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A Framework for implementing Responsible Research and Innovation in ICT for an ageing society

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A Framework for implementing Responsible Research and Innovation in ICT for an ageing society

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FOREWORD

Responsible Research and Innovation (RRI) is a **newly emerging** approach to govern science and innovation. Currently, its main champions are European funding agencies[1]. Hence, to date this approach has been mostly used for publicly funded research and innovation. What about industry, one might ask? A lot of research and innovation takes place outside the publicly funded sphere and, indeed, the **European Commission** is interested in applying the concept to private industry.

A pessimist might say: "Goodness no, not yet another innovation governance framework. They just keep coming. I hope we can wait until this one blows over."

By contrast, an optimist might ask: "What, actually is it, RRI?".

There are many academic definitions, but in essence, they all try to say the same thing.

"**Be more responsive**; don't sit isolated in your laboratories with innovations that will create serious ethical issues later, consult with your consumers and end-users early, take their values and needs into account"; "try to minimize your harmful impact on the world and future generations" and generally, "anticipate, reflect, deliberate and be responsive".
Both the pessimist and the optimist might say, "Is there something in it for us?" And, indeed, early research shows that there is.

By doing innovation responsibly you will contribute to a better world and you will benefit!

1 For instance, the European Commission under its research framework Horizon 2020, the Dutch Research Council, the Norwegian Research Council or the UK Engineering and Physical Sciences Research Council, to name just a few examples of important sponsors of RRI.

HOW WILL THIS BE ACHIEVED?

- → By strengthening links with customers to get insights into their needs and preferences
- → By better matching of societal expectations
- → By undertaking foresight activities as part of risk management
- → By stimulating and motivating the workforce
- → By mitigating environmental impacts
- → By ensuring compliance with qualified norms and standards

THEREBY:

- → Enhancing your company reputation
- → Decreasing business risks and unintended consequences
- → Strengthening public trust in the safety of your products
- → Increasing the acceptability of your products
- → Adopting an environmentally friendly profile
- → Optimizing your medium-term competitiveness/profitability

EXECUTIVE SUMMARY

The Responsible-Industry Project intends to demonstrate how industry can work together with societal actors to integrate principles and methodologies of Responsible Research and Innovation (RRI) into research and development processes.

The project focuses on ICT-based solutions (applications, products, services) for an ageing society, a growing sector combining two essential aspects for RRI: it is research and technology intensive and it raises significant social and ethical dilemmas that need to be addressed during product development.
A Framework for pursuing RRI has been designed over the last two years through an iterative process, which has included literature analysis and broad stakeholder consultation through interviews, workshops and a two-round Delphi Exercise.
The Framework provides industry with strategic options and recommendations for pursuing responsible practices in research and innovation, and improving ethical acceptability, social desirability and quality of their devices, products and services.
The Framework, which is primarily directed at CEOs, senior executives and project managers of industry, will be further developed in a series of case studies and other testing activities planned in the next two years of the project. It has a threefold purpose:

First, the Framework proposes a vision for RRI, emphasizing key aspects of this concept that emerged from the project analysis and consultation with stakeholders. In particular:

→ RRI is an umbrella term, covering a variety of actions to be implemented along the entire process of R&I. It could help the company both to:
- Increase (internal) awareness of ethical and social impacts of R&I processes and adapt the company governance and practices to address those impacts
- Promote responsible practices in R&I that are already adopted by the company to stakeholders and shareholders through an unique and acknowledged approach

→ RRI integrates several concepts that are already developed in the CSR area, but with an increased focus on research and innovation

→ RRI requires ethical and social needs to be taken into account and the process of R&I to be made more inclusive all along the value chain. End-user and stakeholder engagement are essential

→ Integrating RRI practices along the different steps of the research and development process could help to

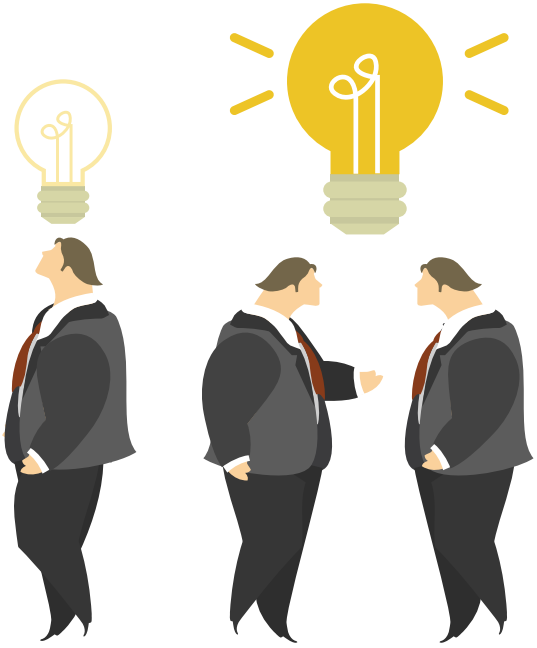
anticipate and mitigate ethical and social impacts of the applications and products of innovation. Early stage actions could be highly effective in terms of results (product usability, desirability, acceptability, quality) and use of resources (reducing R&I costs)

→ Differences between responsibility and liability should be considered and reflected in the discourse on RRI. While responsibility issues are relevant in all stages of the R&I value chain, liability is more relevant to later stages (market entry)

→ RRI requires the embedding of responsible practices throughout the company. It is about a change of thinking (vision) of the organization

→ RRI is a step beyond compliance with regulation. It is about enhancing the quality of research and innovation processes and products

Second, the Framework has identified and selected key options and recommendations



for implementation of RRI in companies active the ICT for an ageing society, based on the following key questions: Who is responsible for what? How can RRI be integrated along the value chain? How can ethical and social impact analysis be performed? What tools can be used for RRI? Recommendations can be summarized as follows:

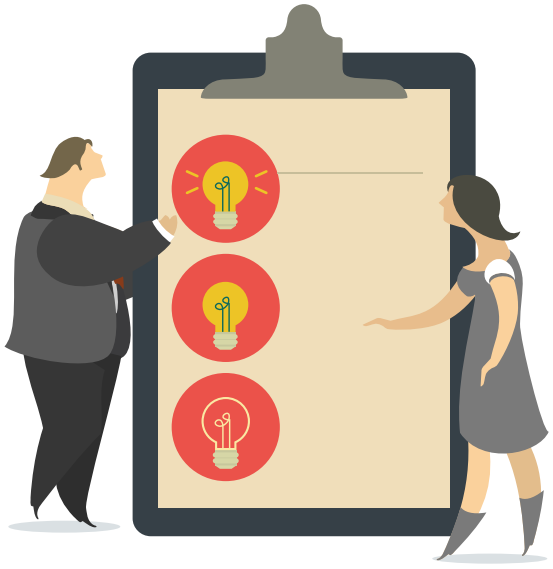
- → Reflect on a vision for RRI within the organization, promoting capacity building and instilling RRI in the culture of the organization
- → Integrate RRI into existing structures and processes, including R&I, CSR, quality and other company functions
- → Promote reflection and awareness of ethical and societal issues related to specific R&I products in ICT for an ageing society
- → Perform in depth ethical analysis of ICT products/services from early stages of the R&I value chain
- → Support early identification of appropriate preventive and precautionary measures
- → Foster stakeholder engagement, and in particular end users, from early stages of product development
- → Pursue open and transparent communication with stakeholders about risk and impact
- → Perform ongoing assessment and management of the impacts of ICT products and services, both in the short/medium term and longterm
- → Ensure training and professional development opportunities to enable staff to fully participate and take responsibility
- → Foster multidisciplinarity between engineering, natural sciences, ethics and social sciences
- → Apply equality principles in recruitment and career progression

Third, the Framework provides examples of policy and communication actions which could facilitate and support industry in pursuing RRI (RRI facilitators).
This part underlines that RRI needs a holistic approach: besides industry commitment, all stakeholders should play a role in setting the conditions to fully exploit the potential benefits of RRI. Key areas of action include:

- → Optimizing/adapting the existing regulatory framework
- → Setting incentives for the adoption of voluntary governance tools and RRI practices
- → Increasing awareness of ethical and societal issues
- → Providing training and fostering a RRI culture

Finally, the Framework provides a selection of resources with respect to guidelines and good practices related to different aspects of RRI in ICT for an ageing society, as determined by different stakeholders in this area. These include references to other projects and initiatives, standards and other

voluntary tools, European legislation and a detailed glossary of relevant terms.
Operationalization of RRI is a complex business and there is a need to individualize practice on a case-by-case basis.
The perception of both responsibility and ethical and social values are dynamic; they change over time and strongly depend on customs, values, codes of conduct, law, etc.
Evaluation of responsibility, ethical and social impact need to be context-sensitive.
Therefore this general Framework will be used to co-create specific Implementation Plans when tested in a variety of scenarios (SME's vs. large companies, different departments or different functions inside the same company, different technology areas, etc.).
The project analysis has shown that adoption of RRI practices could strongly support companies in designing ethically acceptable, affordable, accessible, reliable and easy to use ICT systems, products and services and thus RRI could translate into economic benefits.



1. INTRODUCTION

Responsible Research and Innovation (RRI) is an inclusive approach to ensure that societal actors work together during the whole research and innovation (R&I) process to better align both the process and outcomes of R&I with the values, needs and expectations of European society [EC 2013a].

RRI builds on a strong commitment of European Commission policies to stimulate greater responsiveness of science and innovation to society's needs. To date, RRI has been primary focused on publicly funded research. Wider application of RRI to industry is envisaged by the European Commission, and it could be realized by enlarging CSR (Corporate Social Responsibility) policies to take into account peculiar aspects of research and innovation processes [Iatridis K. 2015].

RRI is also an answer to the demand arising from society that ethical acceptability should be the basis of the design and realization of research and innovation processes and products [EC 2013b].

There are in fact several recent examples of new emerging technologies which have been contested by society because societal impacts and ethical aspects were not adequately taken into consideration in their development [Eurobarometer 2005, 2015]. Considerable investments in the development of these innovations were wasted [EC, 2012b].

There are now several areas of research and innovation in which lessons from the past can be learned, and more inclusive approaches could be taken in order to develop innovative products which provide safe, ethically acceptable and desirable solutions to societal needs and challenges. Among these emerging areas of research and innovation, a leading role is played by ICT (Information and Communication Technologies)-based tools and services that are developed for health care and monitoring, occupational and recreational support of the ageing population.

With changing demographic and health needs ICT holds a huge potential for management and delivery of health and social care to an ageing society and offers increasing opportunities for independent living of elderly people. On the other hand, there is growing concern about the possibility that these technologies, like other innovations, could raise ethical issues and fail to meet societal needs and expectations. This could ultimately severely limit their acceptability and marketability.

In this context, **the Responsible Industry Project specifically aims to integrate principles and methodologies of RRI into**

the research and innovation processes developed by industries active in the domain of ICT for an ageing society.

ICT - related tools and services for an ageing population constitute a maturing technology and market with huge growth potential, combining several aspects relevant for RRI. In particular:

→ The research field is rapidly moving and challenging, because ICT are enablers of innovative and sometimes futuristic solutions
→ The market area is targeted at vulnerable groups of the population, thus significant ethical and social issues must be addressed during product development
→ The target group is heterogeneous with significant cultural differences
→ The market is still in its infancy, and novel specific R&I and business models are under development, thus providing opportunities for RRI approaches to be tested.

