

A Roadmap for the RRI uptake in the industrial context: a tool for strategy setting and RRI impact evaluation

Daniela Pimponi, Andrea Porcari,

Elisabetta Borsella, Pim Klaassen, Maria João Maia, Emad Yagmaei, Elvio Mantovani

About us

Airi – Italian Association for Industrial Research

- Established: 1974
- More than 80 members active in R&S (large companies, SMEs, public research)
- Key theme of action: R&I policies, KETs, RRI and sustainability



Mission

Promote industrial research and innovation as instruments to improve Italy competitiveness

National and EU R&D policies

Monitor and assess R&D Trends

R&D Cooperation and tech transfer

Multi stakeholders dialogues

Responsible Research & Innovation

Disseminate information

Agenda

- Introduction to the PRISMA project
- Why RRI in industry
- Exploring the CEN CWA road-mapping process
- Case Studies

The PRISMA project

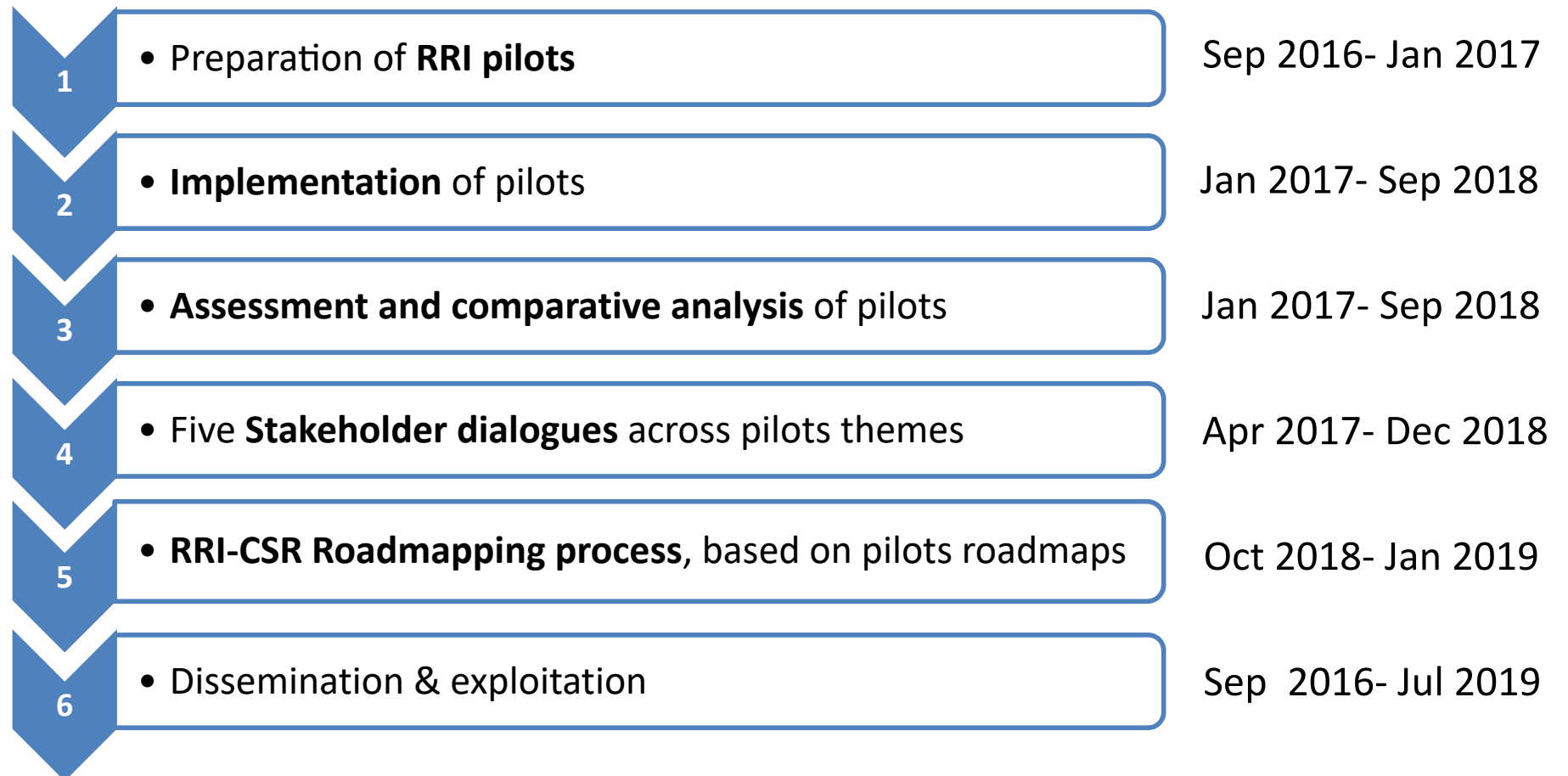
The Prisma project (2016-2019)



- Evidence on how RRI can **improve the innovation process**
- Integration of **RRI in the R&I and the CSR policies of 8 companies** active in the field of transformative technologies
- **CSR/RRI Prisma exemplar roadmap**, based on the 8 pilots roadmaps, that helps industries to implement RRI

Transformative Technologies (TT):
Transform production and **change the relation of the company with users, suppliers and stakeholders**. Contribute to a sustainable society and to competitiveness of Europe

The project workplan



Prisma pilots

Nanotech

- **COLOROBRIA:** Advanced medical therapies for cancer diseases
- **LABORATORI ARCHA:** Safer and more effective dermo-cosmetics



ARCHA

Biotech & Syn Bio

- **EVOLVA:** Sustainable production of synthetic agarwood products
- **BISIGODOS:** sustainable packaging, coatings from waste algae biorefineries



BISIGODOS

IoT

- **HAT:** IoT distributed data platform for increased personal control of data
- **SPECTRO:** IoT in cleaning, to improve public health and hygiene



SPECTRO

Automated vehicles

- **RDM:** automated vehicles to reduce traffic, pollution, land use
- **AERIALTRONICS:** drones, artificial intelligence and IoT solutions toward for safe, and acceptable use of drones in cities



A Roadmap for RRI in industry. Why?

