foRMAtion curriculum

foRMAtion international curriculum for future Research Managers and Administrators

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Authors: Cristina Oliveira, Margarida Trindade, Carolina Varela, Diana Campelo, Andreia Domingues and Madalena Martins, UNIVERSIDADE NOVA DE LISBOA

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INTELLECTUAL OUTPUT 2

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Lead Partner: HÉTFA Research Institute Ltd.

Inputs were provided by the following persons: Lídia Fekete and Éva Kőváriné Ignáth from Corvinus University of Budapest (HU), Virág Zsár and Zsuzsanna Angyal from HÉTFA Research Institute (HU), Dezső Szenkovics from Sapientia Hungarian University of Transylvania (RO), Valentina Malcotti from ISINNOVA (IT)

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Contact: hetfa_formation@hetfa.hu

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1. Executive Summary

The Intellectual Output 2 (IO2) is the international curriculum developed within the framework of the foRMAtion project, designed to be tested and accredited by each partner university and targeted to provide an overview of the main RMA tasks and roles for university students.

The curriculum is named *Research Manager as a profession in the EU ecosystem: concepts, tools and practice* and consists of 24 lessons that will be taught over 2 semesters. The lessons are organized into 4 Modules:
Module 1: Research Methodology and Design
Module 2: Research Funding, Policy and Governance
Module 3: Project Integration and Management
Module 4: Research Impact and Public Engagement.

Based on the partner universities' rules and national accreditation procedures, the curriculum will be accredited with 3 ECTS per semester. It will be available for all students as an elective course, focusing on bachelor students but open to all (when allowed by the rules of the university hosting the course).

Through the curriculum, the students will engage with the EU Research and Innovation Ecosystem where they will gather an overview of RMA work at large, including the broad aspects and technical areas, but also by actively participating in real-case activities and developing transferable competencies. The international curriculum was developed in articulation with IO3 (teaching materials) to integrate the Problem-Based Learning (PBL) approach, combining knowledge, skills, and attitudes in the context of RMA's main tasks and roles.

This document includes the definition of learning outcomes in terms of knowledge, skills, attitudes, and autonomy, plus the detailed content of all 24 curricula units (lessons).

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2. Introduction

The Education and Research & Innovation (R&I) ecosystem has been in rapid evolution during the past two decades, critically influenced by 'demands of contemporary environments' such as (i) globalization and increased mobility; (ii) global financial crisis; (iii) technology advancement; and (iv) knowledge-based economy (Chan et al, 2017). In response, education and research institutions have been implementing structural changes and enhancing the professionalization of their managing structures (Whitchurch, 2008), aiming at better adapting to these new challenges in an increasingly complex research ecosystem. R&I needs not only excellent researchers but also highly skilled professionals working in research administration, research management, knowledge transfer and exploitation, science communication, research governance and research policy to release the full potential of R&I at institutional, national, and international levels. Even though these professionals do not perform direct research tasks, they support researchers in common working ecosystems. These professionals are **Research Managers and Administrators** (RMAs).

Working at the Interface of Science (Agostinho et al, 2020) these professionals can operate *upstream of research* – to attract/advocate for/define a strategy for research funding, projects and partnerships (with both academia and industry); *during the research* – to support the research activity itself (e.g. post-award management, technological platform management, ethical compliance management, intellectual property management); and *downstream of research* – broadening the impact of research (e.g. outreach, science communication, facilitating the impact on understanding, learning & participation; creativity, culture and society; social welfare; commerce & economy; public policy, law & services; health, wellbeing & animal welfare; production; the environment; practitioners & professional services). RMAs also develop their work in cross-cutting issues that are transversal to upstream and downstream phases of research, such as responsible research and innovation, gender, ethics and several broader of areas researcher development.

The foRMAtion international curriculum will take into consideration this broad vision of the profession to provide an inclusive and integrative overview of the work of RMAs to university students, developing the skills and competencies needed for the understanding of the EU R&I funding system.

This Intellectual Output 2 (IO2) provides the structure and the content for the new training offer foRMAtion proposes and, as such, it represents one of the core intellectual outputs of this project. IO2 curriculum was structured and developed to suit the main innovative aspects of the foRMAtion project:

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1) it targets bachelor students without any experience in the field of RMA;
2) it will be tested in the Higher Education Institutions (HEIs) context by the three participant Universities - UNL, Corvinus and Sapientia;
3) it integrates the Problem-Based Learning (PBL) approach, combining knowledge, skills, and attitudes in the context of RMA's main tasks and roles; and
4) it acknowledges the wide range of roles and tasks RMAs perform in the R&I Ecosystem.

By developing an international module to be implemented in HEIs for the first time, the curriculum is an innovative training offer that will widen the pedagogical offer of these HEIs in an area with potential new job opportunities and possibly attract students for RMA professions. More broadly, it will be openly available on the website of the project, on a page specially designed for the online resources, to be applied at any university, amplifying the impact of the curriculum.

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3. Methodology

For the development of the international curriculum (IO2), the team developed the following four preparatory tasks:

Preparatory Task 1 - Horizon scanning on the HEIs and labour market trends and needs: a brief literature review developed to assure that the curriculum content and structure were in line with the up-to-date challenges of the Higher Education Institutions and the new skills needed for the future job markets.

Preparatory Task 2 - Identification of UNL, Sapientia and Corvinus Accreditation rules & procedures: detailed mapping of the ECTS' requirements and the procedures and timings for accreditation in each university is to produce to decide on a common framework for the curriculum.

Preparatory Task 3 - (Brief) Literature review on RMAs training offers: analysis of the survey developed and conducted by the partner HETFA on the existing training and needs targeting RMAs – "Discussion paper supporting the framing and conceptualization of an educational programme for RMA". The team also gathered information on the main training offers for RMAs – namely at EARMA, ARMA and BESTPRAC. This mapping of training offers was also completed with information collected by APRE in IO1 - the methodological guide and collection of good practices.

Preparatory task 4 - C1 Short-Term Joint Staff Training: activity organized as an expert workshop in the frame of the project: members of the Advisory Board and invited experts connected to RMA training, skill, and knowledge development to share knowledge, good and bad practices in the field.

After completing the preparatory tasks, the team developed the curriculum according to the following 5 steps:

Step 1: Definition of the main principles and goals of the international curriculum. That included:

- Definition of the main framework for the foRMAtion Curriculum that showcases the correlation between knowledge, skills, attitudes, and autonomy/responsibility. This mapping of the different approaches to RMA's skills, functions and activities resulted from the literature review developed in the preparatory phase (preparatory task 3).
- Definition of the level of focus of the curriculum that must cover different areas of RMA's expertise, but also be broad enough to be adequate/interesting for students with different backgrounds (with no or reduced experience). This issue was discussed at the C1 Short-Term Joint Staff Training (preparatory task 4), integrating the feedback from all consortium partners as well as the Advisory Board suggestions.
- After agreeing on the broad focus of the curriculum, 6 learning goals were defined.

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Step 2: Definition of learning outcomes in terms of knowledge, skills, attitudes, and autonomy. It included:

- Identification of a set of knowledge, skills, attitudes, and autonomy/responsibility that are important for the diversity of tasks of RMAs, but also relevant for HE students with different backgrounds/career options.
- Conversion of these sets of competencies into 4 modules (main topics/areas of training).
- Definition of 10-15 core learning outcomes per module.

Step 3: Development of the curricula units, in parallel with the definition of the learning activities (teaching methods) from Corvinus (IO3). That included:

- A detailed description of technical content (knowledge) per curricula unit (lesson)
- Collaboration with IO3 – teaching materials in the identification of possible teaching activities (e.g., real-case scenarios)
- Articulation with IO3 in the development of the guidelines for the teachers (that will feed and complete the IO6 – online textbook)

Step 4: Finalization of the structure of the course with the articulation of the content of the 4 modules

IO2 was embedded in the different outputs of the project, namely by output IO1 (delivered by APRE), aiming at the development of a methodological guide and collection of good practices, introducing a comprehensive framework of existing training programmes and methodologies for RMAs. Also, IO2 will continue its development in articulation with other IOs and activities that are still being developed:

- IO3 (aiming at the development of the methodological guide and teaching materials): collaboration will be key to i) making sure all necessary content is provided for the teachers and students and also ii) finalising the curriculum with the development of the evaluation system and requirements of the curriculum;
- IO6 (online textbook): that will showcase the curriculum content online and make blended learning available;
- C2 Short-Term Joint Staff Training: where the curriculum will be explored and tested by the teachers that will deliver the module at the 3 universities;
- Pilot courses at UNL, Corvinus and Sapientia: where the curriculum will be tested by the students for two semesters. Here, all participants involved in the process – students, teachers, pedagogical department/ responsible at each institution – will evaluate the implementation of the course. This will be used to revise the curriculum and provide a final version to be openly available to be used afterwards at any university.

