Executive Brief
Implementing Responsible Research and Innovation in ICT for an ageing society
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Implementing Responsible Research and Innovation in ICT for an ageing society

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1. INTRODUCTION
1. INTRODUCTION
1.1 WHAT IS RESPONSIBLE RESEARCH AND INNOVATION (RRI)?

Responsible Research and Innovation (RRI) is a newly emerging 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 is an answer to the demand arising from society that safety, desirability, acceptability and quality should be the basis of the design and realization of research and innovation products [Eurobarometer 2015, EC 2012]. To date RRI has primarily focused on publicly funded research but broader application of RRI to industry is envisaged, by the European Commission, to stimulate greater responsiveness of science and innovation towards society’s needs [EC 2013b]. RRI is intended to go beyond existing initiatives for responsible business governance that are already in place in enterprises, such as CSR (Corporate Social Responsibility) initiatives [Iatridis K. 2015, EC 2011].

HOW WILL THIS BE ACHIEVED?

→ By strengthening links with customers to get insights into their needs and preferences
→ By better matching 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 the company reputation
→ Decreasing business risks and unintended consequences
→ Strengthening public trust in the safety of products
→ Increasing acceptability of products
→ Adopting an environmentally friendly profile
→ Optimizing the company’s medium-term competitiveness/profitability.

Operationalization of RRI, however, is a complex business and there is need to put it in practice on a case-by-case basis.
In this context, as a significant and challenging bench test, 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.

In the following, a Framework for the Implementation of RRI is set up to provide strategic options and recommendations for industrial actors engaged in research and innovation to enable them to pursue responsible practices and behaviours when developing devices, products and services. The Framework is primarily directed at CEOs, senior executives and project managers of industries that are active in research and innovation. The Framework is a deliverable of the project ‘Responsible Industry’ and its content is drawn from the insights that have arisen from the project activities so far. It is part of a more comprehensive document downloadable at the project web site.

1 See more at www.responsible-industry.eu

2 Links to relevant Project documents can be found in the section “References and Further Reading”

3 Porcari et al., Framework for implementing Responsible Research and Innovation in ICT for an ageing society
1.2 Why do we need to embrace RRI in ICT for an ageing society?

Among the emerging areas of research and innovation, a leading role is currently played by ICT (Information and Communication Technologies)-based tools and services developed for health care and monitoring, as well as for occupational and recreational support of the ageing population in response to changing demographics and health needs [AALIANCE 2 New Roadmap, 2014].

On the one hand 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 [AAL 2014]. On the other hand, there is a growing concern about the possibility that these technologies, like other innovations, could raise ethical issues and fail to meet societal needs and expectations. Ultimately, this could severely limit their acceptability and marketability [AALIANCE 2 Summary Market Review for AAL, 2013].

A Delphi study4 undertaken by the Responsible Industry Project has indicated that amongst the enabling technologies5 that support ICT for ageing, the following raise high ethical concerns:

- **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)

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4 E. Borsella et al. Delphi Exercise Report
5 See more on the list of ICT technologies in the AAlliance Roadmap [AAlliance Project, 2014]
Within this list, as indicated by the Delphi study, 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.

Significant examples of ICT innovations raising ethical dilemmas are given by ICT-based systems designed to enable the outdoor and indoor mobility for elderly people with age-related sensory (visual, auditory) or cognitive (memory) impairments [AALIENCE2 New Roadmap 2014].

Typical outdoor applications include personalized GPS-based systems that are combined with receiving systems to enable a person to find her/his way through a city and to be located by relatives/caregivers in case of unexpected problems. In the case of indoor applications, examples include environmental and wearable devices to monitor movements and physiological parameters, help seniors in their daily life activities at home (e.g. provide alert messages, remind to take a drug) and provide health information to caregivers [AAL 2014]. These systems can give rise to real-time monitoring of the user’s life style and may violate her/his privacy.
An even more critical situation is encountered in 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 relationships. Use of enabling technologies in this scenario raises the question of who should provide consent for the installation of ICT products at home. In general, the 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)

The implementation of RRI concepts in the industry of ICT could help innovators to take these critical issues into account and develop new ICT products which provide safe, ethically acceptable and desirable solutions to meet the needs of the elderly. Moreover, an enhanced consideration of societal needs and ethical aspects from the industry could translate into economic benefits.

The motto proposed by the project is:

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

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6 See more on the possible impact of ICT developments on the rights of elderly people at [www.valueageing.eu](http://www.valueageing.eu)
2. THE FRAMEWORK FOR IMPLEMENTING RRI
EXECUTIVE BRIEF: IMPLEMENTING RESPONSIBLE RESEARCH AND INNOVATION IN ICT FOR AN AGEING SOCIETY

2. 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:

- 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 focuses 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, 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.

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

8 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 RRI with users and societal needs
- Engaging stakeholders in the RRI 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

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

**RRI FACILITATORS**

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

**OPERATIONALIZE RRI IN ICT FOR AN AGING SOCIETY**

Who is responsible for what?