CSR & RRI:

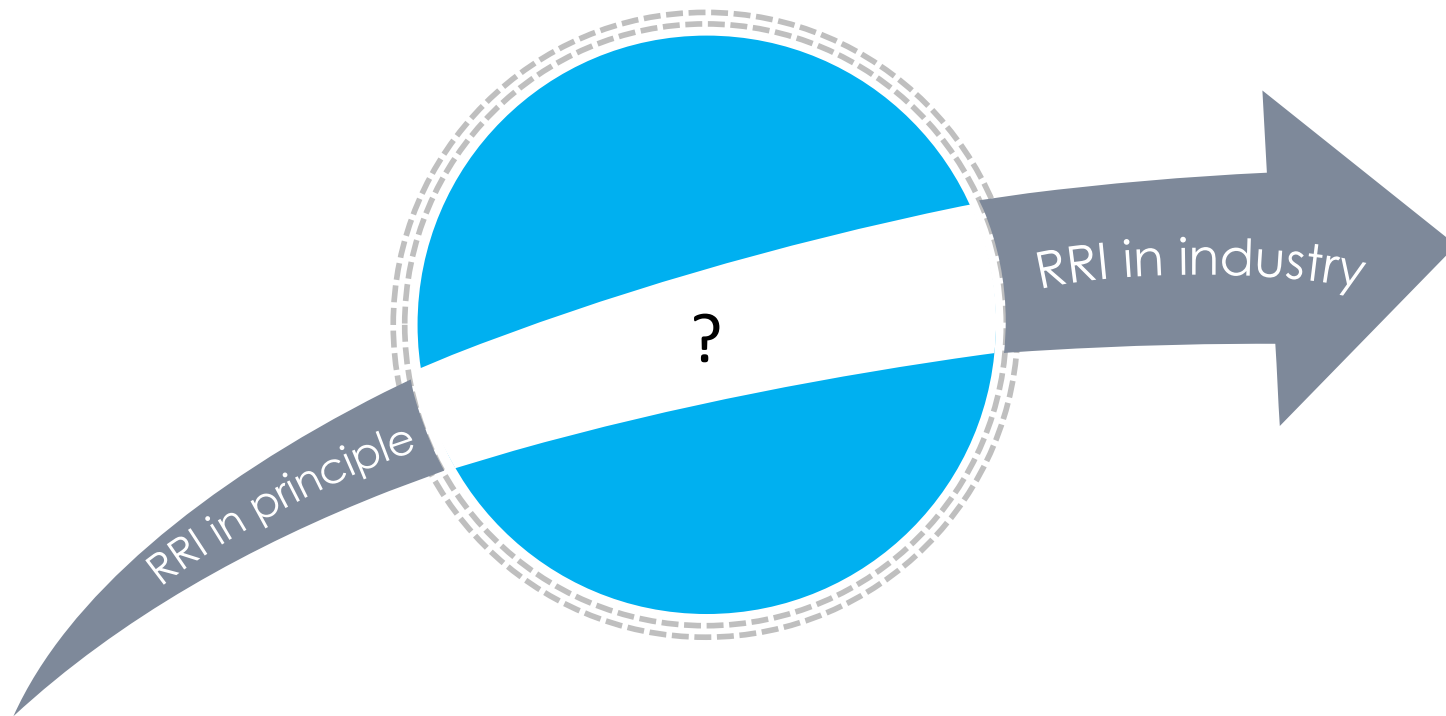
Business practices to address ethical and social impacts

- Corporate social responsibility
 - Integrated reporting
 - Social life-cycle assessment (S-LCA)
 - Corporate Shared Value (CSV)
 - Sustainability practices
 - Business ethic,
 - corporate social performance
 - corporate citizenship...
-
- and risk, quality management



**BUT, still little attention for research, innovation
and product development**

Mind the Gap



A management system

RRI has to be easy to be implemented by companies.

PRISMA developed a **management system for RRI implementation:**

Easier to be integrated with
existing procedures

Principles and terminology
already known by companies

Involving specific company
functions

- aligned with the **ISO High Level Structure** for management systems (e.g. ISO 9001)
- built on experiences on **social responsibility, risk and innovation management** (ISO26000, ISO 31000, ISO 56000)
- Looking at the whole **R&I value chain**

CEN guidelines to innovate responsibly



CEN CWA 105: Guidelines to develop long-term strategies (roadmaps) to innovate responsibly

Scope: provides a **framework to develop long-term strategies (roadmaps) to innovate responsibly**, integrating technical, ethical, social, environmental, and economic issues into research and innovation practices and to improve the ethical and social impacts of final marketable outcomes.

Target: addressed to **all organisations/agents involved in planning and performing research and innovation and technological development**. The focus is on transformative/enabling technologies

The first EU standard document on RRI

Public weblink: <https://www.cen.eu/News/Workshops/Pages/WS-2019-010.aspx>

The CEN CWA 105 – normative references

- Based on ISO and CEN Management standards on quality, CSR, innovation management, including;
 - High Level Structure (HLS) for Management systems, ISO/IEC Directives, 2015
 - ISO 26000 Guidance on social responsibility
 - ISO 31000 Risk management – Guidelines
 - EN ISO 9001 Quality management systems – Requirements
 - Series CEN/TS 16555 Innovation Management

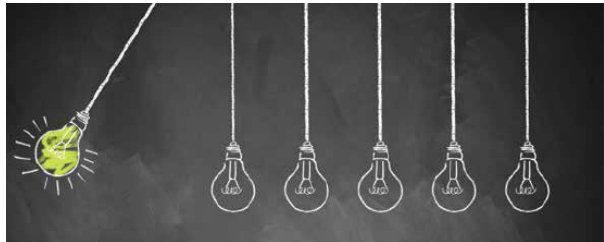
Structure of the document, terminology and some procedures
in common with these standards

CEN CWA: Terminology and definitions

Responsible Research and Innovation

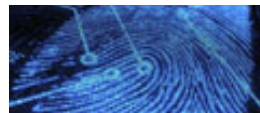
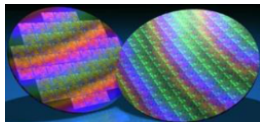
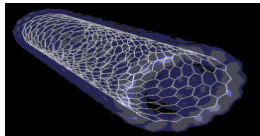
- ✓ a transparent, interactive process by which **societal actors and innovators become mutually responsive to each other**
- ✓ with a view to the **(ethical) acceptability, sustainability and societal desirability** of the innovation process and its marketable products.