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4. foRMAtion Curriculum: the framework

The curriculum is divided into 4 thematic Modules that provide an overview of the main tasks and roles of the Research Managers and administrators:

- Module 1: Research Methodology and Design
- Module 2: Research Funding, Policy and Governance
- Module 3: Project Integration and Management
- Module 4: Research Impact and Public Engagement

It includes 24 lessons – 12 per semester - each of them integrating technical and transferable skills development with new knowledge of specific topics related to RMA main tasks/ roles.

Main goal	**Research Manager as a profession in the EU R&I Ecosystem**			
Knowledge	Scientific knowledge Research design Research methods Research lifecycle Scientific integrity Ethical conduct Research Management and Administration	Policy drivers Research agendas European R&I policy Research strategy and governance Research funding framework and calls Project proposals	Project Lifecycle Project Management Structure Project Management integration, monitoring and control Quality and Risk Management Team management	Research Impact Responsible Research and Innovation Public engagement Science communication, dissemination, and exploitation
Skills and Attitudes	Communication Networking Cooperation Critical thinking	Responsibility Creativity Attention to detail Problem-solving	Management Problem-solving Negotiation Leadership	Communication Creativity Networking “RMA as a broker”
# Module	1	2	3	4
Module	**Research Methodology and Design**	**Research Funding, Policy and Governance**	**Project Integration and Management**	**Research Impact and Public Engagement**

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5. Learning goals and outcomes

5.1 Learning goals

The following learning goals describe the main aims of the foRMAtion curriculum:

1. To understand what research is, how it is funded and governed
2. To understand the role of research within society and the economy
3. To get to know the professions linked to research, including the researcher profession and the professions that support, promote, and facilitate the research activity (RMA)
4. To develop transferable skills to facilitate processes within and between the different stakeholders
5. To master tools to get a quick start in the RMA profession
6. To envision the European dimension of Research Management

These learning goals were the baseline for defining the specific learning outcomes for each of the Modules.

5.2 Learning outcomes

For each Module a set of learning outcomes are defined to describe the skills, competencies, and knowledge the students will develop across the curriculum:

LO Module 1 Research Methodology and Design

Main Goal: To get familiar with research and its specificities according to the different disciplines, its role within society, different scientific approaches to conducting research activity and the professions linked to research.

Core learning outcomes:

Knowledge

1. The student can distinguish and describe the different approaches in scientific theories and epistemological trends, and their scientific historical background (hermeneutical vs scientific, facts and observation, experimentation and falsificationism, induction vs. deduction).
2. The student can distinguish and describe the types and specificities (aims, advantages, limits, appropriateness to certain disciplines) of main research methods that can be applied in different scientific areas (e.g., observation, survey, interview, focus group, experiments, etc).
3. The student can understand the research project lifecycle and the role of RMAs within it.
4. The student can identify the differences between a research design/plan and a research proposal.

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Skills

5. The student can creatively elaborate and design a research plan adapted to a different research discipline (social, economic, natural sciences)
6. The student can apply the stages of the research project lifecycle to a research plan, identifying the key questions to answer at each stage.
7. The student can recognise and integrate the motivations, expectations and roles of a researcher, and other professions linked to the research activity.
8. The student can construct logical arguments to present a research idea.
9. The student can identify areas in need of specialised support along the research project lifecycle and identify key RMA roles (e.g., Funding Advisor, Project Manager, Science Communicator).
10. The students can discuss, formulate arguments, and critically examine their beliefs in the context of real cases of scientific integrity, responsible research, and ethical dilemmas that can emerge in the course of a research project.

Attitudes

11. The student is committed to finding a balance between assertiveness and cooperation in the course of teamwork in research as a leader or team member.
12. The student is open to perceiving and accepting the diversity of cultural and social contexts of research systems and practices.
13. The student is open to different research methods and is committed to finding consensus in an interdisciplinary research setting.
14. The student endeavours to understand the interests and aspects of the different stakeholders and are ready to consider them in the research process.

LO Module 2 - Research Funding, Policy and Governance

Main Goal: To get familiar with major drivers of European policy and how they condition research, in particular research funding and the governance of research institutions, while getting insights into professions linked to research funding and policy.

Core learning outcomes:

Knowledge

- The student can identify major policy drivers (e.g., UN developmental goals, cross-cutting issues) and assess their influence in shaping research agendas.
- The student can identify examples of societal and economic drivers impacting and defining research policy (e.g., the COVID-19 situation).
- The student can understand and contextualise European research funding frameworks and main European funding programmes and schemes to support research and innovation activities (e.g., Horizon Europe) and to identify synergies between funding schemes.
- The student can differentiate between policy and strategy and identify suitable examples in the context of the EU and at the research institutions level.
- The student can differentiate external from internal drivers of research policy.

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- The student is familiar with the general process and principles of evaluation and assessment criteria of research proposals: what funding agencies prefer, what they dislike, vocabulary required, how to interpret what is required in a specific call, and aspects meaning advantage in the context of EU-funded calls.

Skills

- The student can analyse a given European call for funding from the perspective of its underlying policy (need for the call) and proposal (goals, activities, expected outcomes and impact).
- The student can recognize the main components of a funding proposal and link them to the evaluation criteria of a given call for funding.
- The student can draft a funding plan (a) in line with the institutional strategy of the organisation, (b) that addresses external and internal drivers of policy and strategy, (c) adjusted with the specific evaluation and assessment criteria, preferences of research calls (of the funding organisations).
- The student can explain the main governance structure of a given research institution.
- The student can explain the pre-award work and how it fits into the research cycle.
- The student can distinguish and discuss at which stage of policy and strategy development intervene pre-award and research policy/strategy-related professions.
- The student can discuss and formulate arguments and confront opinions in the context of real cases of scientific policies.
- The student can effectively communicate, negotiate terms, and persuade different target audiences including policy makers for programme bodies, senior management of research institutions, research managers, and researchers.
- With the help of the teacher, the student can draft a simple budget for a proposal, according to the activities planned for the different project phases and milestones.

Attitudes

- The learner interiorizes and commits to the values and mission of the institution.
- The student demonstrates curiosity and interest in systemic approaches and the organization of the research ecosystem.
- The student can accept others' views and work together to provide the necessary support for the proposal's preparation.
- The student is critical regarding his work and that of others taking on a constructive attitude.
- The student takes responsibility for their work.

LO Module 3 - Project Integration and Management

Main Goal: To apply management tools and methodologies, to get insights into professional roles linked to project management and as a team member, can effectively contribute to the implementation of a project in different areas.

Core learning outcomes:

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Knowledge

1. The student knows how to identify the activities in the light of the project objectives, outputs, main tasks, performance criteria and resource requirements set in the proposal.
2. The student will identify the RMA professional roles involved directly and indirectly in post-award project management.
3. The student has a basic insight into the theories discussing the features and dynamics of team roles, procession, and decision-making.
4. The student has a basic insight into negotiation theories and conflict management models, as well as the practice of dispute resolution.
5. The student has a basic insight into some main time and project management tools and methodologies.
6. The student will get familiar with the most important leadership models.
7. The student is aware of the concept and methodology of risk management.

Skills

8. The student will map the main internal and external actors' involvement across the project management stages and devise a strategy for their timely contribution to the implementation of the project (i.e., Stakeholder Management).
9. The student will be able to identify and measure the resources needed for project implementation (team and time allocation, the physical and infrastructural resources needed, plus other needs) and to integrate this information with a budget and a calendar plan (i.e., Project Management Plan).
10. The student can effectively define and articulate, brainstorm and select the most adequate management solutions and evaluate their effects on achieving the project's goals.
11. The student will apply methodologies and tools for effective project management, including time, people, and task management, as well as reporting.
12. The student will be able to contribute to the identification and prioritization of the management, financial and legal issues to be addressed at different stages of the project life cycle (i.e., Project Integration Management).
13. The student can follow the development of several simultaneous management tasks (e.g., team management, cost management) and prioritize the most relevant ones at different stages of project management.
14. The student can select and apply the most adequate leadership model according to the given circumstances.

Attitudes

15. The student is ready to approach management problems with assertivity
16. The student can act autonomously, demonstrate originality in solving problems
17. The student demonstrates an interest in detail
18. The student is critical regarding their work and that of others taking on a constructive attitude
19. The student integrates the principles of ethics and research integrity
20. The student takes responsibility for their work

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LO Module 4- Research Impact and Public Engagement

Main Goal: to get familiar with the complex relations between research and societal actors and to get insights into facilitation/communication approaches and roles.

Core learning outcomes:

Knowledge

1. The student can understand the concept of research impact and the different areas of impact beyond academia.
2. The student can distinguish between output, outcome, and impacts.
3. The student can explain Responsible Research and Innovation (RRI) principles and practices in its main thematic elements: public engagement, open access, gender, ethics, science education, science communication and engagement, and impact.
4. The student can identify cross-cutting issues in a given project (e.g., ethical and gender issues) and identify different strategies to address them in different research projects.
5. The student will become familiar with and differentiate several RMA facilitation roles that add value to research (such as science communication, societal engagement, technology, and knowledge exchange).
6. The student can distinguish the aims and activities of science communication, dissemination, and broader impact.
7. The student is aware of the major elements and characteristic features of a research engagement plan and the key performance indicators.
8. The student will be able to map the different target stakeholders and their roles at different stages of the research project.