Consequently, a "Framework for the Implementation of RRI" has been developed to provide strategic options and recommendations for industrial actors engaged in research and innovation to help

pursue responsible practices and behaviours in developing devices, products and services in the above field.

The Framework is primarily directed at **CEOs, senior executives and project managers of industries active in research and innovation in ICT for an ageing society**. Use of the Framework requires the awareness and approval of its principles by the company shareholders.
The main aim of the Framework document is to help the ICT industry to pursue responsible practices in research and innovation and increase the ethical acceptability, social desirability and quality of products/services for an ageing society, through:

→ The strengthening of links with customers to get insights into their needs and preferences
→ The adoption of foresight procedures to limit risks and unintended consequences
→ The engagement of end users throughout the design and development of Research and Innovation processes and products
→ A better matching of products and services with societal expectations
→ The improvement of public trust in the safety of the products
→ Empowering/motivation of the workforce
→ Compliance with qualified norms and standards
→ Alignment of R&I investment to RRI principles
→ As a result the company reputation will be enhanced, with positive impact on its medium and long-term competitiveness/profitability.

As has also emerged from other works related to RRI and CSR, in order to achieve these goals, responsibility should became an integral part of the company culture and mission, a real *change of thinking* should be pursued.

The *motto* proposed by the project is:

DOING RESEARCH AND INNOVATION RESPONSIBLY BENEFITS THE COMPANY AND CONTRIBUTES TO MAKING A BETTER WORLD

In this Report, after a short description of the methodology, firstly it will be detailed why a Framework for RRI is needed in the ICT industry for an ageing society. This will be done by illustrating the social implications and ethical risks likely arising in the development and application of ICT solutions for health monitoring, support of seniors with physical and/or cognitive impairments and for independent and active ageing of seniors at home.

In light of these issues, the Framework will show how to operationalize RRI in the ICT industry for an ageing society while the last part of the Report will focus on the accompanying measures needed to stimulate the adoption of the RRI principles in industry. As detailed in the Conclusions, the proposed Framework is intended as a "working document" to build, in the next project steps, specific implementation plans (case studies) tailored for different audiences.

2. WHY DO WE NEED A FRAMEWORK FOR RRI IN ICT FOR AN AGEING SOCIETY?

Doing research and innovation responsibly benefits the company and contributes to making a better world.

ICT-based solutions (applications, products, services) for an ageing society focus on the prevention of disease and management of chronic conditions of elderly people, facilitation/improvement of their mobility and autonomy, rehabilitation at home, occupation and social interaction, etc. [Borsella E. et al., 2015a and references therein].

These ICT systems are typically comprised of sensors (to monitor physiological parameters or for recognition of activities), of parts that process the sensor data and derive conclusions, of human-machine interface components and actuators that execute actions such as switching on a light, or raising an alarm in case of an emergency. In addition, the different system components need to communicate with each other in order to provide the overall assistive service for which the system has been designed [AAliance2 New Roadmap, 2014].

As detailed in the following sections, a range of social implications and ethical concerns are linked to the above-mentioned technologies and are considered one of the main barriers to their effective use.
The adoption of Responsible Research and Innovation practices, as suggested in the Framework for RRI outlined in this report, could strongly support the company to overcome these barriers.

2.1 WHAT DO I NEED TO WORRY ABOUT IN ICT FOR AN AGEING SOCIETY?

Considering the enabling technologies that support ICT for ageing, the following raise high ethical concerns[2]:

- → **Transmission of data to a third party** (e.g. transmission of personal data from the user's smartphone to e-service portals)
- → **Technologies for data management, such as data storage and data analysis** (e.g. cloud computing)
- → **Real time monitoring of the user lifestyle through "sensing systems"** (e.g. environmental sensors for surveillance applications at home)
- → **Brain-computer interfaces**
- → **"Reasoning systems" for medical data analysis** (e.g. detection of trend anomalies in vital signs to alert caregivers or family members)
- → **"Reasoning systems" for privacy-sensitive data analysis** (e.g. noise analysis for activity recognition)
- → **"Action enabling technologies"** (e.g. automatic control through actuators, artificial muscles)
- → **Machine to machine "communication systems"** (e.g. transmission of medical data from the user smartphone to care management portals)
- → **Human-machine interaction (e.g. robotics)**
- → **Social networking techniques** (e.g. location based social networks)
- → **Health monitoring through "sensing systems"** (e.g. wearable or implantable sensors for daily monitoring of physiological parameters)

Within this list, the highest ethical and societal risks arise from the technologies for data transmission, storage and analysis, followed by the technologies for real time monitoring of the user lifestyle through "sensing systems" and the development of Brain-computer interfaces.
A number of ICT innovations have raised ethical dilemmas.
As an example, ICT-based systems designed to enable outdoor and indoor mobility for elderly people with age-related sensory (visual, auditory) or cognitive (memory)

2 The list of these technologies has been selected through a specific analysis undertaken in the first workpackage of the Responsible-Industry project [Borsella E, et al, 2015a] and using references in the AAliance2 Roadmap [AAliance2 Project, 2014].

impairments [AAL, 2014] belong to this category.
Typical outdoor applications include personalized GPS-based systems, combined with receiving systems to enable a person to find his/her way through a city[3]. These systems can include real-time monitoring of the user's life style and may violate her/his privacy.
In the case of indoor applications, examples include environmental and wearable devices (sensors, communication systems) to monitor movements and physiological parameters, help seniors in daily life activities (e.g. provide alert messages, remind to take a drug) and provide health information to caregivers (e.g. alarms in case of accidents). These applications, while reinforcing the person's autonomy at home, may also lead to more control being taken by family relatives over the private life of the older person, leading to a risk of abusive situations.
An even more critical situation is encountered in the case of ICT products/services for persons affected by mental impairments (dementia, Alzheimer's) which progressively lead to brain damage and to the deterioration of an individual's functional capacity and social relations. It raises the question of who should give the consent to the installation of ICT products at home. The tools to address these issues include *informed consent* on the use of ICT products and services, a key element in respecting individual dignity and freedom, and *regular assessment* of the user's status and how ICT products impact upon his or her QoL (Quality of Life).
ICT solutions may depend upon a lot of data storage and analyses, linked to the different sensors and alerts (either on the body or at home). *Data minimization* (to transmit/

3 See more at the web site of the e-mosion Project at: www.aal-europe.eu/projects/e-mosion

analyze the minimum amount of data) and the possibility of *personalizing data protection* according to a person's wishes, should be included in the consent forms linked to the use of ICT products.
RRI practices proposed in the Framework will assist the developers of ICT products to address and solve ethical or moral dilemmas that can arise when there is an apparent conflict between two moral principles, as in the case of conflict between surveillance of persons with progressive mental impairment and their individual rights and liberties.
The general principles and values that should be considered in developing ICT products for older persons in need of care, i.e. as ***vulnerable consumers,*** are:

- → **Individual rights and liberties** (privacy, data protection, rights to freedom of movement, etc.)
- → **Personal safety and health**
- → **Autonomy, authenticity and identity** (impact of technology on free will, ability to have one's own thoughts and make one's own decisions, to develop own social identity)
- → **Implications for quality of life**
- → **Social isolation**
- → **Integrity and dignity**
- → **Bodily integrity** (self-determination of human beings over their own bodies)
- → **Social safety**
- → **Justice (distributive) and access** to developed technology
- → **Equality** (equal opportunity of human beings in society, including gender aspect)
- → **Dual use** of developed technologies

Further indications on the impact of ICT developments on the rights of older people (such as freedom, dignity and autonomy) can be found in the reports and papers of the Value-Ageing EC Project[4].

4 http://cordis.europa.eu/result/rcn/60667_en.html

2.2 WHY SHOULD I EMBRACE RRI?

The market penetration of ICT solutions for an ageing society is still slow and limited [AAliance2 Summary Market Review, 2013]. Only tele-care currently has a well-established market with products focused on the sensing of events (mainly alarms). Nonetheless, it is evident that this market will grow if the end-user acceptance of ICT technologies increases. In fact end users are not convinced that ICT solutions will effectively improve their quality of life and wellbeing.

In order to meet their needs and expectations, the ICT systems/products should be ethically acceptable, affordable, accessible, reliable and easy to use.

The implementation of RRI concepts in the industry of ICT for an ageing society could impact positively on these aspects. Increased involvement of stakeholders and the general

public in the research and innovation process would bring improved matching of ICT products with societal needs, greater acceptability and increased quality of these products. More generally, **an enhanced consideration of societal needs and ethical aspects from the industry could translate into economic benefits.**
Several industries in these sectors already have various kinds of responsibility practices in place (such as corporate social responsibility initiatives, dialogue and stakeholder engagement practices, technical measures to prevent risks and address ethical and social issues, etc.). RRI is intended to go beyond these practices, since it focuses on early adoption of responsible practices along the research and innovation value chain and alignment of R&I outcomes to the needs of end-users and consumers.

3. THE FRAMEWORK FOR IMPLEMENTING RRI

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The Framework for implementing RRI in ICT for an ageing society proposed here, will help research and innovation players to address social and ethical risks and enhance the capacity for ICT technologies to improve the QoL (Quality of Life) of older people.

It provides options, recommendations and procedures for promoting the following activities[5]:

- → **Reflecting** on ethical and social impacts and implications of R&I activities, with a focus on the critical issues arising in the development of ICT products/services
- → **Aligning** R&I processes along the entire value chain with older people's and societal needs
- → **Engaging** stakeholders in the R&I process
- → **Taking into account** in R&I processes different aspects of the relationship between science and innovation with society: equality, transparency in information & communication (e.g. open access), ethics and education in ethics

THE PROCESS PROPOSED BY THE FRAMEWORK IS DYNAMIC

It requires continuous attention to the evolution of scientific knowledge, regulations, public attitudes and perceptions which must be considered along the R&I value chain, from agenda-setting and basic research to the market stage.

The framework focusses on responsibility of individual organizations along the *R&I value chain*, and thus not on relationships and responsibility of suppliers along the *supply chain*. Nevertheless, since the supply chain might have a significant impact on how ethical and social impacts are addressed in the final product[6], individual organizations should ensure that supplier and end user license agreements are consistent with RRI principles. Ideally, the framework should be adopted by all relevant organizations in the supply chain.

What follows is a suggestion for how to operationalize RRI in companies dealing with ICT for an ageing society.

5 Bullet points refer to the RRI working definition given by the RRI Tools project (www.rri-tools.eu/)

6 For example, a system integrator delivering systems for environmental monitoring of seniors in their home, or health care professional and caregivers using reasoning systems for medical data analysis, might not properly implement procedures for data management (even if foreseen by the producer of the component/system), causing leakages/abuse in the use of seniors/patients data.