(Renè von Schomberg, EC – 2011 - <http://about.me/Rene.vonSchomberg>)



CEN CWA terminology and definitions:

Transformative/enabling technologies



- Knowledge, capital-intensive tech
- Systemic relevance for all phases of product development
- pervasive, enabling process, innovation throughout the economy
- High R&D
- Rapid and integrated innovation cycles
- Highly skilled employment
- Multidisciplinary, trans-sectoral
- Trend towards convergence, tech integration

AND capacity to improve people's health, safety and security, supporting sustainable development and secure connectivity and communication among systems and individuals

Why a roadmap for RRI in Industry?

When developing new products, especially coming from enabling technologies, there is an increasing **need to**:

- Address the increasing **complexity** of the innovation eco-system and of the **societal demand**
- **Anticipate uncertainties** (unknown), about technological, ethical, social, legal, safety, environmental, economical aspects
- Respond and react to **actual (and unexpected) impacts of innovation**

Early engagement of stakeholders is paramount



RESEARCH
COMMUNITY



EDUCATION
COMMUNITY



BUSINESS
& INDUSTRY



CIVIL SOCIETY
ORGANISATIONS

Key benefits and drivers for the uptake of RRI on product development

Scientific & Technical

- Inspire technological innovation
- Product quality

Ethical & Societal

- Product acceptability, safety
- Product related services and guidance (e.g. ethics)
- Users' needs and rights

Strategic

- Corporate image
- Build legitimacy
- Identify new market needs

Organizational

- Address regulatory barriers
- Risk management
- Avoid irresponsible behaviour

Economic

- Favored access to financial support

Possible barriers for the uptake of RRI on product development

Scientific & Technical	<ul style="list-style-type: none">• none
Ethical & Societal	<ul style="list-style-type: none">• Polarization of debate
Strategic	<ul style="list-style-type: none">• Allocation and deployment of resources• Limited awareness and skills• Intellectual Property Rights
Organizational	<ul style="list-style-type: none">• Allocation and deployment of resources• Additional bureaucratic burden• Lack of awareness and skills• Lack of integration of RRI across the company functions
Economic	<ul style="list-style-type: none">• Product cost• Time to market• Use of human resources
RRI action costs	<ul style="list-style-type: none">• Direct costs to perform RRI actions

Testimonials from companies

INTERVIEW WITH GIOVANNI BALDI DIRECTOR, CE.RI.COL – COLOROBBIA CONSULTING RESEARCH CENTRE

The videos below concern interviews with
Giovanni Baldi (Director Research Centre).

“We consider pivotal to our R&D efforts an open and continuous dialogue with stakeholders, patients, in the first place, and regulators, health-care professionals, policy makers, media, the society at large. It is vital to improve functionalities, quality and reliability, acceptability, of the NanoMed technologies and products. With PRISMA we learned the importance of focusing on the ethical and social impacts of NanoMed since the early phases of the development, to become responsive and trustworthy toward needs and requests from users and society. This experience has convinced us of the strategic value of RRI for NanoMed and our organization.”

INTERVIEW WITH LAURENS METTERNICH, CEO SPECTRO

“What was particularly illuminating for me was that by collecting more data about cleaning we also as company may get new responsibilities which may led to new moral dilemmas. This has led us to adapt new policies for what data we share with our clients’

INTERVIEWS WITH SIMON BREWERTON, CTO OF RDM

These interviews are about 2 issues:

- Safety
- Ethical issues and stakeholder engagement

‘As part of our project work that we’ve done with the PRISMA project, we’ve been audited effectively against certain criteria that were generated from the PRISMA project, to see how responsible our innovation is at RDM’

INTERVIEW WITH STUART COLES, WARWICK MANUFACTURING GROUP

“... And it really is informing how we think about designing our projects for different calls, trying to incorporate some form of RRI into most of our grant proposals that we’re putting into the future. So I think what I’m learning is a greater appreciation of what RRI is, and how best to implement it in the future.”

INTERVIEW WITH XIAO MA, HAT DATA EXCHANGE LTD. FOUNDER

*‘Once we started working with the Prisma community we found we’re not alone, we realized there’s a whole school of people who are doing similar approach as we do, we’re also learning from the community on different ways and in best practices of implementing ethical research and innovation.
Xiao Ma, HAT Data Exchange Ltd.
Founder and Warwick University Senior Fellow’.*

INTERVIEW WITH TIMOTHY VAN LANGEVELD, HEAD LEGAL COUNCIL & REGULATORY AFFAIRS

‘I think the main lesson that we have learned from the pilot is you can’t innovate in a vacuum. We have tried to do it for some time but you need others. You get the best results when you involve others’

INTERVIEW WITH STEPHAN HERRERA, VP EVOLVA

‘This program really allowed us to join a community of academic, government industry and friends who are all committed to RRI’

Testimonials from companies

INTERVIEW WITH GIOVANNI BALDI
DIRECTOR, CE.RI.COL – COLOROBIA
CONSULTING RESEARCH CENTRE

INTERVIEWS WITH SIMON BREWERTON,
CTO OF RDM

INTERVIEW WITH XIAO MA, HAT DATA
EXCHANGE LTD. FOUNDER

The vide
Giovann

Collecting more data about cleaning may get new responsibilities which may led to new moral dilemma..

“We
oper
stak
regu
poli
It is
and
Nan
With
focu
Nan
deve
trusi
from
com
for 2

The main lesson that we have learned from the pilot is you can't innovate in a vacuum..

We consider pivotal in our R&D an open and continous dialogue with stakeholders, patients, regulators, health care professionals, policy makers, media...

INTERVI
CEO SP

With PRISMA we learned the importance of ethical and social impacts...

“Wha

was that by collecting more data about cleaning we also as company may get new responsibilities which may led to new moral dilemmas. This has led us to adapt new policies for what data we share with our clients’

about designing our projects for different calls, trying to incorporate some form of RRI into most of our grant proposals that we're putting into the future. So I think what I'm learning is a greater appreciation of what RRI is, and how best to implement it in the future.”