Skills

9. The student can explain the benefits that impact-driven research can bring to the economy and society.
10. The student can argue about the reasons for promoting accountability, responsibility, ethics, and integrity in research.
11. The student can contribute to the design of activities and instruments fitted to each of the RRI principles.
12. The student can effectively communicate ideas and the main results of a given project to non-specialist audiences, applying different strategies to increase audience interest, and understanding.
13. The student can select the engagement strategies, platforms and communication styles suited for each target audience.
14. The student can implement science engagement tasks in simulated situations.
15. The student can design a research engagement plan and identify suitable key performance indicators to assess stakeholder engagement.
16. The student can explore several paths to maximise research impact (for example by finding the ways to incorporate the most relevant 17 UN sustainable development goals into the research project).

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17. The student can formulate evidence-based recommendations and supporting brief documents, arguing their relevance for societal/ policy intervention.

Attitudes

18. The student is open to cooperation in networks to disseminate and exchange knowledge in the context of real cases of science engagement and impact.
19. The student endeavours to understand the interests and aspects of the different stakeholders and considers them along the research process.
20. The student can accept others' views and can compromise and work together.
21. The student takes responsibility for their work.
22. The student integrates the principles of ethics and research integrity.

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6. foRMAtion curriculum: the lessons

The foRMAtion curriculum is divided into 24 lessons, as follows:

- **Module 1 - Research Methodology and Design** (5 lessons)
  - Lesson 1: Introduction to science - what distinguishes scientific knowledge from other types of knowledge
  - Lesson 2: Introduction to research design, research methods and research life cycle
  - Lesson 3: Research integrity and ethical conduct
  - Lesson 4: RMAs as Professionals at the Interface of Science
  - Lesson 5: Oral presentations
- **Module 2 - Research Funding, Policy and Governance** (7 lessons)
  - Lesson 1: Policy drivers, research agendas, European research policy
  - Lesson 2: The funding research framework: funding programmes and calls
  - Lesson 3: Funding proposals and evaluation criteria
  - Lesson 4: Preparation of a project proposal
  - Lesson 5: Institutional proposals, research strategy and governance
  - Lesson 6: Conflict of interests between policy, funding, and research
  - Lesson 7: Oral presentations
- **Module 3 - Project Integration and Management** (7 lessons)
  - Lesson 1: Project Lifecycle & RMAs as Professionals in the Project lifecycle
  - Lesson 2: Project Management Structure, Grant Agreement (GA) and Consortium Agreement (CA)
  - Lessons 3 & 4: Project management integration, Monitoring and Control
  - Lesson 5: Quality and Risk Management
  - Lesson 6: Team management
  - Lesson 7: Oral presentations
- **Module 4- Research Impact and Public Engagement** (5 lessons)
  - Lesson 1: Impact - why does research matter?
  - Lesson 2: Responsible Research and Innovation approach: the EU drivers for Impact
  - Lesson 3: Pathways to research: planning a strategy for public engagement
  - Lesson 4: Science communication and dissemination: framing the message
  - Lesson 5: Oral presentations

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6.1. Research Management and Administration glossary: common vocabulary, concepts, and definitions

Research Methodology and Design	
Overall objective	A general indication of the project's contribution to target groups in terms of its long-term benefit. In other words, a solution to tackle the challenge of the topic and contribute to the targeted impacts
Specific objective	Concrete objectives are needed to achieve the overall objective.
Deliverables	Outputs (e.g., information, study, special report, roadmap, a technical diagram brochure, list, software, or other tangible output of the project) that must be produced at a given moment during the action.
Milestones	Control points at specific time points in the project that help to chart progress. They may correspond to the completion of a key deliverable, allowing the next phase of the work to begin or be needed at intermediary points.
Project Lifecycle	The Project Lifecycle is the sequence of phases through which a project progresses. The number of phases and sequence of the cycle may vary based on the company and the type of project undergone. As part of a project, however, they should have a definite start and end, and they are constrained by time. The lifecycle provides the basic foundation of the actions that must be performed in the project, irrespective of the specific work involved
Research Manager and Administrator (RMA)	Professionals working along with researchers in areas that interface research such as research administration, management, knowledge transfer and exploitation, science communication, research governance, research policy, etc., to release the full potential of research and innovation
Pre-award	The pre-award phase represents the beginning of the grant lifecycle, which includes disseminating opportunities, supporting the submission of applications, reviewing applications, and establishing funding contracts. Below are explanations of what generally occurs during the pre-award phase.
Post-award	The post-award phase comprises implementing the grant, reporting progress, and completing the closeout requirements. The job is to faithfully and diligently ensure that the grant program is carried out successfully.
Research Funding, Policy and Governance	
Call for proposals	Calls for proposals are open invitations for funding issued by a funding agency (such as the European Commission). They are financial contributions aiming to strengthen and leverage actions or projects that support the research objectives and policies from a particular funding agency policy in the most effective way.

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	Each call for proposals includes all the essential information for the submission. Everyone interested can submit a project proposal during the open period of the call.
Project proposal	A project proposal is an in-depth plan of action written by a researcher or by a partnership and submitted for funding. A project proposal is based on an idea that is related to the project objective, leading to a path to solve the particular challenges posed under a call for proposals and create a great impact. Project proposals are submitted to call for proposals.
EU National Agency	An organization funded by the European Commission, responsible for managing "decentralised" grant activities and for providing information on EU funding programmes, reviewing applications submitted in their country, monitoring, and evaluating the implementation of the programme in their country and supporting people and organisations taking part in these programmes.
Project Integration and Management	
Consortium	The group of organizations that are beneficiaries of the same grant and implement a project together
Coordinator	The applicant organization leading and manages the project partnership
Consortium agreement	The contract between the project beneficiaries that are part of the same consortium (partners), where the project implementation framework is set and the rules of cooperation, rights and obligations of project partners are defined.
Grant agreement	The contract between the Funding Agency of the EU and the project coordinator institution defines the rights and obligations and the terms and conditions applicable to the grant awarded.
Eligible costs	The fees that can be approved and covered by the Commission in a project. Usually, they can cover labour, material, machinery, equipment, project planning, design and construction engineering services, legal fees and expenses directly related to the project, capitalized interest during construction of the project, etc. depending on the type of project.
Ineligible costs	Costs that do not comply with the regulations, and conditions and therefore cannot be covered by the grant (e.g., bank costs charged by the beneficiary's bank for transfers, currency exchange losses, etc.)
Direct costs	Costs that directly contribute to the implementation of the project
Indirect costs	Costs that are not directly linked to the project, but necessary for the institution to work (e.g., electricity and water costs, cleaning costs, salaries of administrative staff, etc)

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Research Impact and Public Engagement	
Research Impact	Research impact is the effect research has beyond academia, contributing to or influencing society, culture, environment and/or the economy
Science Outreach	Is an umbrella term for a variety of activities by research institutes, universities, and institutions such as science museums, aimed at promoting public awareness (and understanding) of science and making informal contributions to science education.
Open Science	Open Science is a collection of actions designed to make scientific processes more transparent and results more accessible. Its goal is to build a more replicable and robust science; it does so use new technologies, altering incentives, and changing attitudes.
Intellectual output	A tangible and meaningful activity outcome (such as publications, course materials, analyses, specific software, a digital platform for sharing good practices or developing skills, policy recommendations, etc).
Key performance indicator (KPI)	A well-defined quantitative measure of the effectiveness of an action An institution or a project uses KPIs to evaluate success in reaching their targets

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6.2. Content of the lessons

Module 1 - Research Methodology and Design

Main goal: To get familiar with research and its specificities according to the different disciplines, the role of research within society, different scientific approaches to develop a research plan and the professions linked to research.

Lesson 1: Introduction to science - what distinguishes scientific knowledge from other types of knowledge

Learning outcomes

LO1# - The student can distinguish and describe the different approaches in scientific theories and epistemological trends, and their scientific history background (hermeneutical vs scientific, facts and observation, experimentation and falsificationism, induction vs. deduction).

LO#12 - The student is open to perceiving and accepting the diversity of cultural and social contexts of research systems and practices.

LO#13 - The student is open to different research methods and is committed to finding consensus in an interdisciplinary research setting.

What is this thing called science?

There is abundant evidence from everyday life that science is held in high regard, despite some disenchantment due to the consequences for which some hold science responsible. It is due to science that humankind went to the moon, that human longevity increased unprecedentedly in the last centuries. Finally, the solution to the COVID-19 pandemic has come from science. However, science also generated the technology necessary to build the atomic bomb. Good and bad are two sides of the same coin when it relates to the **consequences of scientific discovery.** Consider these definitions of what science is: Oxford (2020) defines science as 'the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment', and technology as 'the application of scientific knowledge for practical purposes.

While the object of study of the natural sciences is the natural phenomena, including objects such as matter, earth and the human body, the object of study of the social sciences results from the social interaction of human beings and is based on social phenomena and human

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behaviours. Moreover, King et al (1994) define social science as 'an attempt to make sense of social situations that we perceive as more or less complex.'

