS (710543) project-relevant sectors of biomedicine, nanotechnology, and cybersecurity.

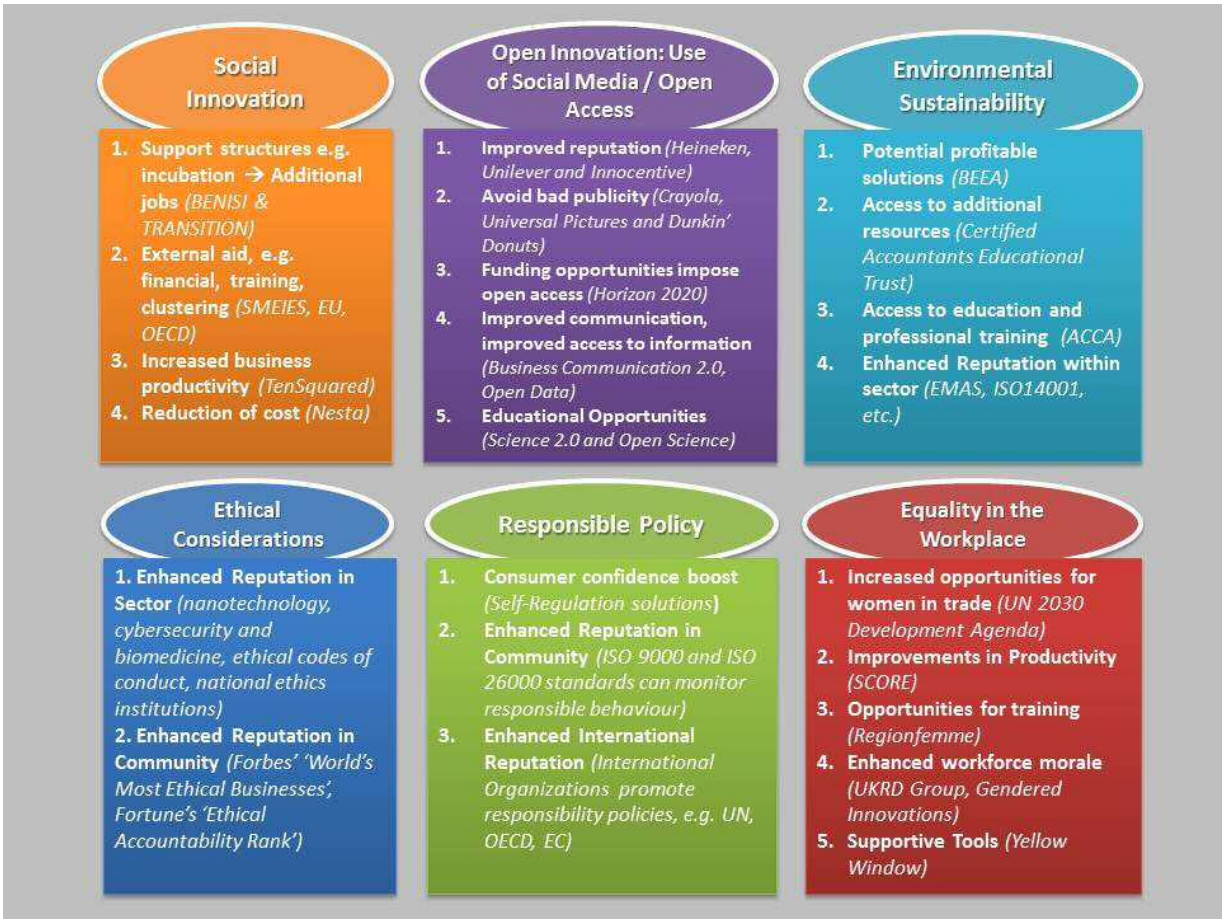


Figure 1: The six innovation areas identified in this Deliverable are linked to a summary of incentives as identified in Section 2.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

4. Further Reading and References

Barak Michàlle and E. Mor (2016): Managing diversity: Toward a globally inclusive workplace. 4th Edition, Sage, London/Thousand Oaks.

Berg, J. (2013). Imagining a sustainable biomedical enterprise, *ASBMB Today,* Accessed: December 2016 http://www.asbmb.org/asbmbtoday/asbmbtoday_article.aspx?id=48265

Business Ethics Briefing (2007). Business Ethics for SMEs, *Institute of Business Ethics, December 2007, Issue 6.*

Busolt, Ulrike/Kugele, Kordula (2009): The gender innovation and research productivity gap in Europe. International Journal of Innovation and Sustainable Development, 4(2-3) 109-122.