INTERVIEW WITH STEPHEN HENNING, CEO
EVOLVA

This program really allowed us to join a community of academic, government industry and friends who are all committed to RRI’

Highlights on RRI uptake experience

- **Work to introduce culture changes in the organization**
 - Commitment of the management (R&D, company level)
 - Look for Return on investment, at least in the medium/long term (for company and stakeholders)
- **Need for tailored methods and approaches**
 - Understand the context, governance and decision-processes of the company
 - RRI interlinked with economical, technical aspects of product development
 - ad hoc «RRI» tools inspire, but (generally) do not fit. Integration of RRI in existing CSR and quality tools seems more promising

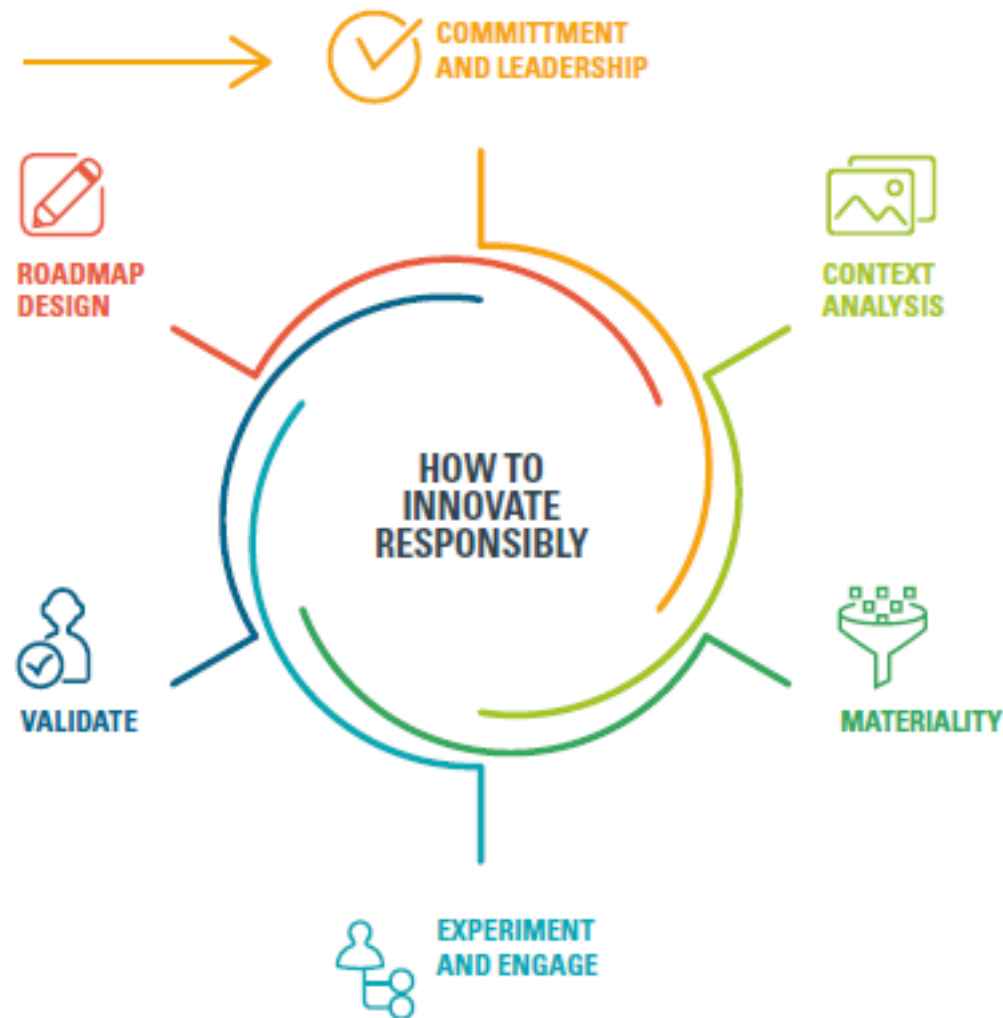
The CEN CWA propose an expert-driven, case by case, company specific approach to RRI uptake, to deal with differences across sectors, companies, and tech



https://www.youtube.com/watch?v=GScPbTh_x1I

The 6 steps of PRISMA Roadmapping process

The six steps of the RRI Roadmap



PRISMA propose a case by case, expert-driven and company specific approach to RRI uptake, to deal with differences across sectors, companies, and tech

Principles and actions for RRI implementation



Reflection & Anticipation

Integrate analysis of ethical, legal and social impacts since the early stages of product development



Inclusiveness

Perform stakeholder engagement to inform all phases of product development









Responsiveness

Integrate monitoring, learning and adaptive mechanisms to address public and social values and normative principles in product development

These actions are considered by the CEN CWA as minimum requirements for RRI uptake at company level

The six steps of the Roadmap

	TOP MANAGEMENT COMMITMENT AND LEADERSHIP	Ensure endorsement of the organization toward RRI values and approach
	CONTEXT ANALYSIS	Analyze the organization, the R&I product(s) and technologies on which to focus; Identify ethical, social and legal impacts of the product and stakeholders of the product innovation eco-system
	MATERIALITY	Identify and prioritize: drivers and challenges for RRI; risks and barriers to overcome; stakeholders to work with; significant RRI actions to pursue
	EXPERIMENT & ENGAGE	Perform exploratory/pilot RRI actions, engaging with stakeholders to inform the RRI roadmap
	VALIDATE	Evaluate impact of the roadmap on both the product development and the organization (Key Performance Indicators)
	ROADMAP DESIGN	Consolidate and visualize the long-term RRI strategy, covering all the R&I value chain (time to market) and product life-cycle

Step 1



Committment and leadership



Endorsement of the top management toward RRI values and approach

CHALLENGE: Integrate RRI in the culture of the organization

TASKS

- RRI roadmap, actions, objectives shared at the top level and in line with **values**, identity and stakeholders of the organization
- RRI principles integrated into the organization's management systems and governance
- resources available for both the roadmap design and its future implementation
- Setting of an initial RRI vision

TOOLS: Internal reflection and advice by experts



Step 2



Context analysis



Analyze the organization, R&I products and tech to focus on, the impacts and the stakeholders

CHALLENGE: RRI implementation is strictly context dependent.