Science is a method of inquiry - a way of learning and knowing things about the world around us. Contrasted with other ways of learning and knowing about the world, science has some special characteristics. It is a conscious, deliberate, and rigorous undertaking. (Babbie, 2010)

Despite these definitions originating either from the physical sciences or the social sciences, they illustrate a widely held belief that there is something special about science and its methods. The naming of some claim or line of reasoning or piece of research "scientific" is done in a way that is intended to imply merit or a **special kind of reliability**. But what, if anything, is so special about science? What is this "scientific method" that allegedly leads to especially meritorious or reliable results? Alan Chalmers in his book *What Is This Thing Called Science* (Chalmers, 2013) addresses this question extensively in a simple and accessible way, with plenty of examples to illustrate the reasoning of several of the main philosophers of science.

Answering the question of 'What is Science?' is by no means straightforward. Men and women have been trying to understand for centuries the distinctiveness of scientific knowledge in comparison to other types of knowledge, and there is an entire discipline, Philosophy of Science, devoted to understanding science and its boundaries.

Philosophy of Science inquires the theoretical foundations, methods, and implications of science. The central questions of this discipline concern what qualifies as science, the reliability of scientific theories, and the ultimate purpose of science. However, the way science is practised - which we will approach later - sometimes is different from theory, and from time to time this mismatch causes changes in the **foundational theories**. Thus, what is science, in theory, goes along with what is science in practice, in the sense that one has influenced the other for centuries.

Exploring the main ideas that have helped science philosophers in formulating theories to attempt to explain what distinguishes scientific knowledge from other forms of knowledge is important. Alan Chalmers's book will be the main guide to this exploration.

Science is based on facts

It is claimed that science is special because it is based on facts. Facts are presumed to be directly established by careful, **unprejudiced use of the senses**. Science "should" be based on what we see, hear and touch rather than on personal opinions or speculative imaginings. If an observation of the world is carried out in an unprejudiced way, then the facts established in this way will constitute a secure, objective basis for science. Reasoning takes us from this factual basis to the laws and theories that constitute scientific knowledge.

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The idea that scientific knowledge has a special status – because it is founded on the secure basis of solid facts firmly established by observation – raises, however, some concerns.

One difficulty relates to the extent to which we rely on our **senses**, which have physical constraints (for example optical illusions). Also, **perceptions** are influenced by the background of the observer; what appears to be an observable fact for one may not be so for another.

An example: a drawing in 3D may not be perceived as such by a tribe/community that was never exposed to this technique or has never interpreted optical illusions.

Figure 1 - Examples of optical illusions

Our perceptions depend, to some extent, on our prior knowledge, and hence on our state of preparedness, our expectations, and the fact that observation statements presuppose the appropriate conceptual framework. How can we obtain significant facts about the world through observation if we do not have some guidance as to what kind of knowledge we are seeking or what problems we are trying to solve? Some facts are more relevant than others to formulate theories, thus our search for relevant facts needs to be **guided by our current**

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state of knowledge (for example: to make observations that might make a significant contribution to botany, one needs to know botany to start with.)

Another difficulty stems from the extent to which judgments about the truth of observation statements depend on what is already known or assumed, thus rendering the observable objects fallible as the presuppositions underlying them (for example the fact that the sun moves around the Earth before the discovery of Galileo that Earth moves around the sun). These difficulties suggest that the observable basis for science, despite being a good basis, is not as straightforward and secure as is widely traditionally supposed.

Observation is not a passive endeavour. There are different ways in which perceptions of the same scene can vary from observer to observer depending on their background, culture, and expectations. Problems that eventuate from this undoubted fact can be countered to a large extent by taking appropriate action. There should be no news to the perceptual judgments of individuals that can be unreliable for a range of reasons. Therefore, the challenge, in science, is to arrange the observable situation in a way that the reliance on such judgments is minimised if not eliminated (for example: the size of the moon; simple observation, size changes, or taking different measurements at different sites and comparing them then one will conclude that size does not change).

An observation statement constitutes a fact worthy of forming a basic structure for science if it can be straightforwardly tested by senses and withstand these tests. Consequently, the emphasis on testing brings out an active, public character of indicating observational statements. Observable realities are to some degree fallible and subject to revision: if a statement qualifies as an observable fact, due to passing all the existing tests, that can be levelled at it hitherto, it does not mean that it will survive to new kinds of challenges considering knowledge advancement and technology.

Relevant facts

What is needed in science is not just facts but relevant facts. Most facts can be established by observation; however, their relevance is subject to the current state of the development of science. In that sense, science poses the questions, and ideally, observation can provide an answer.

Experiments as an adequate basis for science

Many kinds of processes are at work in the world around us, interacting and imposing on each other in complicated ways. A falling leaf, for example, is subject to gravity, air resistance and the force of winds; the same leaf will also rot to some small degree as it falls. Consequently,

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it is not possible to arrive at an understanding of these various processes by carefully observing events as they naturally occur. In general, it is necessary to intervene, try to **isolate the process under investigation** and eliminate the effects on others. In short, it is necessary to experiment. Experiments are adequate and interpretable, displaying or measuring what they are intended to if the experimental set-up is appropriate and **possible disturbing factors** have been eliminated.

Deriving theories from facts: inductive versus deductive inference

No matter what comes first, facts or theory, it is the question that engenders the extension to which a theory is born out by facts. A possible claim, however, could be that a theory can be logically derived from facts. That is, a theory can be proven as a consequence of a fact.

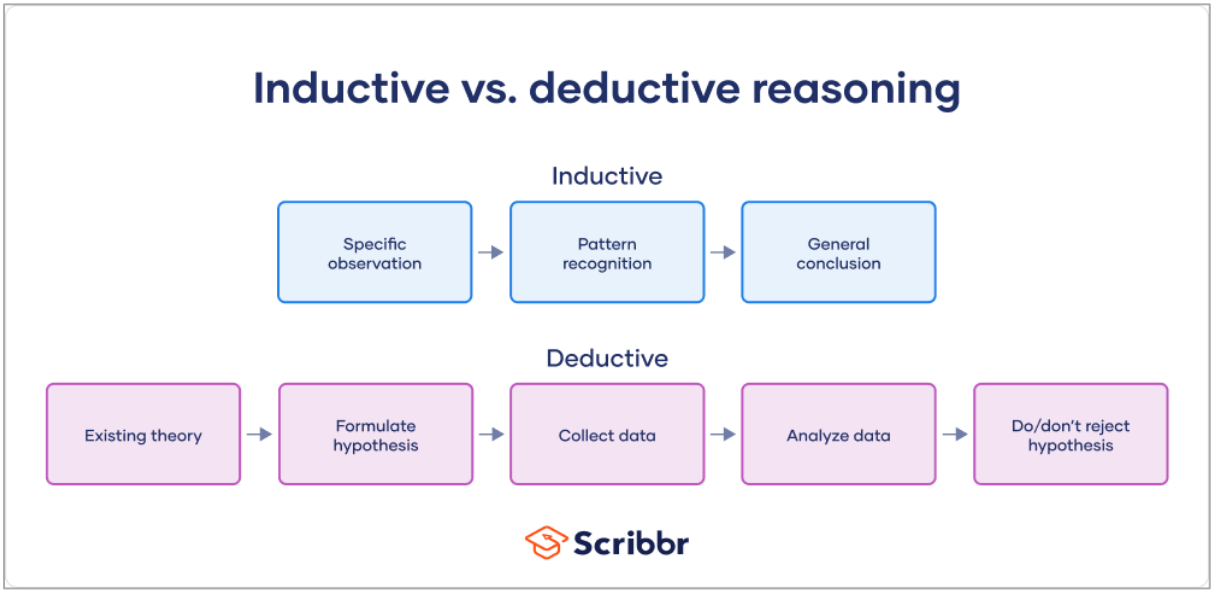

Figure 2 - Inductive vs. deductive reasoning

Inductive reasoning departs from specific events to test a general theory. It represents generalised conclusions based on many observations - looking for a pattern (for example: Premises: 1. Metal Xl expanded when heated on occasion tl. 2. Metal X2 expanded when heated on occasion t2. 3. Metal Xn expands when heated on occasion tn. Conclusion: All metals expand when heated.)

Nevertheless, inductive reasoning is not a logically valid argument. It lacks the basic features of such an argument. This is illustrated by an example attributed to Bertrand Russell. It concerns a turkey who noted on his first morning at the turkey farm that he was fed at 9 am.

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After this experience had been repeated daily for several weeks the turkey felt safe in concluding that he was always fed at 9 am. Alas, this conclusion was shown to be false in no uncertain manner when, on Christmas eve, instead of being fed, the turkey's throat was cut. The turkey's argument led it from several true observations to a false conclusion, clearly indicating the invalidity of the argument from a logical point of view.

Arguments which proceed from a finite number of specific facts to a general conclusion are called inductive arguments, as distinct from logical, deductive arguments. A characteristic of inductive arguments that distinguishes them from deductive ones is that they go beyond what is contained in premises. General scientific laws invariably go from the finite amount of observable evidence that is available to support them, and that is why they can never be proven right considering being logically deduced from that evidence.