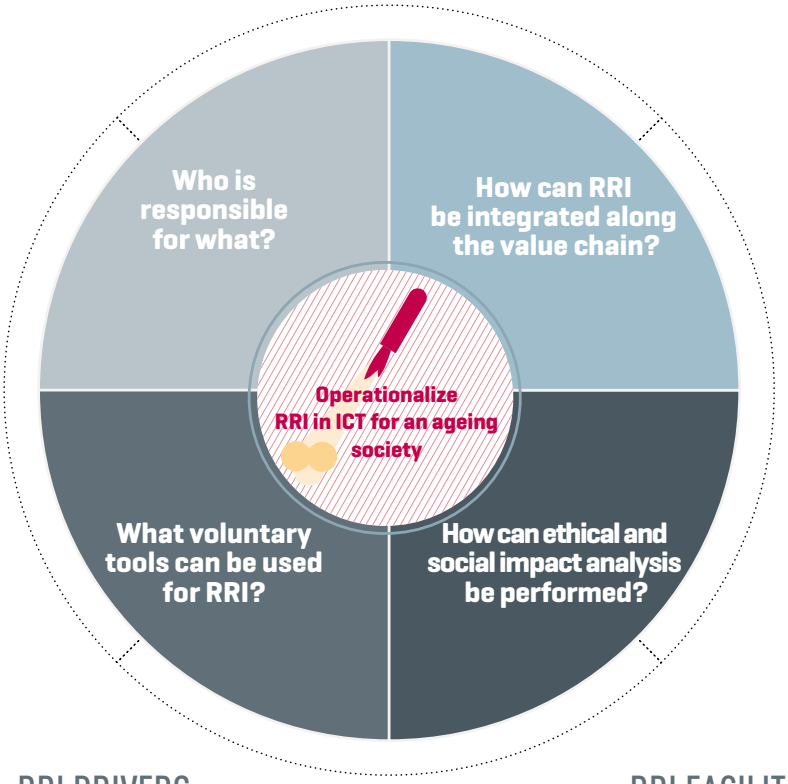
The document provides a full range of different recommendations.
Each organization using the plan might find that only a selection of these recommendations are applicable/relevant.

The pillars of the Framework, as reported in Fig. 2, are the answers to the main questions below:

→ **Who is responsible for what?**
→ **How can RRI be integrated along the value chain?**
→ **How can ethical and social impact analysis be performed?**
→ **What tools can be used for RRI?**

FIG. 2: OVERVIEW SCHEME OF THE FRAMEWORK

DOING RESEARCH AND INNOVATION RESPONSIBLY BENEFITS
THE COMPANY AND CONTRIBUTES TO MAKING A BETTER WORLD



RRI DRIVERS

RRI CORE SUBJECTS

- **Reflection** on ethical and social impacts
- **Aligning R&I** with users and societal needs
- **Engaging** stakeholders in the R&I process
- **Equality and transparency** in information & communication, **education** and **ethics**

VALUES

- **Individual rights and liberties**
- **Personal Safety and Health**
- **Autonomy, authenticity,** identity
- **Quality of life**
- **Social Isolation**
- **Integration and dignity**
- **Bodily integrity**
- **Social Safety**
- **Justice, Access**
- **Dual use**

RRI FACILITATORS

COMMUNICATION

- Increasing **awareness**
- **Informing** the public
- Providing **training** and fostering a **RRI culture**

POLICY OPTIONS

- Optimizing the **regulatory framework**
- Setting **incentives** for RRI practices

3.1 WHO IS RESPONSIBLE FOR WHAT?

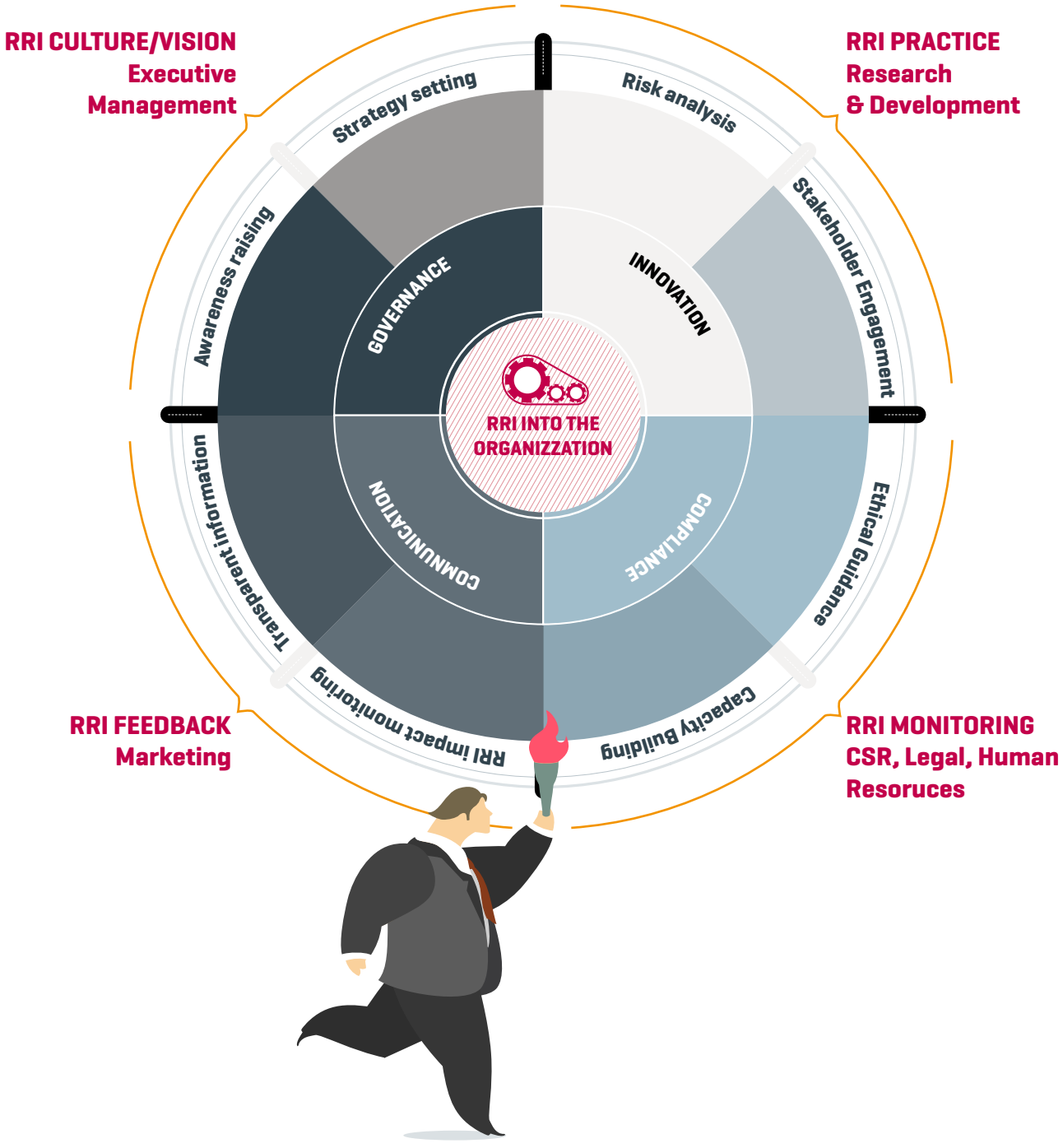
How responsibilities for RRI should be allocated in the company will depend on the size and structure of the organization. In any case, all involved functions need to work in close collaboration and must act in unison, following a common policy/philosophy, to address the different issues that contribute to RRI.

Figure 3 provides a general overview of the roles and responsibilities of the various company functions and offers an indication of how their integrated action could contribute to the implementation of RRI in an organization.
For both SMEs and large enterprises the different functions should jointly agree a strategy to be applied to the different programmes proposed for R&I.
Given the differing natures and sizes of organizations and the projects considered, however, who will deal with the social responsibility issues, the management of risk and the R&D perspective will vary [Borsella E. et al. Delphi Exercise Report]:

- For SMEs the most important functions for RRI are: Management (setting and enforcing RRI policies), R&D (designing responsible products) and, if relevant, Legal (ethical, social and legal guidance and compliance). It must be remembered that for small/micro companies these functions are often merged together.
- For large enterprises the most important functions for RRI are Management, R&D (designing responsible products), CSR, legal and marketing, as detailed in figure 3.

Respondents in the consultation detailed various functions that need to be addressed for implementation of RRI. The main suggestions are reported below (with reference to figure 3):

FIG. 3: KEY RESPONSIBILITIES FOR RRI WITHIN THE ORGANIZATION



EXECUTIVE MANAGEMENT (RRI CULTURE/VISION)

→ Set the vision: include attention to ethical and societal impacts in the company policy and ensure the development of a strategy for ethical and social impact assessment

→ Ensure commitment/accountability of the organization (the assessment of ethical and social impact is a primary responsibility of the producer/provider of a product or services)

→ Create an "ethical culture" amongst the employees:
- raise awareness on RRI principles
- integrate ethical thinking into the design/production process
- advocate and encourage employees to maintain a responsible attitude
- discourage/stigmatize unethical behaviour

→ Recognize RRI as an investment, not a cost

→ Align the overall corporate investment strategy and practices with RRI principles

→ Evaluate the opportunities and benefits of adopting voluntary governance tools for RRI (e.g. code of conduct, global initiatives, standards)

→ Ensure that the company is committed to (and accountable) for:
- identification of the ethical risks/ impacts all along the value chain
- risk and ethical assessment of the R&D projects
- integration of RRI principles along the value chain
- transparency and open access, where feasible

→ Establish an ethical monitoring board to oversee the strategy, ensuring appropriate mechanisms to deal with conflict of interest (economic interests vs. ethical/ human interests)

→ Establish a specific function within the organization to coordinate RRI activities (e.g. "RRI implementation manager")

→ Explicitly include social and ethical risks in corporate/company annual risk assessment reports

→ Support foresight analysis on the impact and implications of current and future ICT products (e.g. open/big data management systems)

→ Take feedback from end-users into consideration

RESEARCH & DEVELOPMENT (RRI PRACTICE)

→ Perform ongoing ethical and societal risk/impact assessment of new applications, from early stages, with the involvement of stakeholders
→ Identify technically feasible solutions that avoid/limit any ethical and social risk/impact
→ Define and apply severe prevention measures to avoid data breaches, concerning all data management activities along the value chain
→ Engage stakeholders alongside the development of new technologies
→ Test prototypes with end-user groups
→ Favour open innovation processes
→ Interact and coordinate activities with CSR and management functions

HUMAN RESOURCES (RRI MONITORING)

→ Ensure selection of people who are willing to engage with RRI principles
→ Organize (periodical) ethical training courses for relevant staff
→ Promote multidisciplinarity

LEGAL DEPARTMENT (RRI MONITORING)

→ Ensure rigorous compliance of the organization with qualified national/international regulation and standards on social and ethical risks/impacts (possibly refer to most stringent norms worldwide)
→ Provide the other departments with the legal framework for undertaking R&D responsibly
→ Ensure that adequate complaints procedures are in place
→ Ensure that supplier and end-user license agreements are consistent with RRI principles
→ Keep the organization updated on regulatory developments, anticipate potential regulatory changes

CORPORATE SOCIAL RESPONSIBILITY (RRI MONITORING)

→ Strengthen cooperation with the management function in the implementation of the legal framework for responsible research as well as in the development of strategy to address ethical and social impacts

→ Collaborate with R&D and Human Resources departments to ensure implementation of general management decisions

MARKETING DEPARTMENT (RRI FEEDBACK)

→ Monitor user and consumer opinions and feedback on ethical and social issues related to ICT products and services on a regular basis (e.g. hidden negative messages or assumptions, high costs, discriminatory issues)

→ Monitor the impact of RRI practice on the final quality of the product, market penetration and user satisfaction

→ Observe relevant social phenomena and trends that can inform the company about social desirability and acceptability of products and services

→ Foster information, transparency and dialogue on ICT products put on the market. In particular, foster transparency in costs for end users, including hidden costs of application and use (e.g. costs for licenses, maintenance of the product/service, advising and training on product functionalities[7]).