TASKS: (to identify)

- The tech and products, on which to focus on the RRI roadmap design
- The development phases of the RRI product (until the time to market or life cycle)
- The potential ethical, legal and societal impacts of the RRI product
- Mapping of stakeholders along the innovation eco-system, including an initial understanding of their needs and perspectives

TOOLS: Analysis of internal and external factors influencing the product development (e.g. SWOT, PESTLE - political, economic, socio-cultural and technological, legal and environmental factors), questionnaires



42



Example of a questionnaire to start the context analysis

Facts and figure:

- Field of activity
- Company ownership
- Size of the organisation
- Date of establishment
- Member of trade organization

Type of organization:

- Organisational structure
- Business model
- Organisational culture
- Gender balance and gender policy (focus on R&I)

R&D and Innovation function:

- Size
- Relevance for the organization
- Type of research activity
- personnel: age, education, sex, home country, race
- R&I & CSR strategy of the organization
- Innovation management model

Experience with CSR and RRI:

- CSR, sustainability, risk and quality strategies
- Responsibilities within the organization
- Experience on stakeholder engagement

Case description:

- Project description
- Technologies
- Regulatory regimes
- Type of R&I activities
- Type of business
- Time to market

Step 3



Materiality analysis



Selecting significant impacts , RRI actions and stakeholders

CHALLENGE: understand and anticipate **significant values and impacts** early on in the R&I value chain, to have time to change and adapt the process

TASKS: (to select)

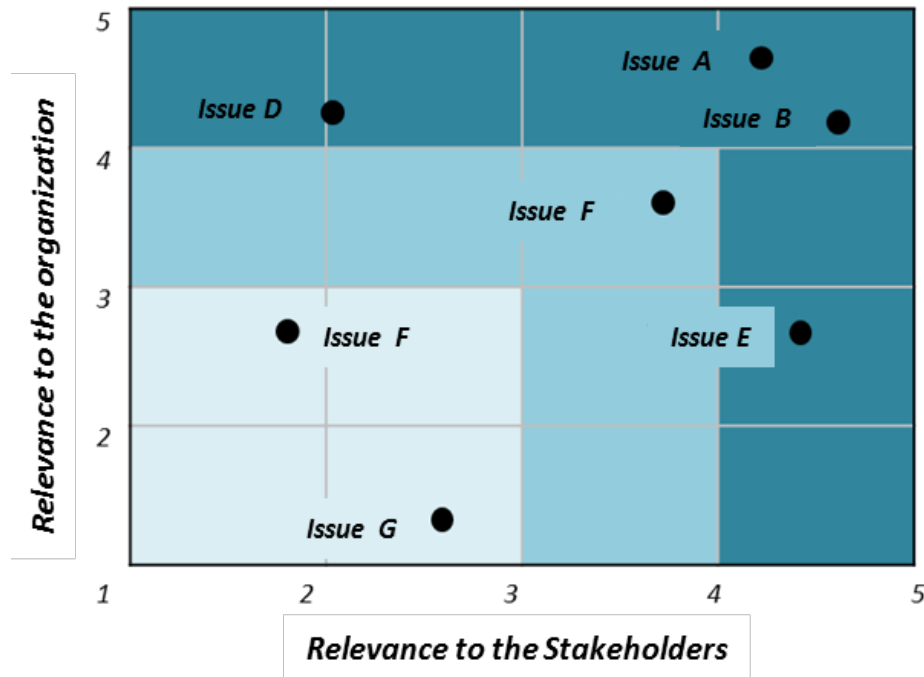
- Drivers (creation of value, positive impacts), and challenges (for achieving the impacts) to realize the RRI products
- Risks and barriers to achieve the impacts. Consider scientific, technical, strategical, organizational, economic, ethical and social aspects
- Stakeholders of the RRI product to engage with
- Significant RRI actions to achieve impacts and address risks and barriers
- Vision of the roadmap, addressing drivers and challenges



TOOLS: Materiality matrix, interest/influence grid, ring stakeholder map, etc.



Example: materiality matrix



Material issues

Issues critical to the success of the business strategy and stakeholders of the company.

Relevant issues, but not strategically material

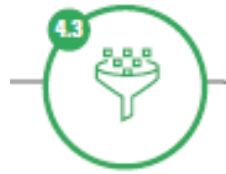
Issues relevant to both performance and stakeholders, but not central to the business strategy

Non-material issues

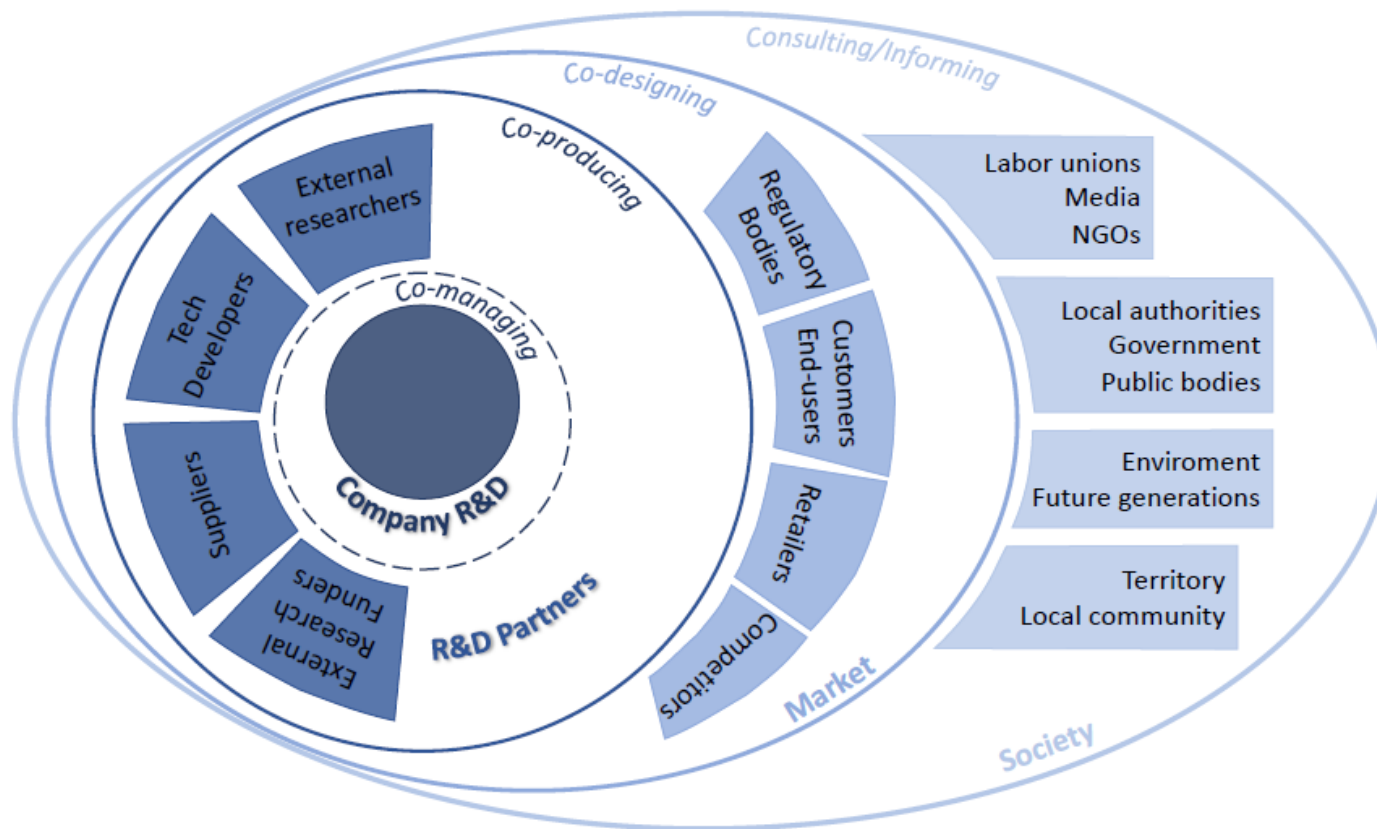
Low priority. These issues do not require special attention at this time. It is necessary to continue monitoring them properly to understand their future development