What are the characteristics of a good inductive argument? The question is of fundamental importance because not all generalisations from observable facts are warranted. Under precisely what circumstances is it legitimate to assert that a scientific law has been "derived" from some finite body of observational and experimental evidence? If an inductive inference rolling observable facts to laws is to be justified, then the following conditions must be satisfied:

1. The number of observations forming the basis of a generalisation must be large.
2. The observations must be repeated under a wide variety of conditions.
3. No accepted observation statement should conflict with the-derived law.

Any generalisation from facts about the observable world can yield nothing other than generalisations about the observable world. Consequently, scientific knowledge of the unobservable world (DNA, microscopic) can never be established by inductive reasoning.

Halperin and Heath (2012) define inference as *'the reasoning involved in the process of drawing conclusions based on facts or logical premises"*. King et al (1994) also state that scientific research is '*designed to make descriptive or explanatory inferences based on empirical information about the world*'.

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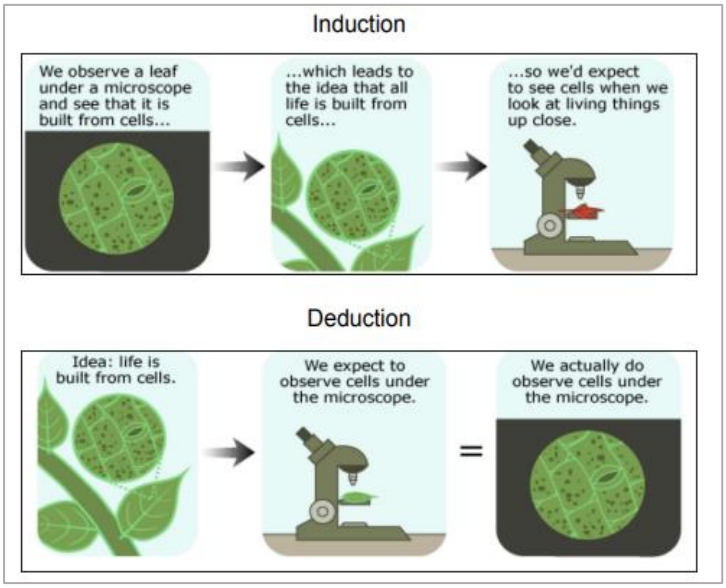

Figure 3 - Illustration of induction and deduction in modern science
Source: https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/key-learning-areas/science/s-6/science-extension/Scientific_thinking_final.pdf

Inference can be used in two opposite directions. **Inductive** reasoning departs from specific events to test a general theory, while **deductive** inference departs from a general theory to forecast or anticipate a specific event. Inductive reasoning represents generalised conclusions based on many observations - looking for a pattern; whereas deductive reasoning is based on testing a hypothesis based on observations.

The laws and theories that make up scientific knowledge are derived by induction from a factual basis supplied by observation and experiment. Once such general knowledge is available, it can be drawn on to make predictions and offer explanations.

For example, consider the following argument:

1. Fairly pure water freezes at about 0º (if given sufficient time) = General rule obtained by induction

2. My car's radiator contains fairly pure water = Observation

3. If the temperature falls well below 0º, the water in my car radiator will freeze (if given sufficient time) = Prediction obtained by deduction that is testable.

Karl Popper's falsificationism

Karl Popper was the most forceful advocate of an alternative to inductivism which is referred to as **falsificationism**. He became suspicious of how he saw Freudians and Marxists supporting their theories by interpreting a wide range of instances of human behaviour or historical change respectively, claiming them to be supported on this account. It seemed to Popper that

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these theories could never go wrong because they were sufficiently flexible to accommodate any instances of human behaviour or historical change as compatible with their theory. Consequently, although giving the appearance of being powerful theories confirmed by a wide range of facts, they could explain nothing because they could rule out nothing. Popper drew the moral that genuine scientific theories, by making definite predictions, rule out a range of observable states of affairs in a way that he considered Freudian and Marxist theories failed to do. He arrived at his key Idea that **scientific theories are falsifiable**, that is a theory shouldn't be considered scientific if it cannot be proved wrong, at least in theory.

Once proposed, scientific theories are to be rigorously and ruthlessly tested by observation and experiment. The ones that fail to stand up to observational and experimental tests must be eliminated and replaced by further speculative conjectures. **Science progresses by trial and error**, by conjectures and refutations. Only the fittest theories survive. Though it can never be legitimately said of a theory that is true, it can hopefully be said that it is the best available, that it is better than anything that has come before.
The falsificationist sees science as a set of hypotheses that are tentatively proposed to accurately describe or account for the behaviour of some aspect of the world or universe. However, not any hypothesis will do. There is one fundamental condition that any hypothesis or system of hypotheses must be falsifiable.

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Lesson 2: Introduction to research design, research methods and research life cycle

Learning outcomes

LO#2 - The student can distinguish and describe the types and specificities (aims, advantages, limits, appropriateness to certain disciplines) of main research methods that can be applied in different scientific areas (e.g., observation, survey, interview, focus group, experiments, etc).

LO#3 - The student should understand the research project lifecycle.

LO#4 - The student can identify the differences between a research design/plan and a research proposal.

LO#6 - The student can apply the stages of the research project lifecycle to a research plan, identifying the key questions to answer at each stage.

LO#7 - The student can recognise and integrate the motivations, expectations, and roles of a researcher.

LO#8 - The student can construct logical arguments to present a research idea.

LO#11 - The student is committed to finding a balance between assertiveness and cooperation in the course of teamwork in research as a leader and as a team member.

LO#12 - The student is open to different research methods and is committed to finding consensus in an interdisciplinary research setting.

LO#13- The student is open to perceiving and accepting the diversity of cultural and social contexts of research systems and practices.

Is there a scientific method that is common to all scientific disciplines? A method that pervades all sciences in implicit contrast with all specialised methods for research applied to some sciences. There is a difference between specialised methods and general principles. Precisely because specialised techniques are specific, and each scientific discipline has its own set of techniques. Simultaneously, the entire scientific community has a set of shared principles, which guide the way research is carried out.
In the previous lesson, we have seen some of the basic ideas defining what research itself is. In doing so, we touched upon the scientific method by introducing ideas of controlled observation, inductive and deductive reasoning, formulation of hypotheses and experimentation. As a continuation, this lesson will focus on the general principles that guide researchers from different fields in designing their research projects.

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Research design

Research design provides the structure for research and helps organise ideas better. It is important to dedicate time to thinking about the research design of your project. King et al. (1994) consider research design as divided into four main components i) **research question**; ii) **theory**; iii) **data** and iv) **use of data**. A major component of the research design is the **methods**.

The research design will depend on the type and purpose of the research. Research serves two purposes:

- **fundamental research** - (also called basic/ pure, blue-sky research) aims to contribute to the theoretical understanding of how the world works. It is driven by curiosity and generates new ideas.

- **applied research** – aims to address real-world problems and provide solutions for those problems.

i) Identifying a research question

Formulating a clear research question is vital in science because it determines the data to collect, the methods to use, and, ultimately, the success of a project. Developing a research question is an iterative process of reading and thinking, to define a problem and specify the contribution that can be brought by the researcher when attempting to solve the question. Research questions are theoretical. They address something that we do not yet know. The theoretical research question is always broader than the specific case study that the researcher chooses to examine. Often it is said that the research question attempts to understand "the big picture".

Research ideas begin with something that interests us, which we narrow to a topic, and from there to a question that we can address. They develop out of theory, observations, and a variety of other sources.

The research question or hypothesis is a statement or a tentative argument (about the relationship between two or more variables) that poses the research question and proposes expected results.

The hypothesis can be researched in two different ways:

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- *By collecting evidence that tests the validity of the hypotheses* - in this case, the hypothesis is formulated as an affirmative sentence that makes some sort of prediction (Example: Cars need oil to function).

- *By using the hypothesis as a guide to a process of discovery* (exploratory research) (Halperin & Heath, 2012) – in this case, evidence is collected to make inductive inferences from it.

Examples of research questions in social sciences can be found here: https://www.scribbr.com/research-process/research-question-examples/

In experimental sciences, identifying the hypothesis is part of a research cycle that involves the following different steps**:**

1. Observation and description of a natural or human phenomenon
2. Desk research (or literature review) about the topic of the research question
3. Asking a question and formulating a hypothesis to explain the observed phenomena
4. Predicting the hypothesis
5. Testing/Experimenting the hypothesis
6. Drawing conclusions
7. Making recommendations for further research areas

ii) Theory: function of the literature review

Fink (2005) defines a literature review as a systematic, explicit, and reproducible method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners. Performing a literature review is a mandatory exercise when conducting research due to the following reasons:

1. It allows the researcher to contextualise and argue his/her research idea within the existing theories and evidence on the topic.

2. It allows the researcher to place his/her research question in literature and defend the need for research on the topic by identifying areas of knowledge that are still unexplored (known as *gaps* in the literature).

iii) Data and methods

To collect relevant data that allows us to answer the research question, the researcher must follow a scientific method. A major component of the research design is the research method that will be used.