7 End users of these products are often vulnerable people (e.g. people with impairment), and for them using a product, as well as following instructions or training, might be quite difficult. Thus, there could be unexpected direct and indirect costs for them (e.g asking and receiving assistance by formal and informal caregivers). These aspects should be taken into account during product development.

3.2 HOW CAN RRI BE INTEGRATED ALONG THE VALUE CHAIN?

Industry in ICT for an ageing society is already used to networking with stakeholders. It works with end-users (care professionals, patients' groups, caregivers, etc.) to test applications and products before entering the market; with suppliers to design the final product or service; with ethical committees for advice/compliance with respect to regulatory constrains (e.g. healthcare/medical applications); and with policy-makers (public administration, insurance, etc.) to evaluate business models of their applications.
Doing research and innovation responsibly requires, however, a wider and more integrated methodology aiming to:

- → Improve the quality and acceptability of services and products by better matching the rapidly evolving user requirements, identifying both opportunities and threats
- → Provide global analysis and holistic evaluation of risks
- → Uncover unintended or unforeseen consequences as the products are developed and deployed

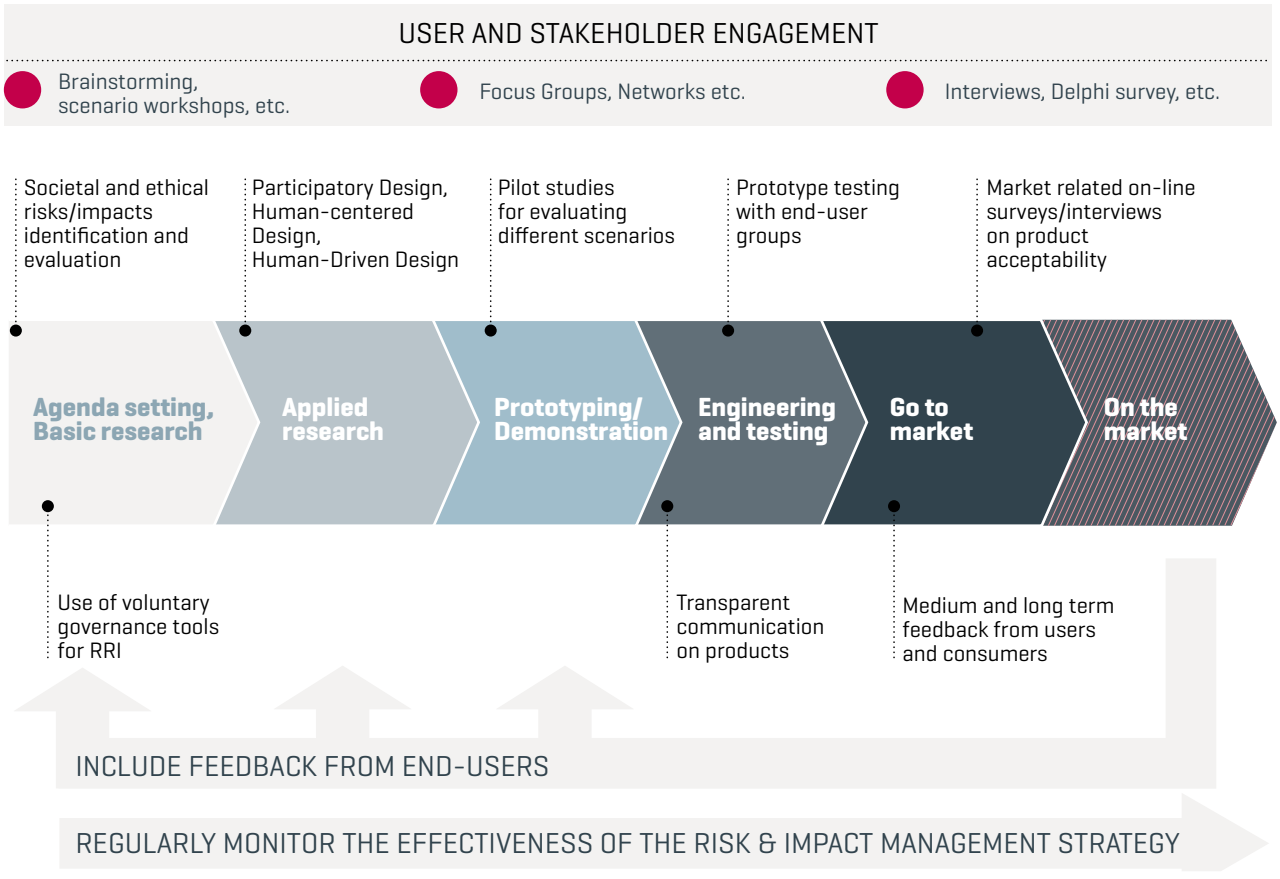
The RRI approach for reaching these objectives is based on the **stakeholder engagement all along the value chain** from product planning to market delivery[8].
The most common methods for active stakeholder engagement in R&I[9] are Participatory Design, Human-Centered Design [Niemelä M., et al. 2014], and User-Centered Design[10] (see glossary).
Participatory Design is based on a consultation phase with individuals and community organizations, followed by an interactive design process which includes field tests with the users of the developed technologies and devices.

8 The framework focuses on RRI practices within a specific organization. Thus, it does not analyse the relationships amongst suppliers and the responsibilities along the supply chain. As mentioned in the previous paragraph, the organization should ensure that supplier and end user license agreements are consistent with RRI principles.
9 Methods and tools to engage public, stakeholders, consumers and other groups in the research process are extensively mapped and developed by the project Engage2020 (www.engage2020.eu).
10 An inventory of methods and tools for user-centered design in the ICT for an ageing society is available in the report from the Nomandic Media project: *User-Centred Design Guidelines for Methods and Tools*.

Designing for users is a common practice in the field of industrial and service design. The user is seen as a customer and the future buyer of the product. Participatory **design with potential users** (and stakeholders) who are concerned with ethical issues possibly arising from the proposed new ICT solutions is a quite different, responsible approach finally leading to more acceptable products.

Key steps to be undertaken for integration of RRI principles and practices along the whole value chain are sketched in Fig. 4 and detailed below.

FIG. 4: ACTIVITIES TO BE UNDERTAKEN FOR THE INTEGRATION OF RRI ALONG THE WHOLE VALUE CHAIN



AGENDA SETTING, BASIC RESEARCH:

→ Identify social and ethical risks, and evaluate their impacts

→ Balance between strengths and weakness of the system (product or service) to be developed

APPLIED RESEARCH (R&D STAGE):

→ Implement user-centered approaches in creating, designing and engineering the application, such as Participatory Design, Human-Centered Design, Human-Driven Design

→ Perform pilot studies to identify and evaluate application scenarios

PROTOTYPING/DEMONSTRATION /ENGINEERING

→ Test the prototype with end-user groups both in laboratory and in real-world context

→ Testing and further development of the prototype should be performed, as much as possible, in a the context that resembles holistically the real future service environment

→ Take into account the heterogeneity of the various end-user groups

GO TO MARKET

→ Perform market-related online surveys/ interviews with users to understand and evaluate products' acceptability

AFTER INTRODUCTION ONTO THE MARKET

→ Ensure transparent and open communication that illustrates the impacts/risks associated with the use of the new products and services
→ Collect feedback from users on a regular basis through evidence based post-market studies (e.g. interviews, Delphi survey)
→ Consider analysis of long term impacts (monitor over time how the product affects users and society in a 5-10 year time-frame)

ALL ALONG THE VALUE CHAIN

→ Define monitoring approaches for ethical and social impact analysis in all the phases
→ Regularly monitor the effectiveness of the risk management strategy
→ Stimulate life-cycle thinking, consider also provision for end-of-life products (e.g. e-waste)
→ Encourage open access (and open innovation) of research and innovation results, possibly to the general audience or at least within relevant stakeholders (care professionals, caregivers, patients, research partners, etc.)
→ Consider adoption of voluntary governance tools to support RRI implementation

In the case of lack of resources, or simple/short value chains, limiting the assessment and management of ethical and social impacts to the early stage of the value chain (e.g. through security and privacy protection by design approaches) could be sufficient and cost-effective. It would help to plan activities and investments and to reduce the risk of expensive changes in later stages from unforeseen critical ethical issues.

However, mistakes in the early phase can lead to premature termination of a production process and limit innovation, and not all ethical issues can be foreseen or anticipated at the early planning stage. To avoid these problems, whenever possible, it is better to integrate RRI along the whole value chain.

3.3 HOW CAN ETHICAL AND SOCIAL IMPACT ANALYSIS BE PERFORMED?

Ethical and social impact analysis should be undertaken by the company with the aim of influencing research and innovation processes, so as to make the developed ICT solutions more ethical for the benefit of society and the greater good [Grunwald A., 2009]. Key to RRI is the involvement of stakeholders for the early evaluation of ethical and social risks and impacts. Procedures for ethical and social impact analysis can be tailored for specific cases. A number of recommendations are indicated below:

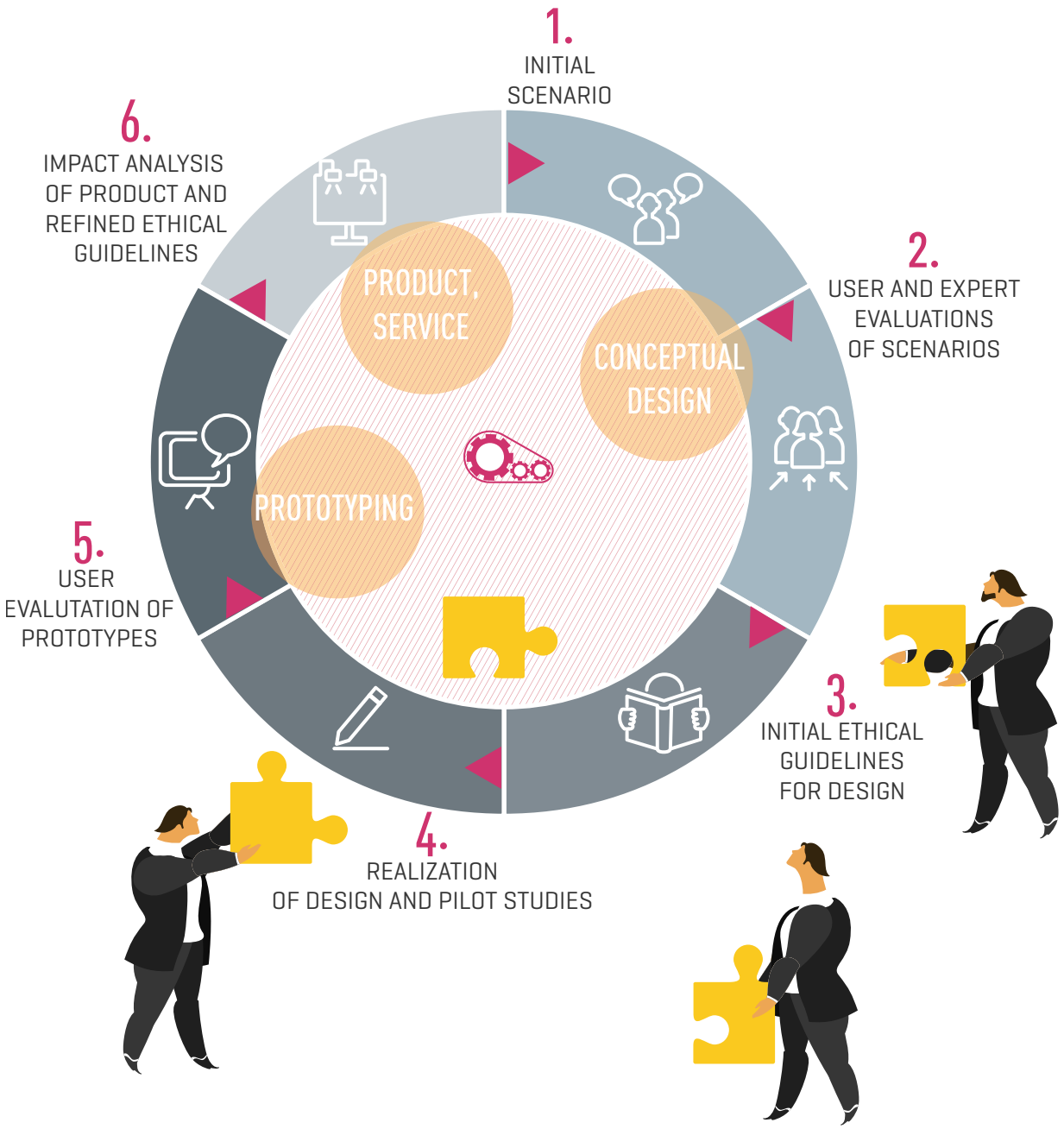
- → Design a specific strategy for the assessment and management of ethical and social risks and impacts, and ensure that it is updated regularly. Take into account the adoption of voluntary governance tools to support the strategy implementation
- → Identify/consider creation of a body to oversee the impact assessment strategy, formed by independent actors, including stakeholders' representatives
- → Identify and evaluate impact scenarios of each specific product/service through procedures such as: Ethical Assessment[11], Social Impact Assessment[12] in pilot studies. This includes regular mapping of relevant stakeholders and analysis of concerns of each specific product/service
- → Promote a user-centered approach to R&I, working together with stakeholders to develop ethically acceptable and socially desirable products via participatory, human-centered, human-driven design
- → Involve key stakeholders in ethical and social impact analysis such as end-users[13], consumer organizations and other representatives of civil society, policy makers/legislators