A way to analyze and prioritize issues emerged from the context analysis.



Example: mapping of stakeholders of the innovation eco-system



A way to highlight connections between stakeholders, their roles in the innovation ecosystem and their possible contribution, for example in a co-creation process.

Step 4



Experiment & Engage



Perform pilot RRI actions, engaging with stakeholders to inform the RRI roadmap

CHALLENGE: create a dialogue with stakeholders, experiment RRI, and go out of your «comfort zone»

TASKS (select):

- Engaging key stakeholders of the innovation eco-system to review significant (ethical, social, legal) impacts
- Review the initial RRI roadmap with stakeholders
- Possibly perform additional RRI actions, to pilot activities planned in the roadmap
- Finalize the materiality analysis and consolidate the roadmap

TOOLS: focus groups, plenary sessions, multi-stakeholder workshops, world-café, etc.



Avoid initiatives only to inform product development, studying people's behaviour, product testing



Examples of RRI Actions



Reflection and Anticipation

- Ethical analysis (foresight, scenario analysis, social phenomena and trends evaluation, etc).
- Design for values, safe by design
- Meetings with R&D staff to reflect on ethical issues
- Advice from experts on ELSI, on a need basis
- Life Cycle Assessment (LCA) and Social-LCA



Inclusiveness

- Sharing values and create positive ethical networks with businesses and social SHs
- Co-design with policy/normative actors
- Public dialogues (defining needs and concerns)
- Providing consumers an official role in the innovation process
- Capacity building with vulnerable stakeholders



Responsiveness

- User-centered design, co-creation
- Procedures for investigating reports of concerns or misconduct
- Adaptive risk management
- Embedded ethicists
- Ethical and FAIR research data management
- Include ELSI of R&I in CSR reporting

Step 5



Validate



Evaluate impact and feasibility of the roadmap on both the product development and the organization

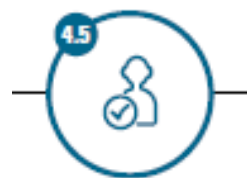
CHALLENGE: evaluate both tangible and intangible, short and long term impacts of RRI

TASKS (select):

- Identify and select criteria, KPIs, and methods to perform evaluation of impacts
- Evaluate impacts of the RRI roadmap actions on
 - Product development, using lines of evidence (costs & benefits)
 - Organization, using Key Performance Indicators
- Resources and processes to operationalize the RRI roadmap: People, Time, Knowledge, Finance, Infrastructures
- Integration in the innovation, risk, quality, social responsibility policies of the organization.
- documented information on the RRI roadmap



TOOLS: Multi Criteria Decision Analysis, qualitative and quantitative KPIs



Example: impact criteria and KPIs for RRI



Impact on
product development

Lines of evidence

1. Scientific & Technological
2. Ethical & Societal
3. Strategic
4. Organizational
5. Economic
6. RRI costs



Impact on
the organization

Key Performance Indicators

1. Awareness of moral values
2. Awareness of ethical issues
3. Does the company embed moral values in its innovations?
4. Does the company (actively) anticipate social effects of R&I ?
5. Stakeholder engagement
6. Gender Diversity
7. Transparency and accountability about RRI-relevant choices
8. Learning mechanisms to address public and social values
9. Capacity to align to societal goals
10. Active monitoring of RRI impacts