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In this section, we will briefly introduce some types of scientific methods, knowing that there are many other methods as each research field tends to develop ways to collect evidence from its research objects.

Adequate scientific methods to address a given research question, need to take into consideration the difference between these objects of study: natural or social. While natural objects are precise, accurate and deterministic, social objects are naturally less precise and deterministic (Bhattacherjee, 2012). Consequently, natural sciences will be more precise, accurate and deterministic than social sciences. We often collect **qualitative data** (example: discourse from interviews) when performing social sciences, while the natural sciences typically collect **quantitative evidence** (example: number of occurrences, temperature, pH, etc.).

The main characteristics of the most used scientific methods in social sciences are:

1. **Survey Research**. This technique is based on the selection of a "sample" that is representative of the population of respondents to a questionnaire. The data collected can be qualitative and quantitative, depending on the questions and the purposes of the research. Types of surveys: Cross-sectional surveys, run regularly but to different individuals, and longitudinal surveys, run to the same individuals over time.

2. **Discourse analysis**. The linguistic/semiotic analysis of discourse is used to study the meaning of language (spoken or written/textual) in the representations of social life. Sources of data in discourse analysis: Primary qualitative material, such as interviews or focus groups; or secondary material, such as archive material, analysis of social or traditional media, advertisements, films, political speeches, or policy documents.

3. **Mixed-methods** research. It combines different scientific methods to create a framework of analysis using both quantitative and qualitative data.

The most used scientific method in natural sciences is the **experimental method**. Indeed, when possible, natural scientists conduct experiments in which they impose conditions upon the phenomena being studied, so that, to the greatest extent possible, only one factor can vary. In a laboratory, all conditions such as light, temperature or humidity can be controlled. In the field, conditions can be more variable, but if the experimental treatment and the **control** are side by side, the variability of all factors except the one being studied might be the same and, therefore, the conditions for analysis are not present. Experiments are not always possible: the object of study can be too big (a mountain, for example), or too complex (an ecosystem, for example).

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Saunders et al, (2007) have developed the *Saunders Research onion* that illustrates how different elements involved in the research could be examined to develop the final research design, integrating many of the methods and approaches defined above.

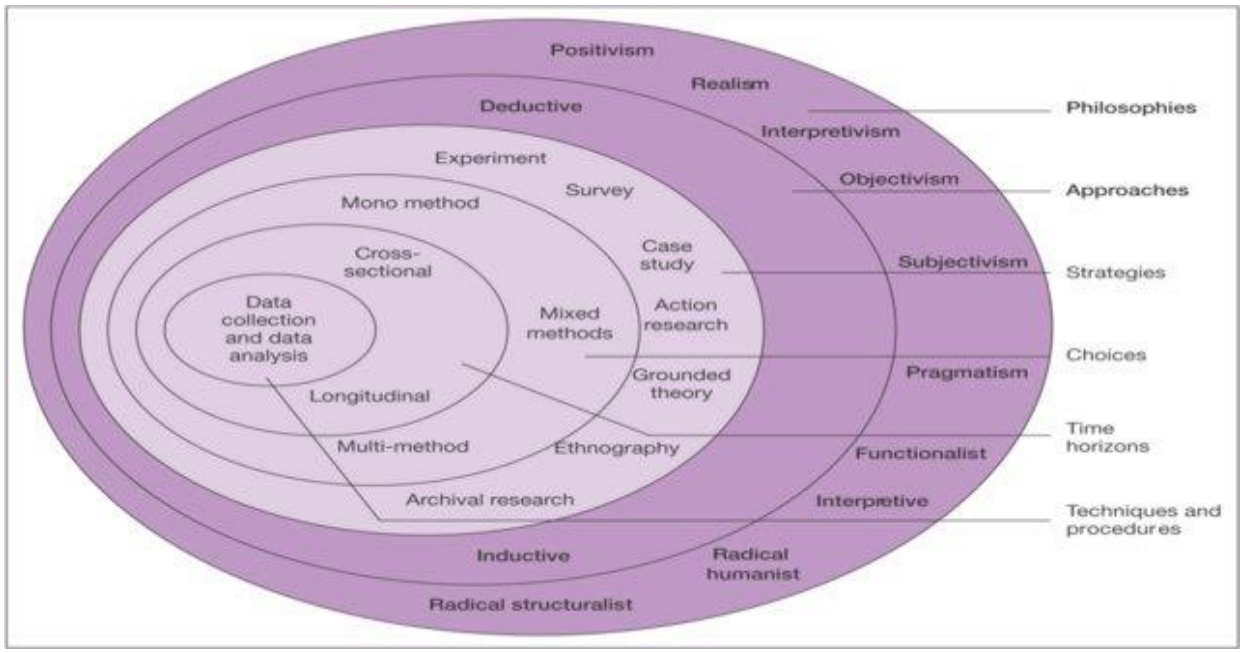

Figure 4 - Saunders Research Onion
(Source: https://research-methodology.net/research-philosophy)

iv) Use of data

The research outputs are varied and can have distinct uses. When designing a research project, the future use of the expected results shall be carefully analysed, and the type of outputs thoroughly chosen.

The most common way to convert data is to present the results obtained and the conclusions of the study in the format of a **scientific publication**. A scientific publication is a published piece of work that has been subjected to a **peer-review** process (a review and validation by other researchers, independent from the ones who have conducted the research) that communicates the results of the given research to the public.

A great deal of the researchers' time is devoted to the publication of the results. Planning and scheduling publications help organise and strategically direct research outputs. When publishing, it is important to consider which **scientific journals** are preferable. This requires researchers to compare journals/other publications and evaluate their potential impact (there are specific metrics for that, such as the **impact factor** of journals), to consider whether the journal is **open access** (free for all to read).

Scientific publications are generally read by other scientists who can understand the specificity of that piece of research. However, research results can be of interest to many other research stakeholders and serve other purposes than mere information directed to

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other scientists (this will be detailed in Module 4). For this reason, there are many other types of outputs from scientific research.

A non-exhaustive list includes:

- Patents, oral communications, spin-offs, companies, pilots, prototypes, mathematical models, software, algorithms, observatories, exhibitions, etc.

Research Lifecycle

The different stages and processes of conducting research form the **research lifecycle**, which starts with the development of the idea and planning of the research and ends with the communication and use of the knowledge produced.

- **Planning** - conceiving the research idea and preparing a **research proposal**
- **Implementation** - developing the **research project**, from its inception to its completion
- **Spreading the word** - communicating project results (example: **research paper**)

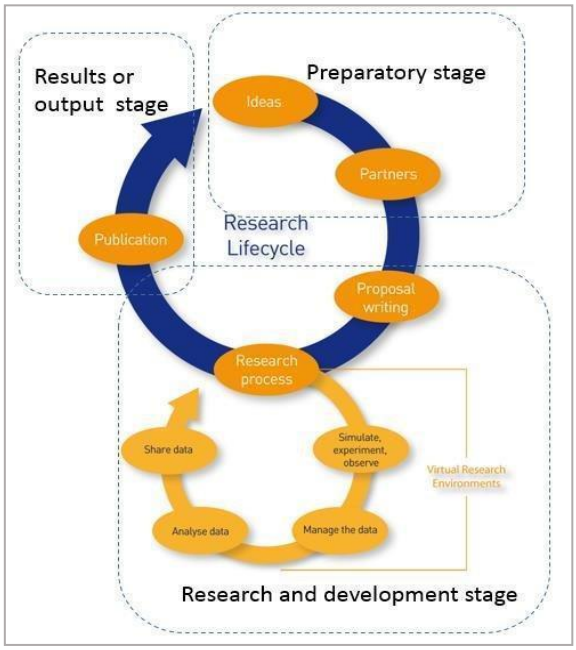

Figure 5 - A possible illustration of a research lifecycle
(Source: https://www.researchgate.net/publication/318696225_Embedding_library_services_in_research_stages_Chinese_subject_service_and_the_research_lifecycle_model/figures?lo=1)

For researchers, conducting research involves several periods of planning and writing, besides the moments of data collection and analysis. Most researchers will have to produce at least two different types of written work at different stages of the research lifecycle:

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i) The **research proposal**. Whatever a researcher proposes to research, he/she is likely to need funding for equipment, supplies, transport, tuition fees, living expenses, and other expenses. Funding is generally granted by specialised funding agencies that award funding to the most competitive research projects. Applying for funding means entering a competition, often with other projects from around the world. To apply for funding, it is necessary to write a funding proposal that describes the **research project** to be carried out if the funding is approved.

ii) The **research output.** The outputs of the research will be made public in different formats such as a research essay, publications, communications, or patents.

The structure of these two types of written pieces, despite addressing the same research question, is a bit different but with many similarities, as the proposal envisions the future while the research output describes what was already accomplished.

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Lesson 3: Research integrity and ethical conduct

Learning outcomes

LO#3 - The student should understand the research project lifecycle and the role of RMAs within it.

LO#10 - The students can discuss, formulate arguments, and critically examine their beliefs in the context of real cases of scientific integrity, responsible research, and ethical dilemmas that can emerge in the course of a research work project.