Castro, D. (2011). Benefits and Limitations of Industry Self-Regulation for Online Behavioural Advertising, *The Information Technology & Innovation Foundation Report, pp. 1 - 14*

Chesbrough, H., and Crowther, A. K. (2006). Beyond High Tech: early adopters of open innovation in other industries, *Journal of R&D Management,* 36(3), pp. 229-236.

Council of Europe (2015): Council of Europe Key Standards on Gender Equality and Women's Rights. Online: http://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=090000168058feef

Curran, C., et. al. (2007). Challenges in multi-dosciplinary systematic reviewing: a study on social exclusion mental health policy, *Social Policy and Administration, 41(3): 289-312.*

Davalli, C. (2017). All Scale Innovation, *RRI Tools Blog.* Posted: January 2017. *https://blog.rri-tools.eu/-/all-scale-innovation*

Davalli, C., et. al., *eds*. (2016). *Scaling Social Innovation*. BENISI – TRANSITION: experiences and first success stories of the two European networks of incubators for social innovation. *Joint Report of BENISI and TRANSITION projects,* DG Research and Innovation, FP7-CDRP-2013-INCUBATORS.

Di Gangi, P. M., and Wasko M. (2016). *Social Media Engagement Theory: Exploring the Influence of User Engagement on Social Media Usage*, In: Journal of Organizational and End User Computing (JOEUC), 28(2), 53 – 73, DOI: 10.4018/JOEUC.2016040104

European Commission (2009). *Global Governance of Science - Report of the Expert Group on Global Governance of Science to the Science*, Economy and Society Directorate, Directorate-General for Research, European Commission. Luxembourg: Office for Official Publications of the European Communities.

European Commission (2009a). *Guide for Training in SMEs,* Directorate-General for Employment, Social Affairs and Equal Opportunities, Unit F.3.

European Commission (2012). Responsible Research and Innovation: Europe's ability to respond to societal challenges, *Research and Innovation Policy*. DOI: 10.2777/11739

European Commission (2013). Science with and for Society, *Horizon 2020 - Work Programme 2014-2015.*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

European Commission (2013a). Diversity for Talent and Competitiveness: The SME Business Case for Diversity. See http://www.iegd.org/pdf/Task%202%20-%20SMEs.pdf

Ewald, F. (1991). Insurance and Risk, in G. Burchell, C. Gordon and P. Miller (eds) *The Foucault Effect: Studies in Governmentality*, pp. 197-210. London: Harvester/Wheatsheaf.

Frost, R. (2011). ISO 26000 Social Responsibility – The Essentials, *ISO News. http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1558*

Galatsis, et. al. (2015). Nanoelectronics Research Gaps and Recommendations, *IEEE* Society and Technology Magazine, June 2015, pp. 21-30.

Gorgoni, G. (2006). La responsibilite comme projet. In Pavie, X., et. al. (2014), The emergence of the Responsible Innovation Concept, *Responsible Innovation: From Concept to Practice,* p.11.

Iatridis, K., & Schroeder, D. (2015). *Responsible Research and Innovation in Industry: The Case for Corporate Responsibility Tools*. Cham, Switzerland: Springer International Publishing.

Jamali, Dima and Dirani, Ali (2014): Synergies of CSR and diversity management: a converging agenda. In: Karatas-Özkan, Mine, Nicolopoulou, Katerina, Özbilgin, Mustafa F. (ed.) Corporate Social Responsibility and Human Resource Management. A Diversity Perspective. Edward Elgar, Cheltenham, 51-65.

Jayeola, O. (2015). The impact of environmental sustainability practice on the financial performance of SMEs: A study of some selected SMEs in Sussex, *International Journal of Business Management and Economic Research,* 6(4), pp. 214-230.

Jones, R., and Rowley, J., (2011). Entrepreneurial Marketing in small businesses: A conceptual exploration, *International Small Business Journal,* 29(1), pp. 25 – 36.

Kaloyeros, A. E. (2014). The Role of Clean Technology and Sustainability, *Practicum on Innovative Sustainability Leadership,* K4310, Columbia University.

Klarsfeld, Alain, Booysen, Lize A.E., Ng, Eddy, Roper, Ian, Tatli, Ahu (2014): International Handbook on Diversity Management at Work. Country Perspectives on Diversity and Equal Treatment. Edward Elgar, Cheltenham.

Martin, P., and Hollin, G. (2014) A new model of innovation in biomedicine? *http://nuffieldbioethics.org/wp-content/uploads/A-New-Model-of-Innovation_web.pdf*
Martinuzzi, A., and Krumay, B. (2014). The Good, The Bad, and The Successful – How Corporate Social Responsibility Leads to Competitive Advantage and Organizational Transformation, *Journal of Change Management,* 13(4), pp. 424-443. .

Mitra, S. (2016). Corporate Innovation Management: Lessons Learned, *One Million by One Million Blog.* Posted: July 2016, Accessed: December 2016.