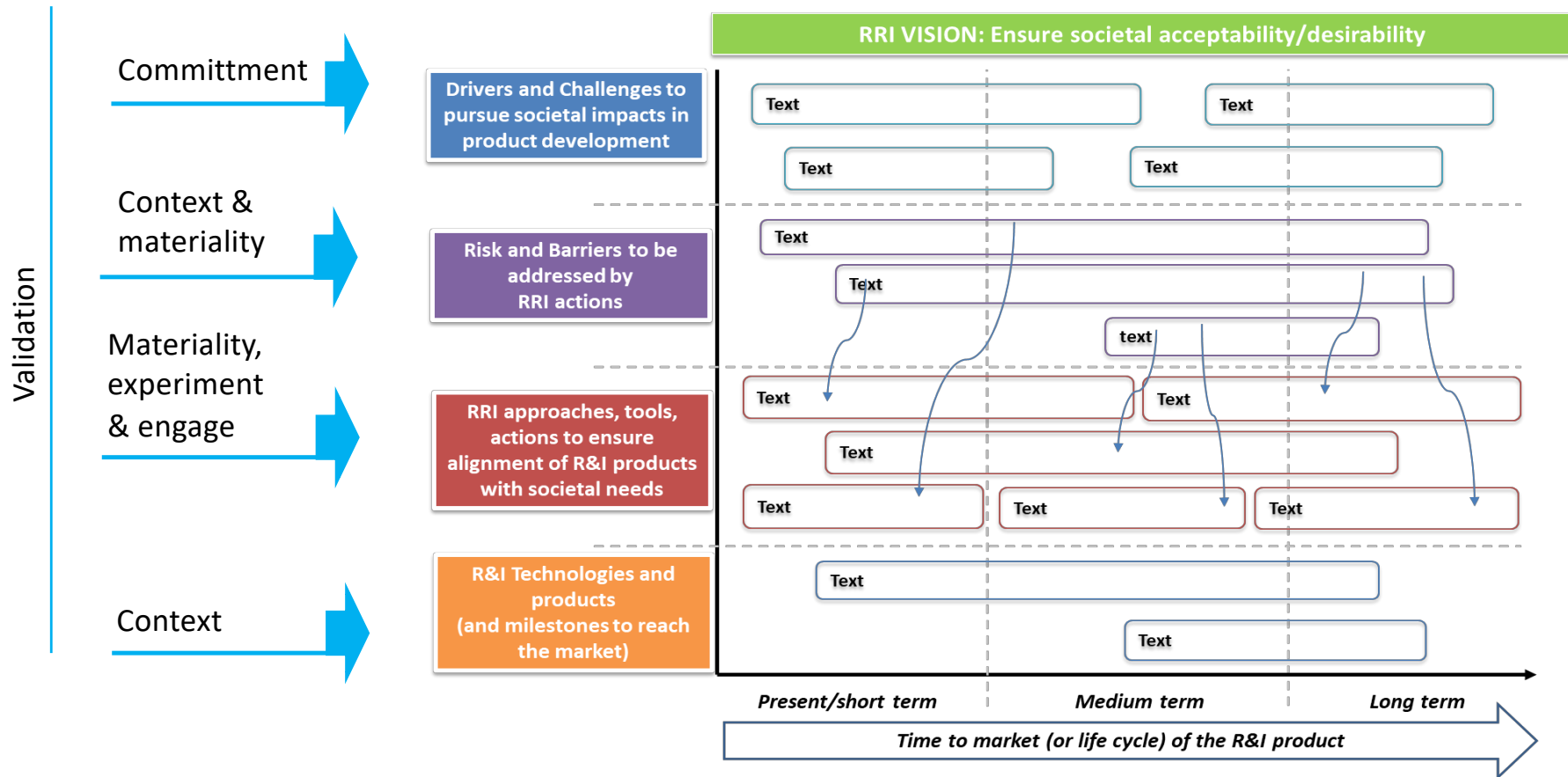
Step 6



Roadmap design



Consolidate and visualize the long-term RRI strategy





Consolidate and visualize the long-term RRI strategy

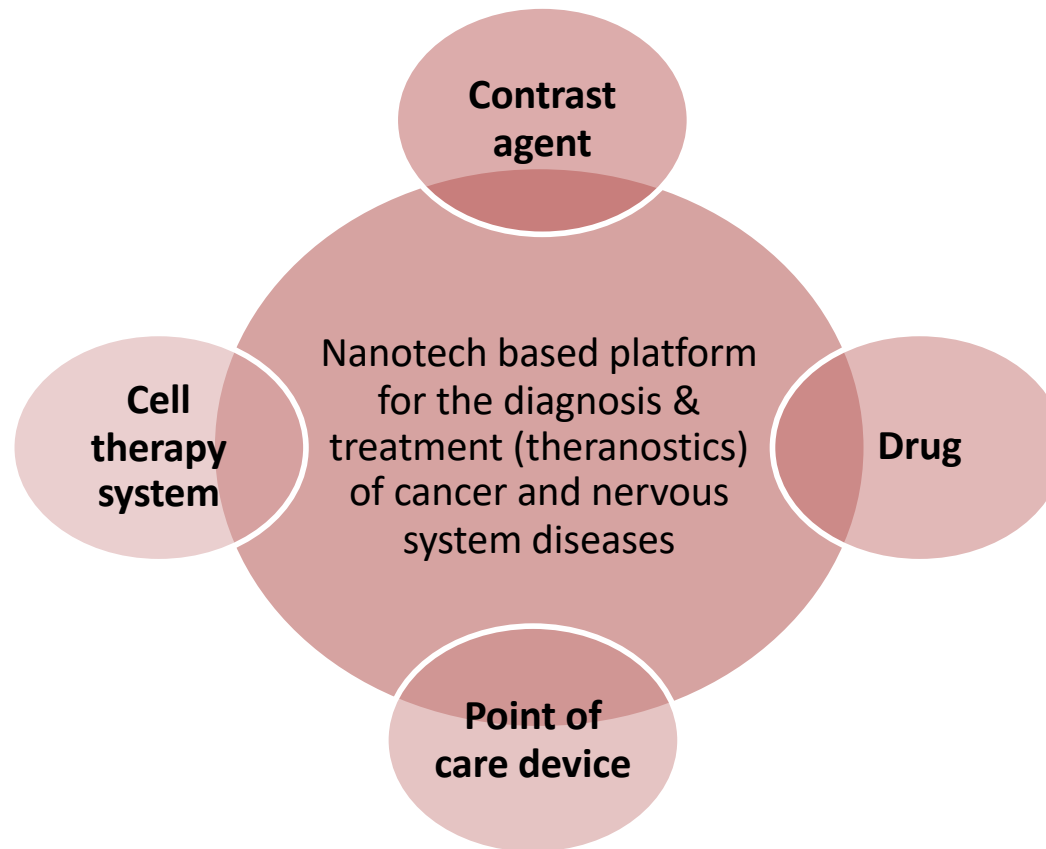
- The starting point is the long-term RRI vision
- Integration of ethical and social aspects with scientific, technical, strategical, organizational, economic factors
- At least one specific action for each of the RRI three key principles
- **The construction of the roadmap is a flexible and adaptable process using a modular approach**

Case studies

Examples: RRI visions of the pilots

- **COLOROBBIA:** personalized and point of care therapy, for a highly effective, accessible and affordable treatments of severe diseases
- **ARCHA:** nano-based dermo-cosmetics products, based on ethically acceptable and sustainable production methods and safe and more effective use of natural and organic ingredients
- **EVOLVA:** Create a mutual understanding of a desirable innovation pathway that can benefit both the synthetic biotechnology value chain and stakeholders
- **BISIGODOS:** bio-based (algae) feedstock to replace petrol-chemicals, based on RRI-aware LCA
- **HAT:** distributed data platform as a mechanism for increased personal control of data
- **SPECTRO:** new cleaning technologies that contribute to public health and hygiene (and respect other relevant values) and to increase market share
- **AERIALTRONICS:** drones, combine data collection and AI, ensuring safety, and safeguarding users' rights, including privacy and fair use of data.
- **RDM:** automated and personalized public transport to reduce traffic, pollution and parking land use