LO#12 - The student is open to perceiving and accepting the diversity of cultural and social contexts of research systems and practices.

Researchers are part of society; as the knowledge generated by research contributes to solving major societal problems, **scientific integrity and ethics become key aspects of the research activity**. Therefore, research institutions and funding agencies have increased requirements and professional practices to reinforce trust in research. In this task of consolidating values and practices of research integrity, every actor must be engaged:

> It is essential that institutions foster a culture of integrity in which students and trainees, as well as senior researchers and administrators, have an understanding of and commitment to integrity in research.

Source: *National Research Council (US) and Institute of Medicine (US) Committee on Assessing Integrity in Research Environments, 2002*

Ethics and Compliance

Ethics and compliance are key players in research. Ethics is the act of critically reflecting on the norms, conventions and consequences of human actions and their beliefs in society (Briggle and Mitcham, 2012). Compliance means respecting the institutional rules and codes of conduct (i.e., regulations on ethics and guidelines, codes of conduct in research).
The scientific activity presents many challenges and dilemmas, especially when research involves human or sentient beings. Therefore, it represents a horizontal activity within the research lifecycle: from compliance with ethical guidelines and data collection, in the development phase of the project idea, to compliance with specific regulations of funding

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agencies, in the project management stage. All the following actors involved within the research lifecycle should be made aware of and have access to ethics compliance principles:

- students and researchers should be provided with training and access to ethics guidance;
- RMA staff working with research directly;
- supervisors and research group coordinators;
- deans, directors, and decision-making board members.

Key Cases in Research Ethics

The Nuremberg Trials (1945-1946): Military trials held following WWII by Allied forces that led to the creation of a set of guidelines by the International Law Commission of the United Nations. Namely:

- *The Nuremberg principles*: which describe what constitutes a war crime
- *The Nuremberg Code (of ethics):* a set of research ethics principles for human experimentation. Medical experiments conducted by German doctors led to the creation of the Nuremberg Code to control future trials involving human subjects.

The Helsinki Declaration (1964): a set of ethical principles regarding human experimentation developed for the medical community and created by the World Medical Association.

The Belmont Report (1979): defined the core ethical principles (respect for persons, beneficence, justice, key cases in research ethics) and the primary areas of application (informed consent, assessment of risks/benefits, and selection of subjects). Created by the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research.

There are four interlinked key principles for ethical research:

1. **Respect for human beings:** making sure each person involved in research, participates by free will and that their rights and cultures are respected;

2. **Beneficence**: Everyone involved in the research gets something positive out of it, not just the researcher;

3. **Justice**: making sure that research is fair and inclusive: no section of a community of the population is deliberately left out (i.e., children, marginalised groups, people with disabilities, etc.);

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4. **Merit and Integrity**: researchers need to be experienced and competent, conducting research in such a way that allows others to have confidence and trust in the methods and the findings of the research.

Existing Codes of Conduct: EC Charter and Code of conduct for Researchers

Within the framework of the implementation of the European Research Area, the European Commission developed the Charter and Code for Researchers, in 2005, to promote the improvement of conditions for research work and boost career development for researchers.

The Code and Charter can be endorsed by the R&D institutions as a seal to attract researchers. It defines a set of general principles and requirements which specifies the roles, responsibilities, and entitlements of researchers, as well as of employers and/or research funders.

Figure 6 - General Principles and Requirements applied to the researcher (Source: EURAXESS)

Access the Charter here: https://euraxess.ec.europa.eu/jobs/charter/european-charter

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1. Planning research

Research begins with developing the research problem or research questions. At this stage, ethical issues may arise - for example, conflict of interests and judging the value of research.

a. **Conflict of interests** - any interest that undermines research involving financial gains, personal relationships or other relationships that can influence the research design, interpretation of data or dissemination of research (Briggle and Mitcham, 2012).

b. **Judging the value of research***:* when analysing the value of the research idea, researchers need to consider if the research they are proposing follows the values of research integrity. Is the research worth doing? Whose interests will it serve? Are there possible negative side effects? What are the justifications: making money, and personal gains?

2. Implementation

During the active research phase, new ethical dilemmas can arise. Briggle and Mitcham (2012) identify the following: (a) *objectivity, inferences, and data management;* (b) *bias and self-deception*, and (c) *trust*.

a. **Objectivity, inferences, and data management** - researchers conduct their work based on observation and inferences from the interpretation of collected data. It is important to maintain objectivity and ethical norms such as honesty, carefulness, accuracy, and open-mindedness.

b. **Bias and self-deception** - research inferences and interpretation of data can also be undermined by systematic biases or false assumptions. External review or verification is an important tool to identify existing biases in research. *Self-deception* stems from the exercise of wishful thinking and carelessness. Researchers must undertake a self-evaluation exercise geared toward maintaining objectivity and accuracy to avoid deceptive assumptions.

c. **Trust** - research is based on mutual trust between researchers and participants, stakeholders, funding authorities and public audiences. Researchers must ensure and build trust by conducting research following transparent norms and values, present in the code of conduct and secure ethical screening.

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3. Disseminating findings

Disseminating and communicating research results is a key activity of research. Important aspects researchers must consider are a) **peer review** and b) **authorship**.

a. **Peer review** - is an important process that must be undertaken throughout the research lifecycle, but most importantly when publishing research findings. It allows us to eliminate existing biases, errors, and deceptions.
b. **Authorship** - citing the work and providing the credits of other researchers and peers represents a key element of ethical conduct.

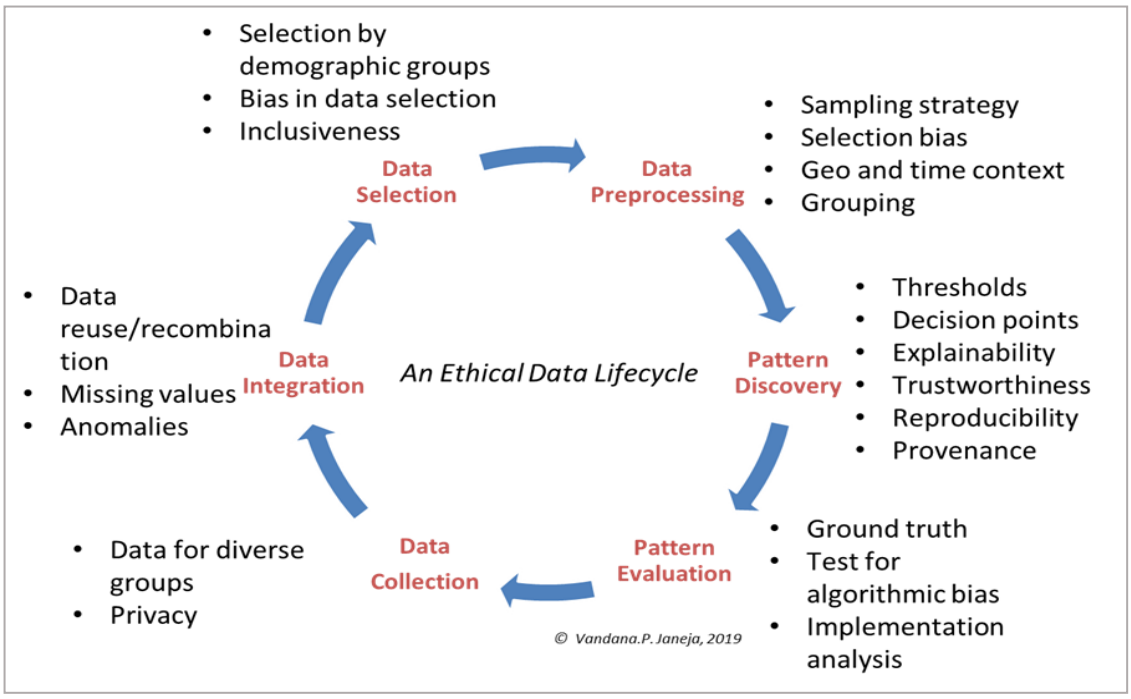

Figure 7 - Ethics in the research lifecycle
(source: https://www.aaaspolicyfellowships.org/blog/do-no-harm-ethical-data-life-cycle)

4. Scientific misconduct

Falsification, fraud, or plagiarism in conducting, reviewing, disseminating, and reporting research.

- **Fabrication** - Making up data or results and recording or reporting them as factual results.
- **Falsification** - Manipulating research materials, equipment, or processes; changing or omitting data results such that the research is not accurately represented in the research records.

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- **Plagiarism** - The appropriation of someone else's ideas, processes, results, or words without giving appropriate credit, including those obtained through a confidential review of others' research proposals and manuscripts.

RMA's role in Ethics and Compliance

Research Managers and Administrators are active actors in the research lifecycle, supporting researchers in their daily activities.

Transversal to all activities

- Processing research ethics applications, i.e., collecting information from the lead researcher, creating, and maintaining electronic and/or paper files, assisting researchers in completing consent forms and information sheets, collating applications, and disseminating for review, disseminating, reviewing, and recording committee/panel decisions, ensuring all relevant paperwork is in place as appropriate (ARMA Professional Development Framework, 2011).