11 An example of ethical assessment in ICT for an ageing society is given by "MEESTAR - Model for the Ethical Evaluation of Socio-technical Arrangements. an instrument for Ethical Evaluation of Socio-Technical Arrangements" [A. Manzeschke et al, 2013]

12 See more at the web-site of the Project PACITA (Parliaments and Civil Society in Technology Assessment at http://www.pacitaproject.eu/)

13 Networking with end-users representation groups, such as organized carers and advocacy groups for seniors, could be an effective way to reach end users. Examples are given by the work of the HAIVISIO project,and the AGE and 50 + platforms.

FIG. 5: HOW TO PERFORM ETHICAL ANALYSIS OF NEW PRODUCTS/SERVICES THROUGH SCENARIO WORKSHOPS [IKONEN V. ET AL. 2008B]



→ Use methodologies for stakeholder engagement such as[14]:
  - *network mapping*
  - *focus groups and brainstorming events;*
  - *scenario workshops (Fig. 5), user committees, citizen's jury*
  - *online forums, online pool, Delphi study*

→ Regularly update and adapt the ethical and social impact assessment strategy throughout the product value chain

STAKEHOLDER ENGAGEMENT

The roles of the different stakeholders vary according to the stage of the ethical and social impact assessment process. Their involvement should fit the focus of the specific issue:

→ Regularly interact with research and ethical committees in all stages of risk/impact assessment. Ensure ethical committee decisions take into account end users (e.g. senior and senior associations, patients, care givers) views[15]

→ Interact with end-users and civil society organizations for hazard identification and assessment of potential risks (and to a lesser extent in the definition of precautionary measures and in updating the risk/impact assessment)

→ Cooperate with policy-makers and regulators in: defining precautionary measures, updating/reviewing the risk and impact assessment[16], identifying new opportunities to improve the QoL (Quality of Life) of the ageing population and prepare seniors to age well.

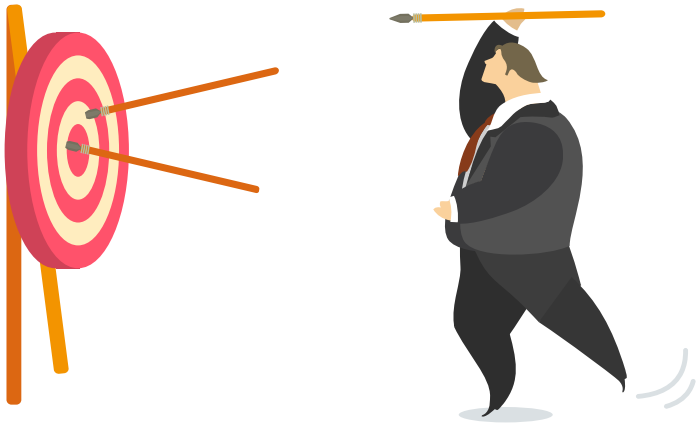
An overall picture showing how the ethical and social risk and impact analysis is a multi-step process is given in Figure 6 where the stakeholders involved are highlighted along with the stages in which the various stakeholders should have their main input.

14 See more at the web-site of the Project pe2020 *Public Engagement Innovations for Horizon 2020* and of the project Engage 2020.

15 As emerged during the project consultation, ethical committees are seen as fundamental to provide independent, evidence based advice for RRI. They could provide a concrete support to industry in taking into account the user needs and perspectives *("a place for commonalities of interest on which giving different perspectives")*. However, in order to be effective they need to be fully representative of end-users, ensuring carers, health professionals and seniors (carers association and groups, possibly also individuals) are included.

16 See more at the web-site of the Project *PACITA (Parliaments and Civil Society in Technology Assessment)* at www.pacitaproject.eu/

FIG. 6: STAKEHOLDERS INVOLVEMENT IN THE DIFFERENT PHASES OF ETHICAL AND SOCIAL RISK AND IMPACT ASSESSMENT



3.4 WHAT VOLUNTARY TOOLS CAN BE USED FOR RRI?

Taking into account the adoption of voluntary governance tools is an essential step for the organization for pursuing responsible research and innovation.
These tools can help the organization to address critical ethical principles, values and issues in the ICT for an ageing society, as well as to support compliance with the existing regulatory framework.
They can support the organization in all the three RRI areas pointed out in the previous paragraphs.
As indicated by the project consultation [see Borsella E. et al. *Delphi Exercise Report*], existing governance tools (global initiatives, standards and principles on Corporate Social Responsibilities, codes of conduct, risk management systems, technical standards) are all considered suitable to support responsible R&I along the value chain (see figure 7).
The project analysis and consultation provided a selection of these tools.
However, the analysis also pointed out that most of these tools have a general purpose and therefore actions and principles foreseen should be better tailored to the specific needs of RRI in ICT for an ageing society.
Specific recommendations are:

→ Consider adoption of voluntary CSR tools. Relevant tools emerging from project analysis and consultation are[17]:
- *CSR global initiatives: Global Reporting Initiative (GRI), UN Global Compact*
- *CSR standards: AA1000ES, AA1000AS, ISO/IEC27001, ISO50001*
- *CSR principles: Ceres roadmap for sustainability, the Caux Round Table*

→ Consider adoption of general (not sector-specific) risk management systems and quality certifications. Relevant tools emerging from project analysis and consultation are[18]:
- *ISO9001 quality management standard*
- *ISO14001 environmental management standard*
- *OHSAS18001 health and safety management standard*
- *ISO27001 information security management standard*
- *ISO 13485 quality management standard for medical devices*
- *ISO20000 information technology service management*
- *ISO26000 Social Responsibilities*

→ Consider the adoption of a specific Code of Conduct to commit the organization

17 Further details on the tools and the selection of tools are given in the report Iatridis K. *Tools Survey and Matrix for RRI in Industry* Deliverable D1.3, Responsible Industry Project
18 Ibid.

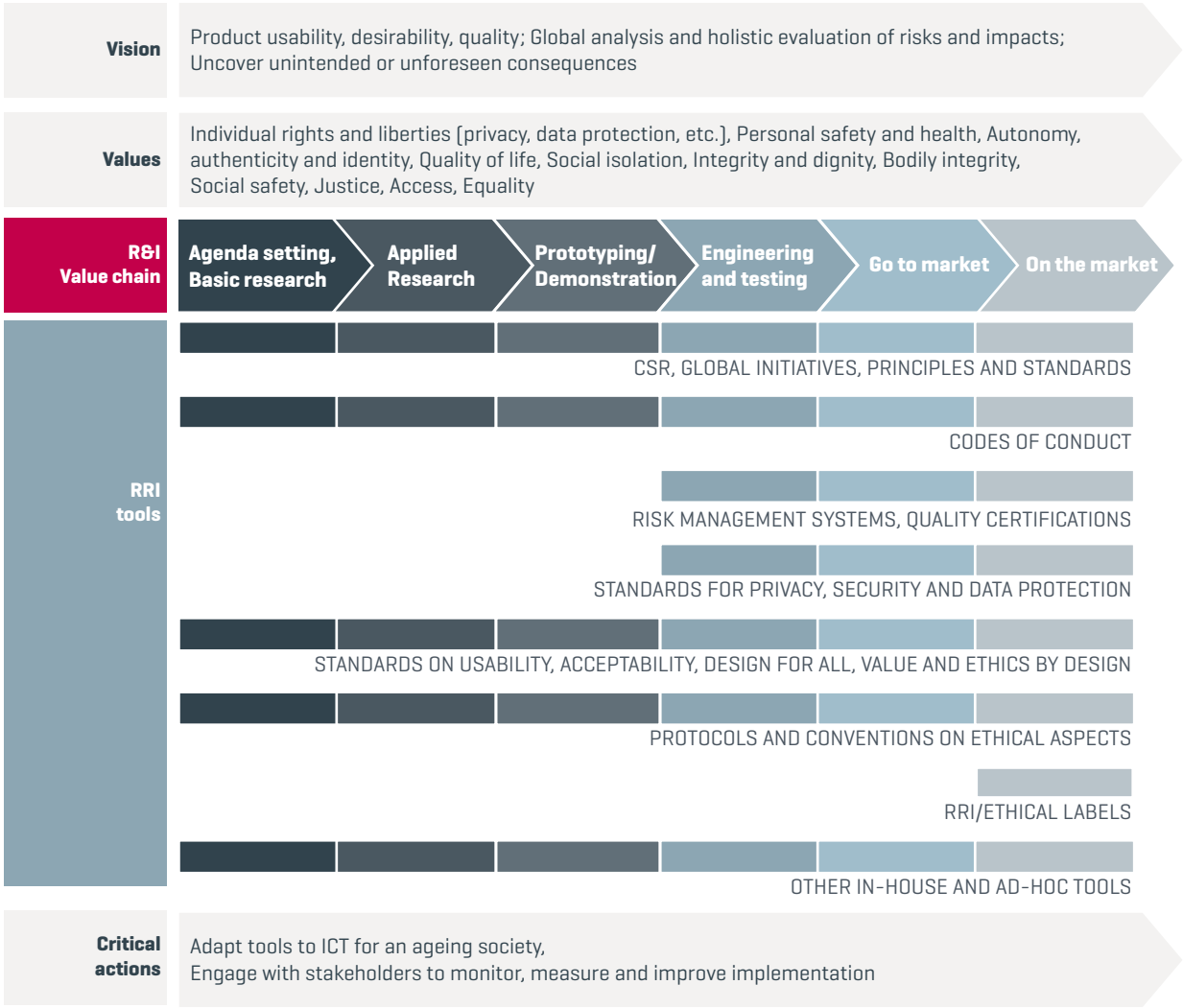
(and employees) to behave responsibly in research and innovation in ICT for an ageing society. Relevant examples for the ICT field emerging from project analysis and consultation are (business and professional ethics)[19]:

- *Electronic Industry Citizenship Coalition Code of Conduct*[20]
- *The Software Engineering Code of Ethics and Professional Practice*[21]

19 Further details on Codes of Conduct in the ICT field are provided in the report Soraker J. H. et al *Systematic review of industry relevant RRI discourses* Deliverable D1.1, Responsible Industry Project

20 Available at www.eiccoalition.org/
21 Available at www.acm.org/about/se-code

FIG. 7: VOLUNTARY GOVERNANCE TOOLS FOR RRI ALONG THE VALUE CHAIN



→ Take due account of international declarations on human rights, such as:
- *United Nation Convention on the Rights of Persons with Disabilities and Optional Protocol*[22]
- *European Charter of the rights and responsibilities of older people in need of long-term care and assistance*[23]

→ Carefully evaluate use of existing technical standards relevant for the engineering and design of products in ICT for an ageing society, including [24, 25]:
- *Standards on risk and quality management for the ICT, AAL and healthcare sectors, guidance related to the EU regulatory framework for telecommunications ICT*[26]
- *Guidance within the regulatory framework on Medical Devices (Medical Devices Directive)*[27]
- *Standards from international professional organizations and networks active in the ICT and Health sectors*[28]
- *Standards on privacy, security, data protection, health informatics (including standards on privacy by design, security by design, information security systems, electronic health records, etc.), and guidance related to EU Privacy and Data*

22 Available at www.un.org/disabilities/default.asp?id=150

23 Available at www.age-platform.eu/images/stories/22204_AGE_charte_europeenne_EN_v4.pdf

24 Standards relevant for ICT for an ageing society are developed by CEN, CENELEC, ETSI, ISO, IEC, IEEE, W3C. For a full list of relevant standards see *AALIANCE2 Repository of Standards* and the webpage on standards and interoperability of AAL Europe at www.aal-europe.eu/promoting-standards-and-interoperability-in-the-field-of-aal/

25 International professional organizations are also playing a key role in developing standards for interoperability and security of ICT systems. See the work of the International Telecommunication Union –ITU – (available at www.itu.int/ITU-T/recommendations/index.aspx?ser=X) and the work of the Continua Alliance network on design guidelines for interoperability of e-health devices (available at www.continuaalliance.org/products/design-guidelines)

26 A series of EU directives provide a harmonized regulatory framework covering all electronic communications networks and services. Besides quality, safety and security of ICT products and systems, the framework set out key principles regarding users' rights, including: right of choice, quality of service, safeguard of public and users interest, transparency, privacy. See annex of this report and https://ec.europa.eu/digital-agenda/en/telecoms-rules

27 The Medical Device Directive includes requirements for quality and safety of medical devices, relevant to e-health applications. See annex of this report and http://ec.europa.eu/growth/sectors/medical-devices/regulatory-framework/legislation/index_en.htm

28 Such as the standards for security of ICT systems developed by the International Telecommunication Union –ITU – (available at www.itu.int/ITU-T/recommendations/index.aspx?ser=X) and the design guidelines for interoperability of e-health devices of the Continua Alliance Network (available at www.continuaalliance.org/products/design-guidelines)

Protection Directives[29].

- *Standards on consumer rights (e.g. Code of EU Online Rights*[30]*)*

29 Privacy Directive (EC) 95/46/EC on processing and free movement of data, regulation (EC) No 45/2001 on processing and free movement of data by EU institutions and bodies, Directive 2002/58/EC (e-Privacy) processing of personal data and the protection of privacy

30 Available at http://ec.europa.eu/digital-agenda/en/code-eu-online-rights

→ Promote the adoption of certification marks for RRI/ethical issues

→ Commit the organization to the regular review of the adopted governance tools. Define monitoring and auditing procedures involving external, independent bodies

→ Work with stakeholders, and in particular end-users, to integrate your tools taking into account peculiar aspects related to research and innovation in ICT for an ageing society.

3.5 WHAT ARE THE POSSIBLE CONSEQUENCES OF RRI ADOPTION (OR NON ADOPTION)?

EXPECTED BENEFITS

To date, research and development in the field of ICT for an ageing society has led to the development of a huge number of systems and technological devices [AAL, 2014]. However, only a few of them are on the market, purchased and used by elderly, their caregivers and medical practitioners. Besides their costs (and the decision about whom should shoulder it) and relative complexity for their implementation, the following factors were identified as barriers to market deployment of these products [AAliance 2, 2013; AAliance 2, 2014a].

→ Many solutions are not properly designed to take into consideration the true requirements, characteristics and contexts of use, thus they turn out to be inadequate and unusable by their potential users
→ Limited awareness (and skepticism) about the potential benefits of these products
→ Resistance to accept changes in caring for the elderly
→ Ethical concerns (see Par. 2.1)

According to *Aquilano et al. (2007)*, the acceptability of assistive devices (including ICT products for an ageing society) is dependent upon **user perceptions** about the usability as well as other factors reported in Fig. 8. Respondents to the Delphi consultation [see Borsella E. et al. *Delphi Exercise Report*] indicated that the adoption of RRI practices, and in particular the active involvement of stakeholders in all the phases of the product design and realization, is essential to ensure:

→ Higher acceptability and desirability
→ Enhanced quality and usability
→ Improved matching with societal needs thus leading to a ***better market penetration of the ICT systems and solutions for an ageing society.***

Other important outcomes for the "virtuous" enterprises, as a consequence of the general perception that the company acts responsibly and for the public good, are [Søraker J.H., Brey P.A.E, 2014]:

→ Better corporate image
→ Higher employee satisfaction and productivity

ADDITIONAL COSTS

The implementation of RRI practices may, however, lead to additional costs, mainly related to the use of dedicated structures/ resources and procedures and of specific research activities that all add to the economic account.
Therefore, attention should be paid to limit ***extra costs*** in adopting RRI related to:

→ Additional bureaucratic burden for the company

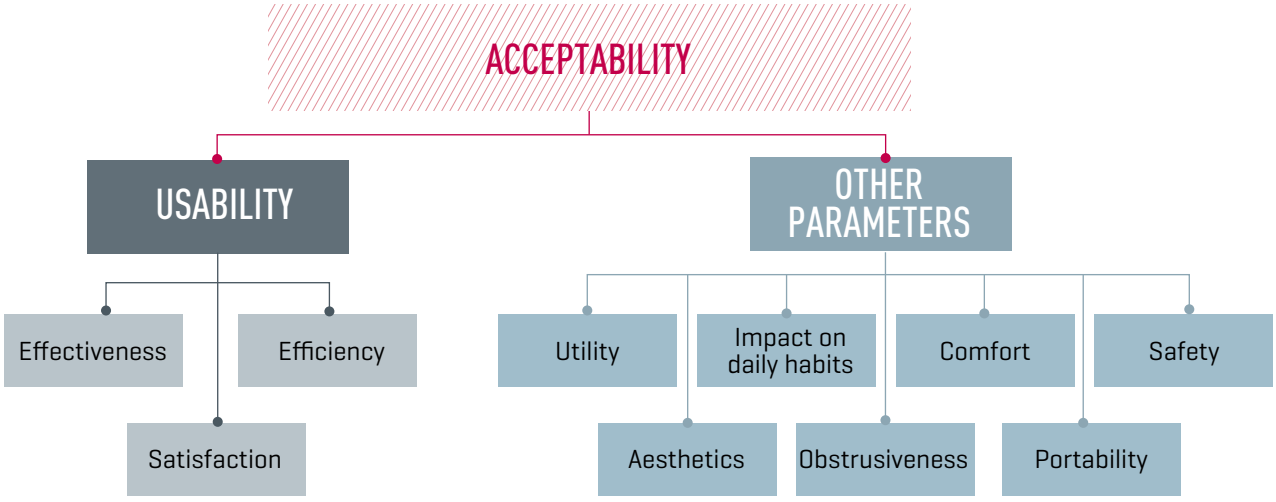
→ Over engineering deriving from precautionary approach

To optimize the process, resources for RRI should be allocated with the aim of:

→ Coordinating the different functions to embed RRI in the organization
→ Motivating and training the organization staff
→ Implementing RRI procedures
→ Measuring the effectiveness, reliability and transparency of the RRI process (monitor implementation and impacts)
→ Engaging the stakeholders and networking with experienced and reliable partners
→ Governing conflicts between economic interest and the social responsibility/ sustainability vision within the company and with shareholders.

In order to pursue RRI, a company should have a long term vision in setting its R&I strategy. This allows the company to reach the appropriate trade-off between the (immediate) costs of RRI and the long-term advantages of RRI, deriving from better acceptability, usability and quality of the products and services developed (and thus expected increased profitability and market penetration).

FIG.8 SCHEME OF THE FACTORS INFLUENCING THE ACCEPTABILITY OF ASSISTIVE DEVICES [AQUILANO ET AL. (2007]



4. HOW TO INCENTIVIZE THE ADOPTION OF RRI

The Responsible Industry analysis provides indication for actions, which could facilitate and support industry in pursuing RRI (RRI facilitators in figure 2). These are mainly recommendations to policy makers for integration of RRI issues in normative measures and for setting incentives to foster RRI adoption in industry. Other accompanying measures are related to the need for improving communication to favor awareness raising and capacity building of all stakeholders and the general public of RRI themes.

Policy options:

→ Optimizing/adapting the existing regulatory framework

→ Setting incentives for adoption of voluntary governance tools and RRI practices

Communication:

→ Increasing awareness of ethical and societal issues

→ Providing training and fostering an RRI culture

4.1 POLICY OPTIONS TO FOSTER RRI ADOPTION

OPTIMIZING/ADAPTING THE REGULATORY FRAMEWORK

Although the ICT sector is regulated by a comprehensive and harmonized regulatory framework (see annex), data from the Responsible Industry analysis, as well as ongoing debates on the revision of the data protection legal framework[31], show that R&I players and other stakeholders want improvement and integration of the existing regulatory framework, in particular regarding consumer rights, user needs and ethical principles. Data management, data protection (prevention of data breaches) and privacy are considered the areas where regulatory oversight needs to be strengthened. With the increasing complexity and globalization of the ICT supply chain, liability is also becoming a challenging issue (e.g. critical examples are applications using *big data*, or *cloud computing* technologies).
Key suggested areas of action are:

→ Improve existing EU legislation[32] (in particular privacy and data protection directive) concerning:
  - the nature of third parties in data handling
  - the reasons and scopes of the data gathering
  - the liability in data management
  - the full awareness of persons providing their data

→ Improve existing EU legislation (in particular the medical device directives) to include e-devices, e-health, mobile-health devices

→ Foster pan-European regulation on ICT products, reducing legislative fragmentation across Member States. In particular regarding rules for personal data protection

→ Possibly foster establishment of global data protection rules, valid for all ICT companies

SETTING INCENTIVES FOR ADOPTION OF VOLUNTARY GOVERNANCE TOOLS AND RRI PRACTICES

It is commonly agreed that the issue of creating incentives for participation (some kind of reward) and strong disincentives for non-participation (some kind of penalties) is mandatory for the successful up-take of voluntary practices for RRI.
Setting up favorable policies and incentives could give rise to business opportunities for companies that behave responsibly and create virtuous economic dynamics in sectors with social needs, such as the ageing

31 See http://ec.europa.eu/justice/data-protection/review/index_en.htm
32 See annex for a list of regulation relevant for the ICT for an ageing society

society [Søraker J.H., Brey P.A.E 2014].
Key areas of action for policy makers that emerged from the project consultation (see Borsella E. et al. *Delphi Exercise Report*) are listed in the following:

→ Communication campaigns and awarding of best practices to improve the standing of "virtuous" enterprises
→ Introduction of evaluation criteria for selection and funding of R&I projects
→ Integration of RRI into public procurement tenders and contracts for ICT products and services for an ageing society[33]
→ Development and promotion of ethical funds (funds where the choice of investment is influenced by ethical criteria)
→ Development and promotion of an RRI certification mark (such as "age friendly" or "ethical" labeling), providing for public evaluation of products with respect to RRI criteria
→ Development of metrics to assess the impact of RRI on the ICT products (enhanced usability, acceptance, etc.)