A pilot example: the NANOMED project



RRI vision:

Realize a personalized, **patient-centric** and point of care therapy, for a highly **effective, accessible** and **affordable** treatments of severe diseases

NANOMED Project: timeline for development



Line 1: theranostic and cellular therapy approach: Proof of concept and testing

Line 2: Medical device for point of care treatment: proof of concept and testing

Line 3: Theranostic: Authorization, clinical trials and product development

Line 4: Cellular therapy and point of care medical device: authorization, clinical trials and product development



Case study: Colorobbia Consulting and NANOMED Project case

- **Assessment:**
 - Medium size company
 - RRI Maturity Level: Strategic
 - Tech: Nanomedicine
 - Regulatory regime: nanomaterials, medical devices, ATMP products;
 - Time to Market: 5-10 years
- **Key stakeholders:**
 - Company (R&D, Quality and Management), R&D partners (research centres and academia, hospitals), business partners (public and private investors, suppliers), market clients and end-users (hospitals, healthcare professionals, patients associations, patients, advocacy groups), policy makers and regulators (healthcare sector), society (media and the public)

Case study: Colorobbia Consulting and NANOMED Project case

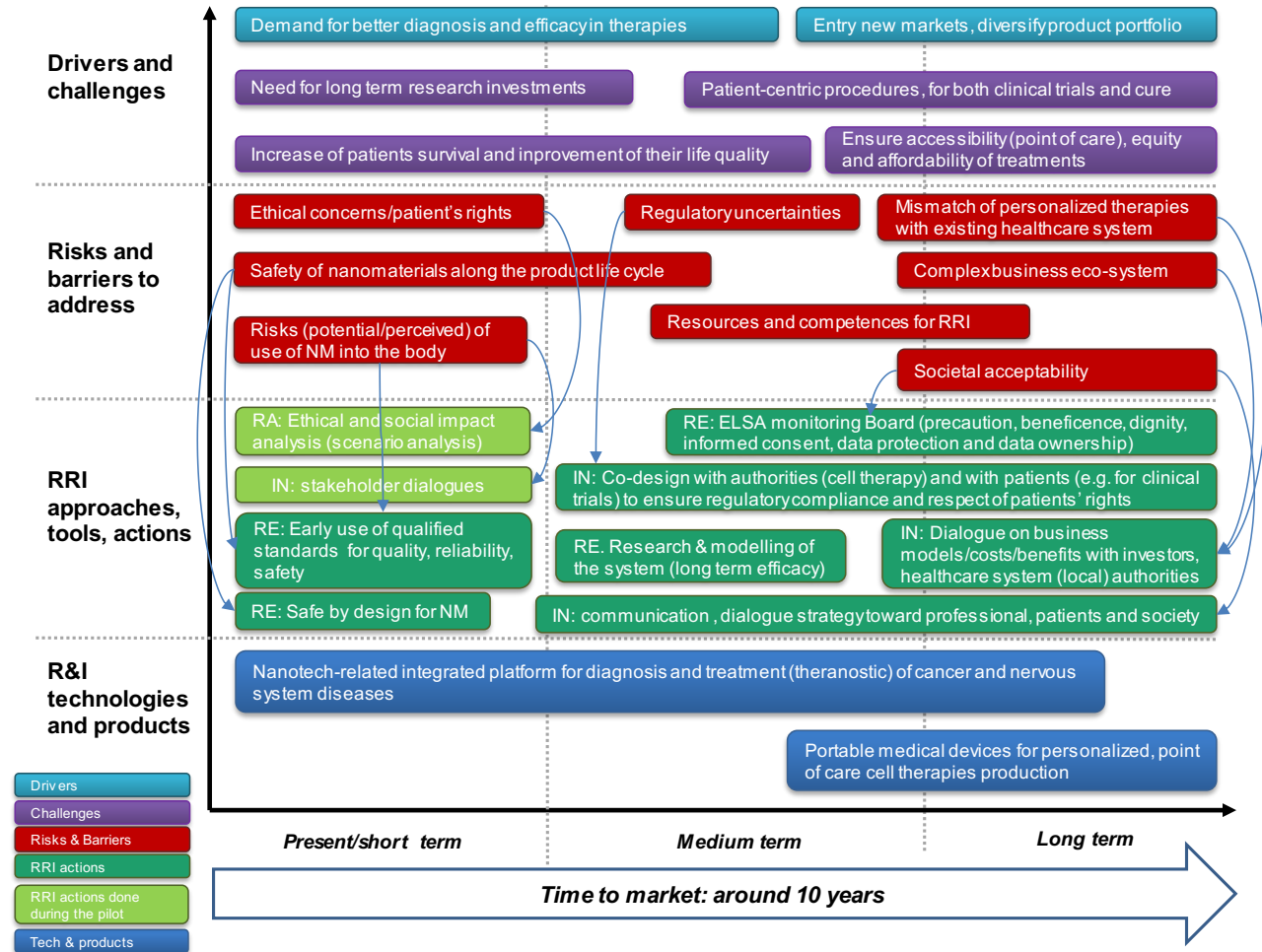
- **Reflect & define (significant issues):**
 - Product efficacy,
 - safety (use of nanomaterials in particular),
 - excellence in R&D,
 - ethics (respect of patients' rights),
 - patient-centric procedures for both clinical trials and cure,
 - respect of the principles of precaution,
 - beneficence, dignity,
 - informed consent, data protection and data ownership
- **Experiment & Engage:**
 - **Key actions: Ethical analysis (>5 meetings), in-house stakeholder dialogue (20 participants), Prisma external dialogues (3 events)**
- **RRI Roadmap:** 9 areas of actions selected



An example: Colorobbia Consulting, NanoMed project

RRI VISION

Realize a nano-based platform for personalized and point of care therapy, for a highly effective, accessible and affordable treatment of severe diseases.



RRI VISION: Realize a personalized and point of care therapy, for a highly effective, accessible and affordable treatments of severe diseases



<https://www.youtube.com/watch?v=IL5CwR1QOGI&feature=youtu.be>

Thank you.

pimponi@airi.it

info@airi.it