Miyao, T. (2016). Protecting Social Infrastructure from Creeping Threats – Robust Security against attack is not achieved in a day, *Social Innovation Hub,* Hitachi. *http://social-innovation.hitachi/eu/topics/security/index.html*

Mohammed, A., and Abimiku, J. (2015). Innovation among Small and Medium Enterprises in Nigeria, *Journal of Resourcefulness and Distinction, 11(1).*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

Mwangi, M. S., and Namusonge, M. J., (2014). Influence of Innovation on Small and Medium Enterprise (SME) Growth – A Case of Garment Manufacturing Industries in Nakuru County, *International Journal of Innovation Education and Research,* 2(5), pp. 31-41.

O' Hare, E. (2010). Sustainability and Cybersecurity: Two Sides of the Same Coin, *Great Government Through Technology Blog. https://gsablogs.gsa.gov/technology/2010/07/28/sustainability-and-cybersecurity-two-sides-of-the-same-coin/*

O' Regan, N., et. al. (2010). Training in SMEs and its relationship to profitability, *International Journal of Human Resources Development and Management,* 2(10), pp. 166-181.

Organisation for Economic Co-operation and Development (2000). *Small and Medium-sized Enterprises: Local Strength, Global Reach,* OECD Observer Policy Brief June 2000.

Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. Science and Public Policy, 39(6), 751-760.

RRI-TOOLS (2014). *A Practical Guide to Responsible Research and Innovation: Key Lessons From RRI Tools. https://www.rri-tools.eu/documents/10184/16301/RRI+Tools.+A+practical+guide+to+Responsible+Research+and+Innovation.+Key+Lessons+from+RRI+Tools*

Schiek, Dagmar and Chege, Victoria (2008): European Union Non-Discrimination Law, Comparative Perspectives on Multidimensional Equality Law. Routledge, London.

Schiebinger, Londa (2008): Gendered Innovations in Science, Medicine, and Engineering. Online. http://genderedinnovations.stanford.edu

Smith, C. N. (2013). When it comes to CSR, Size Matters, *INSEAD Knowledge,* FORBES. *http://www.forbes.com/sites/insead/2013/08/14/when-it-comes-to-csr-size-matters/#50c069811b6f*

Soraker, J. H., et. al. (2017). Models of RRI in Industry, *Responsible Industry Deliverable D3.3, 7th Framework* Programme.

Soraker, J. H., and Brey, P. A. E. (2014). Current Discourse of RRI, health, demographic change and wellbeing, *Responsible Industry Deliverable D1.1, 7th Framework Programme.*

Spence, et. al. (2012). Environmental Aspects of Sustainability: SMEs and the Role of the Accountant, *ACCA Research Report 128,* Certified Accountants Educational Trust: London.

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. Research Policy, 42(9), 1568-1580.

The Guardian (2014). *The expert view: top corporate sustainability leaders of 2014,* Guardian Sustainable Business. https://www.theguardian.com/sustainable-business/blog/sustainability-leaders-2014-unilever-patagonia-interface-marks-spencer

Trott, P. (2012). *Innovation Management and New Product Development*, 5th Ed., Harlow: Pearson Education Limited.

Uhlaner, L. M., Berent-Braun, M. M., Jeurissen, R. J., & de Wit, G. (2012). Beyond size: Predicting engagement in environmental management practices of Dutch SMEs. *Journal of Business Ethics, 109*(4), 411–429.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543

UN Documents: Gathering a Body of Global Agreements (1987). Report on the World Commission on Environment and Development: Our Common Future, *Transmitted to the General Assembly as an Annex to document A/42/427- Development and International Cooperation: Environment.*

UNESCO (2015). Women in Science: UIS Fact Sheet, *UNESCO Institute for Statistics,* November 2015, No. 34.

United Nations (2015). Transforming Our World: The 2030 Agenda for Sustainable Development, *United Nations Sustainable Development Knowledge Platform,* A/RES/70/1.

VanderBrug, Jackie (2013): The global rise of female Entrepreneurs. Haward Business Review. Online. https://hbr.org/2013/09/global-rise-of-female-entrepreneurs

Verhulst, S., and Caplan, R. (2015). Open Data: A Twenty-First Century Asset for Small and Medium-Sized Entrprises, *Governance Lab 2014,* Creative Commons Attribution 4.0 International License.

Von Schomberg, R. (2012). Prospects for technology assessment in a framework of responsible research and innovation. In Technikfolgen abschätzen lehren (pp. 39-61): Springer.

Von Schomberg, R. (2013). A vision of responsible research and innovation. In R. Owen, M. Heintz & J. Bessant (Eds.), Responsible Innovation (pp. 51-74). London: John Wiley.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 710543