Moreover, in the case of ICT for an ageing society, specific regulatory and policy actions are needed to create a more favorable environment for market deployment. The main suggestions from the project analysis and consultation are:

→ Promote the use of standards and interoperability in the design of ICT products to combine different components in the realization of complex systems and services[34] [Kawamori M, 2013]
→ Promote the development of integrated care models between the different players (hospitals, practitioners, specialists, etc.)
→ Develop long-term strategies that responsibly introduce specific ICT products on the list of publicly funded care/health services and ensure basic care for everyone in need [Barland M. et al., 2014]
→ Stimulate the conducive reimbursement approach of telehealth and telecare providers [AAliance2, 2014a]

33 The recent report *Options for Strengthening Responsible Research and Innovation* [EC, 2012b] from an expert group on RRI of the European Commission strongly recommended to use public procurement as an instrument to stimulate RRI in research and innovation conducted by business enterprises.

34 See more at AAL Project: Action Aimed at Promoting Standards and Interoperability in the Field of AAL (Ambient Assisted Living, 2014)

4.2 COMMUNICATION

INCREASING AWARENESS & INFORMING THE PUBLIC

Although ethical issues are generally encountered in the daily work of many involved in ICT for an ageing society and the need for a responsible approach to R&I is generally acknowledged by all stakeholders, awareness of the RRI concept and RRI approaches and practices is limited, as underlined by the project consultation (see Borsella E. et al. *Delphi Exercise Report*). This is the case for organizations, employees and the general public alike. The Delphi consultation strongly recommended the following areas of action:

→ Raising awareness of stakeholders by promoting best practices at EC and national level:
- Reserve space for discussions about RRI in all research-related events
- Public acknowledgments of projects that implement RRI
- Dedicated funding programs at EU and national level on RRI issues (support actions)

→ Raising awareness and informing the public through general dissemination:
- Traditional media: Press release, TV programs; articles on broadsheet newspapers (which are the preferred communication media for the elderly); entertainment-like programs, such as talk shows and popular investigative journalism shows (not just news and science programs)
- Web tools: e-newsletters, web sites, You Tube videos; discussions on social media like Linkedin or Twitter; webinars and online trainings
- Sessions in relevant conferences, organization of workshops/seminars with stakeholders; information forums; public discussions
- Face to face engagement of users in public places, like libraries
- ICT courses for older people to enhance their comprehension and appraisal of ICT products.

PROVIDING TRAINING AND FOSTERING A RRI CULTURE

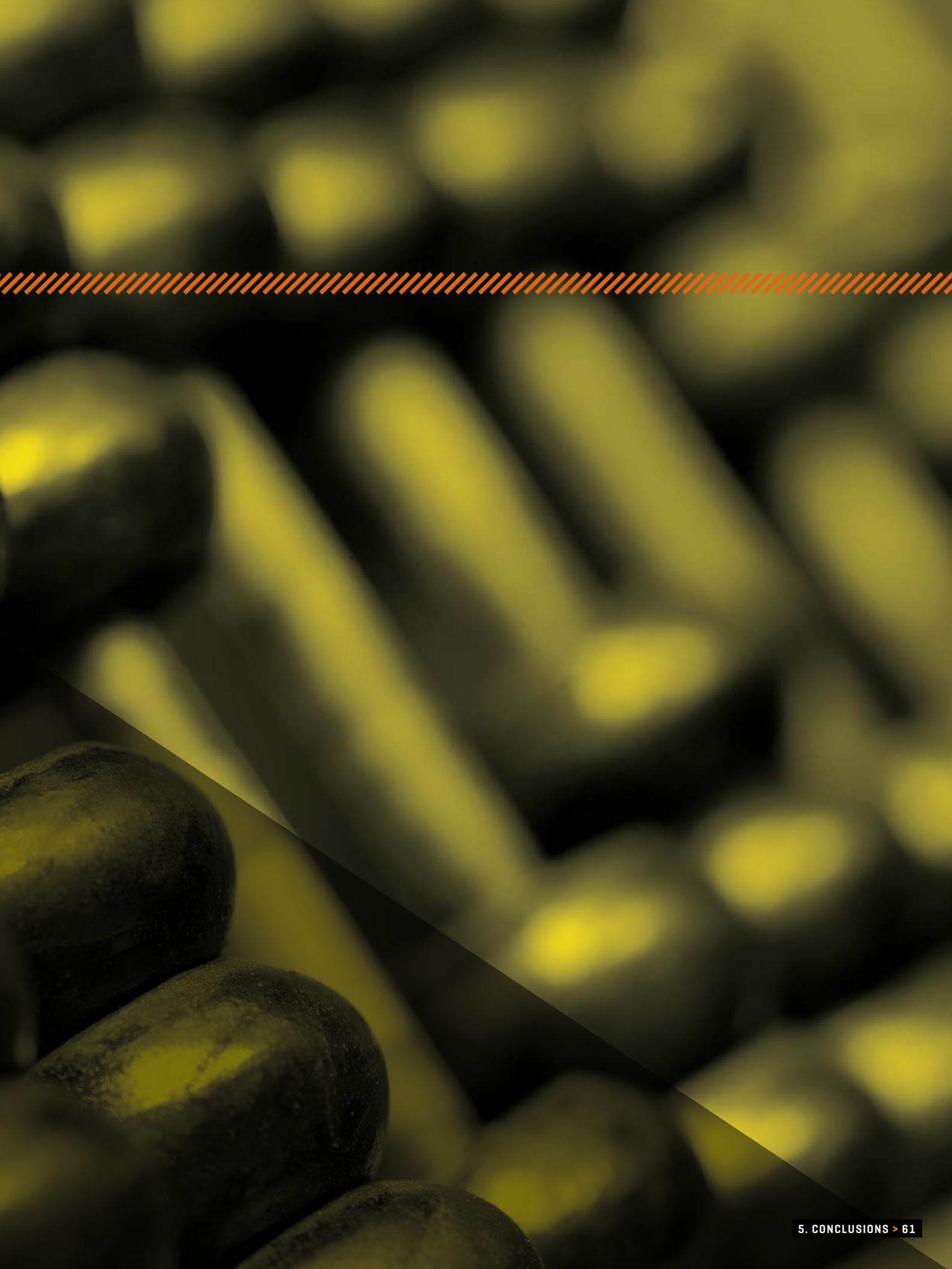
Acceptance and up-take of RRI concepts rests on the diffusion of an ethical culture at all levels.

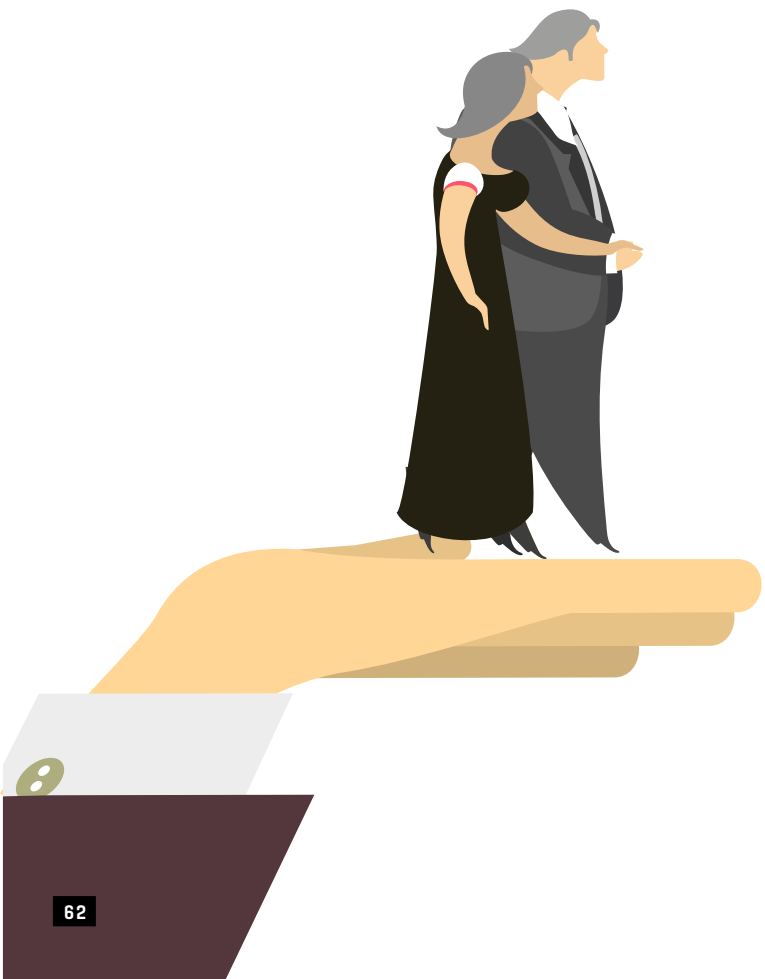
Key suggested areas of action are[35]:

- → Introduce social & ethical responsibility as an education subject from high school to doctoral training
- → Introduce education and training in ethics of R&I in the Marie Curie actions of H2020 and Erasmus; Use Marie Curie Actions to promote exchange between researchers on RRI themes from public research (e.g. people from humanities) and industry
- → Promote RRI issues as an aspect of continuous professional development for researchers and innovators
- → Create a master degree to provide training for professionals who are in a position to put RRI principles into practice.
- → Promote training and debates at the workplace on ethical aspects of programmes, activities and products
- → Provide an online library of best practices; facilitate discussion on social media about best/worst practices
- → Promote training initiatives for both seniors and private caregivers for capacity building on ICT (reduce "ICT illiteracy"), with a focus on face to face events and inter-generational learning

35 See additional options at the web-site of the IRRESISTIBLE Project aiming to foster the involvement of students and the public in the process of Responsible Research and Innovation (RRI) www.irresistible-project.eu/index.php/en/

5. CONCLUSIONS





This document brings together all the insights arising from the project activity so far making it possible to prepare ***a general Framework to guide the implementation of RRI in ICT for an ageing society.***

The key actions for implementation of RRI can be summarized as it follows:

- → Reflect on a vision for RRI within the organization, promoting capacity building and instilling RRI in the culture of the organization
- → Integrate RRI into existing structures and processes, including R&I, CSR, quality and other company functions
- → Promote reflection and awareness of ethical and societal issues related to specific R&I products in ICT for an ageing society
- → Perform in depth ethical analysis of ICT products/services from early stages of the R&I value chain
- → Support the early identification of appropriate preventive and precautionary measures
- → Foster stakeholder engagement, in particular end users, from early stages of product development
- → Pursue open and transparent communication with stakeholders about risks and impacts
- → Perform ongoing assessment and management of the impacts of ICT products and services, both in the short/ medium term and long-term
- → Ensure training and professional development opportunities to enable staff to fully participate and take responsibility
- → Foster multi-disciplinarity between engineering, natural sciences, ethics and social sciences
- → Apply equality principles in recruitment and career progression

In the end, operationalization of RRI turns out to be a complex business that can add extra costs to R&D activities.
Nevertheless, the project analysis shows that adoption of RRI practices would bring improved matching of ICT products with societal needs, higher acceptability and increased quality. More generally, an enhanced consideration of societal needs and ethical aspects in product development could ultimately translate into economic benefits that could compensate for any extra costs.
The project analysis has shown also that there is a strong need for incentives to be set by policy makers for the successful up-take of voluntary governance tools and RRI practices by companies, in particular by SME's and spin-off companies.