How can RRI be integrated along the value chain?

What voluntary tools can be used for RRI?

How can ethical and social impact analysis be performed?
2.1 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

- RRI CULTURE/VISION
  - Executive Management

- RRI PRACTICE
  - Research & Development

- RRI FEEDBACK
  - Marketing

- RRI MONITORING
  - CSR, Legal, Human Resources
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).\(^9\)

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9 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.
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\(^\text{10}\). The most common methods for active stakeholder engagement in R&I\(^\text{11}\) are Participatory Design, Human-Centered Design [Niemelä M., et al. 2014], and User-Centered Design\(^\text{12}\).

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.

\(^{10}\) 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.

\(^{11}\) 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).

\(^{12}\) An inventory of methods and tools for user-centered design in the ICT for an ageing society is available in the report from the Nomadic 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

**USER AND STAKEHOLDER ENGAGEMENT**

- Brainstorming, scenario workshops, etc.
- Focus Groups, Networks etc.
- Interviews, Delphi survey, etc.

**Societal and ethical risks/impacts identification and evaluation**
- Use of voluntary governance tools for RRI

**Agenda setting, Basic research**
- Participatory Design, Human-centered Design, Human-Driven Design

**Applied research**
- Pilot studies for evaluating different scenarios

**Prototyping/Demonstration**
- Prototype testing with end-user groups

**Engineering and testing**
- Transparent communication on products

**Go to market**
- Medium and long term feedback from users and consumers

**On the market**
- Market related on-line surveys/interviews on product acceptability

INCLUDE FEEDBACK FROM END-USERS

REGULARLY MONITOR THE EFFECTIVENESS OF THE RISK & IMPACT MANAGEMENT STRATEGY
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.
2.3 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\(^\text{13}\), Social Impact Assessment\(^\text{14}\) 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\(^\text{15}\), consumer organizations and other representatives of civil society, policy makers/legislators.

\(^\text{13}\) 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]

\(^\text{14}\) See more at the web-site of the Project PACITA (Parliaments and Civil Society in Technology Assessment at http://www.pacitaproject.eu/)

\(^\text{15}\) 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]

1. INITIAL SCENARIO
2. USER AND EXPERT EVALUATIONS OF SCENARIOS
3. INITIAL ETHICAL GUIDELINES FOR DESIGN
4. REALIZATION OF DESIGN AND PILOT STUDIES
5. USER EVALUATION OF PROTOTYPES
6. IMPACT ANALYSIS OF PRODUCT AND Refined ETHICAL GUIDELINES
→ Use methodologies for stakeholder engagement such as:\(^6\):
  - 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\(^7\)

→ 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\(^8\), 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.

\(^6\) See more at the web-site of the Project pe2020
\(^7\) 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.

\(^8\) 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

<table>
<thead>
<tr>
<th>Phase</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard identification</td>
<td>ETHICS COMMITTEES</td>
</tr>
<tr>
<td>Decide who might be harmed and why</td>
<td>RESEARCH ORGANIZATIONS</td>
</tr>
<tr>
<td>Evaluate the risks and decide on precautions</td>
<td>CIVIL SOCIETY ORGANIZATIONS &amp; END-USERS</td>
</tr>
<tr>
<td>Regularly review and update the risk and impact assessment</td>
<td>POLICY MAKERS</td>
</tr>
</tbody>
</table>

**ETHICAL AND SOCIAL RISK & IMPACT ASSESSMENT**

- **Hazard identification**: Decide who might be harmed and why.
- **Evaluate the risks and decide on precautions**: Regularly review and update the risk and impact assessment.
2.4 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:

- 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:

- 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

19 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.

20 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)\textsuperscript{21}:

- Electronic Industry Citizenship Coalition Code of Conduct\textsuperscript{22}
- The Software Engineering Code of Ethics and Professional Practice\textsuperscript{23}

\textsuperscript{21} 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

\textsuperscript{22} Available at [www.eiccoalition.org/](http://www.eiccoalition.org/)

\textsuperscript{23} Available at [www.acm.org/about/se-code](http://www.acm.org/about/se-code)
FIG. 7: VOLUNTARY GOVERNANCE TOOLS FOR RRI ALONG THE VALUE CHAIN

<table>
<thead>
<tr>
<th>Vision</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product usability, desirability, quality; Global analysis and holistic evaluation of risks and impacts; Uncover unintended or unforeseen consequences.</td>
<td>Individual rights and liberties [privacy, data protection, etc.], Personal safety and health, Autonomy, authenticity and identity, Quality of life, Social isolation, Integrity and dignity, Bodily integrity, Social safety, Justice, Access, Equality.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RRI Value chain</th>
<th>Agenda setting, Basic research</th>
<th>Applied Research</th>
<th>Prototyping/Demonstration</th>
<th>Engineering and testing</th>
<th>Go to market</th>
<th>On the market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRI tools</td>
<td>Cal</td>
<td>RRI/ethical labels</td>
<td>Protocols and conventions on ethical aspects</td>
<td>Standards on usability, acceptability, design for all, value and ethics by design</td>
<td>Risk management systems, quality certifications</td>
<td>Standards for privacy, security and data protection</td>
</tr>
<tr>
<td>Critical actions</td>
<td>Adapt tools to ICT for an ageing society, Engage with stakeholders to monitor, measure and improve implementation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. THE FRAMEWORK FOR IMPLEMENTING RRI > 33
→ Take due account of international declarations on human rights, such as:

- United Nation Convention on the Rights of Persons with Disabilities and Optional Protocol\textsuperscript{24}
- European Charter of the rights and responsibilities of older people in need of long-term care and assistance\textsuperscript{25}

→ Carefully evaluate use of existing technical standards relevant for the engineering and design of products in ICT for an ageing society, including \textsuperscript{26, 27}:

- Standards on risk and quality management for the ICT, AAL and healthcare sectors, guidance related to the EU regulatory framework for telecommunications ICT\textsuperscript{28}
- Guidance within the regulatory framework on Medical Devices (Medical Devices Directive)\textsuperscript{29}
- Standards from international professional organizations and networks active in the ICT and Health sectors\textsuperscript{30}
- 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

\textsuperscript{24} Available at www.un.org/disabilities/default.asp?id=150
\textsuperscript{25} Available at www.age-platform.eu/images/stories/22204_AGE_charte_europeenne_EN_v4.pdf
\textsuperscript{26} 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 AALIANCE\textsuperscript{2} 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/
\textsuperscript{27} 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)
\textsuperscript{28} 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
\textsuperscript{29} 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
\textsuperscript{30} 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\textsuperscript{31}.

- Standards on consumer rights (e.g. Code of EU Online Rights\textsuperscript{32})

\textsuperscript{31} 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
\textsuperscript{32} Available at \url{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.
2.5 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)]**

- **USABILITY**
  - Effectiveness
  - Efficiency
  - Satisfaction

- **OTHER PARAMETERS**
  - Utility
  - Impact on daily habits
  - Comfort
  - Safety
  - Aesthetics
  - Obstrusiveness
  - Portability
3. POLICY OPTIONS TO FOSTER RRI ADOPTION
3. POLICY OPTIONS TO FOSTER RRI ADOPTION
3.1 POLICY OPTIONS TO FOSTER RRI ADOPTION

The accompanying measures to help drive, facilitate and support industry in pursuing RRI are primarily recommendations to policy makers for:

- Optimizing/adapting the existing regulatory framework
- Setting incentives for adoption of voluntary governance tools and RRI practices
- Fostering an RRI culture

Optimizing/adapting the regulatory framework

Key suggested areas of action are:

- 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 the establishment of global data protection rules, valid for all ICT companies

SETTING INCENTIVES FOR ADOPTION OF VOLUNTARY GOVERNANCE TOOLS AND RRI PRACTICES

The establishment of 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 society [Søraker J.H., Brey P.A.E 2014].

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33 See https://ec.europa.eu/digital-agenda/en/telecoms-rules
Key areas of action for policy makers emerged from the project consultation (see *Delphi Exercise Report*) and 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
- 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) allowing for public evaluation of products with respect to RRI criteria

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:

*The recent report* *Options for Strengthening Responsible Research and Innovation* [EC, 2013] 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.
- Promote the use of standards and interoperability in the design of ICT products to facilitate the combination of different components in the realization of complex systems and services.
- 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 a conducive reimbursement approach amongst telehealth and telecare providers [AAliance2, 2014a]

FOSTERING A RRI CULTURE
Awareness of the RRI concept and RRI approaches and practices is still limited and should be raised. Recommended areas of action are:

- Raising awareness of stakeholders promoting best practices at EC and national level:
- Reserve space for discussions of RRI in all research-related events

35 See more at AAL Project: Action Aimed at Promoting Standards and Interoperability in the Field of AAL (Ambient Assisted Living)
4. CONCLUSIONS
4. CONCLUSIONS
This document presents a set of guidelines for the implementation of RRI in ICT for an ageing society.

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

- Reflect on a vision for RRI within the organization, promoting capacity building and, instilling RRI within 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, in particular with 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 impact of ICT products and services, both in the short/medium term and long-term
- Ensure training and professional development opportunities to permit staff to fully participate and take responsibility
- Foster multidisciplinarity between engineering, natural sciences and ethics and social sciences
- Promote training and debates in the workplace on ethical aspects of programmes, activities and products
- Apply equality principles in recruitment and career progression

Ultimately, the operationalization of RRI is a complex business that can add extra costs to R&D activities. Nevertheless, the project analysis shows that adoption of RRI practices could engender improved matching of ICT products with societal needs, higher acceptability and increased quality. Moreover, 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.

As a concluding remark, there is a great need for policy makers to develop incentives for the successful up-take of voluntary governance tools and RRI practices by companies, in particular by SME's and spin-off companies.
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