6. GLOSSARY

→ **CROWD-SOURCING**
is the process of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, and especially from an online community, rather than from traditional employees or suppliers. It is distinguished from outsourcing in that the work comes from an undefined public rather than being commissioned from a specific, named group. Crowdsourcing can involve division of labor for tedious tasks split to use crowd-based outsourcing, but it can also apply to specific requests, such as crowdfunding, a broad-based competition, and a general search for answers, solutions[36].

→ **CORPORATE SOCIAL RESPONSIBILITY (CSR)**
has been defined as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis", as well as "the responsibility of enterprises for their impacts on society" [EC, 2011].

→ **DELPHI STUDY**
is a method of structuring a group communication process so that allows a group of individuals, as a whole, to deal with a complex problem. The goal (and the result) of a Delphi study is to organize a debate, to collect and synthesize opinions and to achieve a degree of convergence on selected themes of exploratory, predictive and even normative nature [Adler & Ziglio, 1996; Dalkey, Brown, & Cochran, 1969; Linstone, Turoff, & Helmer, 1975].

→ **ETHICS**
is the systematic reflection on right and wrong conduct according to norms and values that we believe should be followed. Ethics refers to duties, responsibilities, rights, welfare, justice and the avoidance of harms. Typical moral values include autonomy, freedom, dignity, privacy, justice, well-being and responsibility [Satori project, 2015].

→ **ETHICAL ASPECT**
of some phenomenon is an aspect that raises ethical questions: whether its implications are sufficiently in line with our considered moral values, and whether or not it raises an ethical or moral dilemma: an apparent conflict between two moral principles or norms that somehow should be resolved [Satori project, 2015].

36 Wikipedia

→ **ETHICS ASSESSMENT**
is the identification and evaluation of ethical issues relating to specific research undertakings, initiatives or actions

→ **ETHICAL ISSUE**
is an issue that raises questions in terms of moral principles and the different choices that these entail. Moral principles and actions are fluid and influenced by specific regional historical, cultural and legal contexts

→ **FOCUS GROUP**
is a planned discussion among a small group (4-12 persons) of stakeholders facilitated by a skilled moderator. It is designed to obtain information about (various) people's preferences and values pertaining to a defined topic in a permissive, non-threatening environment [Steyaert, 2005].
Focus groups bring together a cross-section of interested parties in an informal discussion group format. The group should include users or their representatives. A facilitator elicits views on relevant topics. Meetings can be recorded for later analysis. Focus groups are useful early in the user requirements specification. They help to identify issues which may need to be tackled, and provide a multi-faceted perspective on them.

→ **HUMAN-CENTERED DESIGN (HCD)**
is characterised by:
- The design is based upon an explicit understanding of users, tasks and environment;
- Users are involved throughout design and development;
- The design is driven and refined by user-centred evaluation;
- The process is iterative;
- The design addresses the whole user experience;
- The design team includes multidisciplinary skills and perspectives. [ISO 9241-210:2010]

→ **HUMAN-DRIVEN DESIGN (HDD)**
is an approach to technology design characterized as follows [Niemelä M., et al. 2014]:
- is collaborative in terms of promoting participatory and co-design methods to empower users and other stakeholders in design and to ensure successful design outcomes by means of deep understanding of the user's needs, values and circumstances.
- is responsible in terms of being aware of human, societal and ethical values related to a particular design and reflecting them in the design in order to make the technology support well-being and activities of people as well as sustainability (social, environmental and economic).

- takes a human and social view to users of technology as individuals and members of human social groups, such as family, organization or community, and as consumers. The starting point in the design is the human being and her or his needs, goals and desires.

→ **ICT FOR AN AGEING SOCIETY**
Information and Communication Technologies dedicated to services to persons, aimed at making these services more accessible and effective for an ageing population, particularly in terms of health.

→ **IMPACT ASSESSMENT**
is the assessment of research and innovation for its projected or actual societal impacts [Satori project, 2015]

→ **PARTICIPATORY DESIGN**
is a "practice of collective creativity" that emphasizes active involvement by the users and all the stakeholders in design and development of new systems [Niemelä M., et al. 2014]

→ **RISK ASSESSMENT**
A process of evaluation including the identification of the attendant uncertainties, of the likelihood and severity of possible adverse effect (s) /event(s) occurring to man or the environment following exposure under defined conditions to potential risk source(s). A risk assessment comprises hazard identification, hazard characterization, and exposure assessment and risk characterization[37].

→ **SCENARIO WORKSHOP**
is an instrument for participatory planning, based on dialogue and collaboration between a group of citizens, stakeholders, experts and policy makers. The purpose of the scenario workshop is to assess different solutions to a specific problem. The solution can be technical, regulatory or an alternative method to manage a problem. Before the workshop, a set of scenarios is developed and used as visions and inspiration at the scenario workshop. From these the participants develop visions in groups through discussion such as plans of action to solve the problem. It is well suited to the design of new product concepts.

→ **SCENARIO BUILDING WORKSHOP**
Scenarios consist of visions of future states and paths of development, organised in a systematic way. They can be either extrapolative or normative but should enable participants to build internally consistent pictures of

37 definition originally drafted in: Communication on Consumer health and Food Safety, European Commission, 1997

future possibilities and are useful for envisaging the implications of uncertain developments and examining the scope for action. Scenario building engages a group in a process of identifying key issues and then creating and exploring scenarios in order to explore the range of available choices involved in preparing for the future, test how well such choices would succeed in various possible futures and prepare a rough timetable for future events. The method was designed to challenge the mind-set of participants by developing scenarios of alternative futures in order to understand how the world might unfold and how that understanding can be used in strategic planning [Steyaert, 2005].

→ **SOCIETAL IMPACT**
is divided in several categories, including:

- **Technological impact**: contribution to the creation of product, process and service innovations.
- **Scientific impact**: contribution to the subsequent progress of knowledge, the formation of disciplines, training and capacity building.
- **Economic impact**: contribution to the sale price of products, a firm's costs and revenues (micro level), and economic returns either through economic growth or productivity growth (macro level).
- **Social impact**: contribution to community welfare, quality of life, behaviour, practices and activities of people and groups.
- **Health impact**: contribution to public health, life expectancy, prevention of illnesses and quality of life.
- **Environmental impact**: contribution to the management of the environment, for example, natural resources, environmental pollution, climate and meteorology.

→ **SOCIAL IMPACT ASSESSMENT**
is a methodology to review the social effects of infrastructure projects and other development interventions.

→ **STAKEHOLDERS**
are those entities (groups, organizations, individuals) that may be affected by research and innovation and therefore have an interest in it[38].

→ **TECHNOLOGY ASSESSMENT (TA)**
is a scientific, interactive and communicative process which aims to contribute to the formation of public and political opinion on societal aspects of science and technology [TAMI, 2005]

38 Stakeholders of ICT for an ageing society are identified by the BRAID Project www.braidproject.eu

→ **USABILITY**
is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [International Standard ISO/IEC 9241-11, 1998]

→ **USER-CENTERED DESIGN (UCD)**
is an approach to interactive system development that focuses specifically on making systems or applications easy to use [International Standard ISO/IEC 13407, 1999]

→ **USER COMMITTEES**
This method involves users and other stakeholders in the formal monitoring and steering of the research and innovation process. Typically, there is a kick-off, a mid-term, and a final workshop [Engage2020 Project, 2014]

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ANNEX. LIST OF RELEVANT EUROPEAN LEGISLATIONS

An indicative (and partial) list of all European legislations related to the ICT, Data Protection, and Health care (medicinal products, medical devices) and product liability is provided below.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

- → Directive 2002/21/EC of the **European Parliament and of the Council** of 7 March 2002 on a **common regulatory framework for electronic communications networks and services (Framework Directive)**, as amended by Directive 2009/140/EC and Regulation 544/2009
- → Directive 2002/19/EC of the **European Parliament and of the Council** of 7 March 2002 on **access to, and interconnection of, electronic communications networks and associated facilities** (Access Directive), as amended by Directive 2009/140/EC
- → Directive 2002/20/EC of the **European Parliament and of the Council** of 7 March 2002 on the **authorization of electronic communications networks and services** (Authorization Directive), as amended by Directive 2009/140/EC)
- → Directive 2002/22/EC of the **European Parliament and of the Council** of 7 March 2002 on **universal service and users' rights relating to electronic communications networks and services** (Universal Service Directive), as amended by Directive 2009/136/EC
- → **Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union**
- → **Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009 establishing the Body of European Regulators for Electronic Communications (BEREC)**

Directive 2006/95/EC of the **European Parliament and of the Council** of 12 December 2006 on the harmonization of the laws of Member States relating to **electrical equipment designed for use within certain voltage limits**

- → Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the **restriction of the use of certain hazardous substances in electrical and electronic equipment**

DATA PROTECTION

- → **Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data**
- → Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the **processing of personal data by the institutions and bodies of the Community and on the free movement of such data**.
- → **Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (privacy and electronic communications)**

MEDICINAL AND VETERINARY PRODUCTS

- → Directive 2001/83/EC of the European Parliament and of the Council of 6 November 2001 on the **Community code relating to medicinal products for human use**
- → Directive 2003/94/EC of 8 October 2003 laying down the principles and guidelines of **good manufacturing practice in respect of medicinal products for human use and investigational medicinal products for human use** ("the GMP Directive)
- → Regulation (EC) No 726/2004 of the European Parliament and of the Council of 31 March 2004 laying down Community procedures for the **authorisation and supervision of medicinal products for human and veterinary use** and establishing a European Medicines Agency
- → Directive 2005/28/EC of 8 April 2005 laying down principles and detailed guidelines for **good clinical practice** as regards investigational medicinal products for human use, as well as the requirements for authorisation of the manufacturing or importation of such products" (**Good Clinical Practice**)
- → Regulation No 536/2014 of the European Parliament and of the Council on **clinical trials on medicinal products for human use**, and repealing Directive 2001/20/EC
- → Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the **protection of animals used for scientific purpose**
- → Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to **veterinary medicinal products**

MEDICAL DEVICES

→ Council Directive 90/385/EEC on Active Implantable Medical Devices (AIMDD) (1990)
→ Council Directive 93/42/EEC on Medical Devices (MDD) (1993)
→ Council Directive 98/79/EC on In Vitro Diagnostic Medical Devices (IVDMD) (1998)

LIABILITY

→ Directive 1999/34/EC of the European Parliament and of the Council of 10 May 1999 amending Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products
→ Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage

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