Grant Preparation

- Raising awareness and providing 'up-to-date' information to comply with research ethics and governance requirements of the funding agencies.
- Providing ethical resources to researchers.

Contract negotiation

- Monitoring regulatory, governance and ethics issues arising from the contract.

Reporting

- Reporting and checking regulatory, governance and ethics issues.

At the institutional/governance level

- Supporting the development of institutional strategies about research ethics and governance.
- Maintaining oversight of institutional research ethics and governance processes and systems.
- Producing FAQs for key areas (i.e., IP, ethics, liability, legislation, governance) and making them available to the rest of the staff.

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Lesson 4: RMAs as Professionals at the Interface of Science

Learning outcomes:

LO#4–- The student should understand the research project lifecycle and the role of RMAs within the research cycle.

LO#7–- The student can recognise and integrate the motivations, expectations and roles of a researcher, and other professions linked to the research activity.

LO#10–- The student can predict the needs for research interface activities along the research project lifecycle and identify key RMA roles (e.g., Funding Advisory, Project Manager, Science Communicator).

LO#11–- The student is committed to finding a balance between assertiveness and cooperation in the course of teamwork in research as a leader and a team member.

The scientific revolution has brought to humanity a fantastic venture that now relies on millions of researchers all over the world, building on each other's discoveries (and denials!) to **advance knowledge and technology**. **Science is now a societal endeavour** that brings together different actors and resources, places, and relations, combined in what we can call the **Research and Innovation (R&I) ecosystem**.

There is not an official and unique definition of the R&I ecosystem, as they are complex systems which need various elements to perform optimally. In that sense, a common overview was suggested by Agostinho et.al:

> *"R&I ecosystem is understood as the set of infrastructures and human, financial, institutional and information resources, projects and activities organised for scientific and innovation production. It includes scientific discoveries, the creation of policy frameworks, production and management of knowledge, as well as, transfer and promotion of its application and dissemination of science and promotion of scientific culture."*

We can then conclude that to 'do' science, we need highly trained individuals, state-of-the-art infrastructures, competent institutions, and informational resources, as well as funding systems able to provide agile ethical and legal frameworks. Nevertheless, to make all this process work, and to be able to reach scientific discoveries, **we need more than just researchers**: there is a whole group of other professionals who work and contribute to maintaining the R&I ecosystem.

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The Education and Research ecosystem has been in rapid evolution during the past two decades, critically influenced by 'demands of contemporary environments' such as (i) **globalisation** and **increased mobility**; (ii) **global financial crisis**; (iii) **technology advancement;** and (iv) **knowledge-based economy** (Chan et al, 2017). In response, education, and research institutions (ERI) have been implementing structural changes and **enhancing the professionalisation of their managing structures** (Whitchurch, 2008), aiming at better adapting to these new challenges in an increasingly complex research ecosystem.

Moreover, R&I needs not only excellent researchers but also **highly skilled professionals working in research administration, research management, knowledge transfer and exploitation, science communication, research governance and research policy**, to release the full potential of R&I at institutional, national, and international levels. Although these professionals do not perform direct research tasks, they support researchers in common working ecosystems. These professionals have a name: **Research Managers and Administrators (RMAs)**.

Research Managers and Administrators: diversity and definition

Collinson (2006) highlighted several common features between professionals working in research management in British Higher-Education Institutions (HEIs), such as i) the wide range of roles; ii) the cross-boundary interaction with academics, and iii) their 'occupational identity issues'. These thin boundaries between academics and non-academics and new identities within HEIs were also evidenced by Whitchurch (2008), who proposes the term ***third space professionals*** to refer to individuals who perform managing roles, with a diversified background and a non-academic contract, and who undertake activities between the professional and academic spheres.

On a similar note, the second type of space is defined by Shelly (2010) as the ***shifting area***', highlighting the shared space where research management crosses into the academic domain. Santiago et al. (2006) had previously defined the increasingly specialised role of these professionals as "*being able to define missions, objectives and strategies; having capacity to manage financial and human resources and to assume strong management leadership, in contrast to traditional academic styles of negotiation and consensus building*".

More recently, Agostinho et al. (2020) proposed the term ***Professionals at the Interface of Science*** **(PIoS)** as an **umbrella identity that encompasses all these professional roles and profiles**.

Despite the different terminology and conceptual framework proposed to define these professionals, all authors acknowledge that **Research Managers and Administrators operate at different levels/ stages of research development**:

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- ***upstream of research*** - to attract/ advocate for/define a strategy for research funding projects and partnerships (with both academia and industry);
- ***during the research*** - to support the research activity itself (e.g., post-award management, technological platform management, ethical compliance management, intellectual property management);
- ***downstream of research*** - broadening the impact of research (e.g., outreach, science communication, facilitating the impact on understanding, learning & participation; creativity, culture, and society; social welfare; commerce & economy; public policy, law & services; health, wellbeing & animal welfare; production; the environment; practitioners & professional services).
- **transversal areas** - RMAs also develop their work in cross-cutting issues that are transversal to upstream and downstream phases of research, such as responsible research and innovation, gender, ethics, and several broader areas of researcher development.

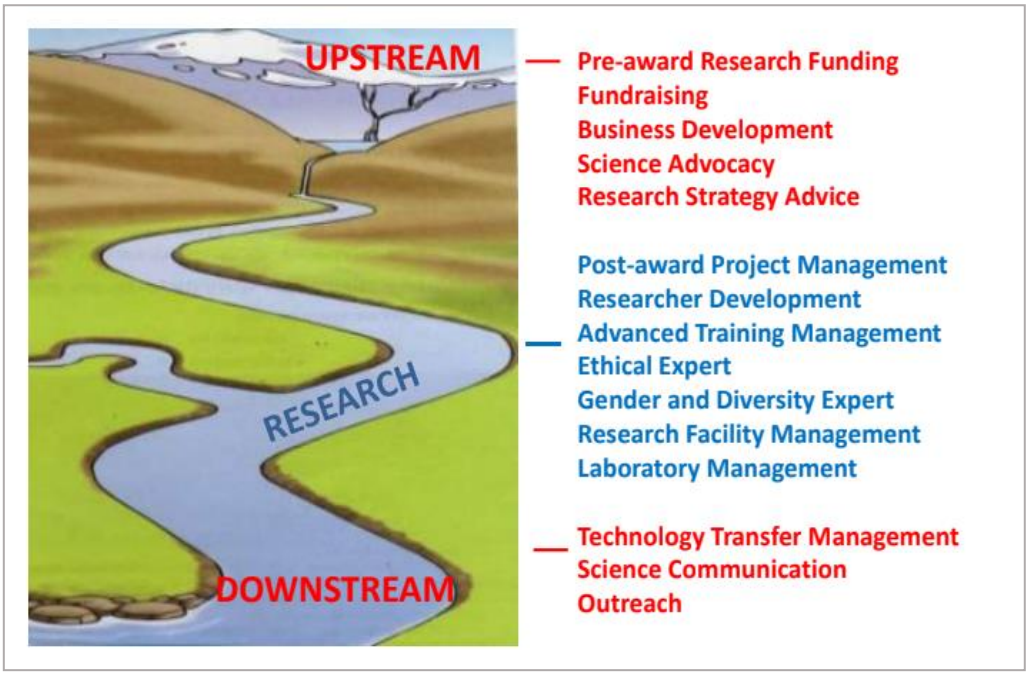

Figure 8 - Level of action where RMAs operate

Research Managers and Administrators: why they demand professional recognition

The recognition of **Research Management and Administration as a Profession** has been growing, empowered by the Professional Associations that provide capacity-building in topics

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related to the daily activities of these professionals. Their most relevant daily tasks include the **definition of the Professional Development Framework** created by several associations and instrumental to then identify the knowledge and skills needed per functional area by the professionals in their activities.

Two main Professional Development Framework should be acknowledged:

1. ARMA Professional Development Framework: comprises 21 different functions undertaken by RMAs, grouped under seven broader headings:
    a. Developing Proposals
    b. Project Lifetime
    c. Translation
    d. Postgraduate Researchers
    e. Policy and Governance
    f. Management Information and Related Functions
    g. Service Organisation and Delivery

    Each of these functions is described from three different perspectives – Operational, Management and Leadership.

2. BESTPRAC's Research Support Staff (RSS) - Framework: identifies the various roles, tasks and skills performed by an RMA in the frame of the project lifecycle. It also considers four stages i) before the proposal; ii) proposal; iii) grant preparation and, iv) project. In this professional framework, three other perspectives are considered: Research Administrator, Funding Advisor/ Liaison Manager and Project Manager.

RMAs within the research lifecycle

Both frameworks above acknowledge the important role played by RMAs in the development of research. Casting an eye at the **overall Research Lifecycle (RL)**, we can see that RMAs are called to participate from the development of the research idea to its implementation and from facilitating the broad impact of research, to acting as brokers in the stakeholders' involvement. If we relate the Research Lifecycle with the RMA's main roles, the result will be the following figure:

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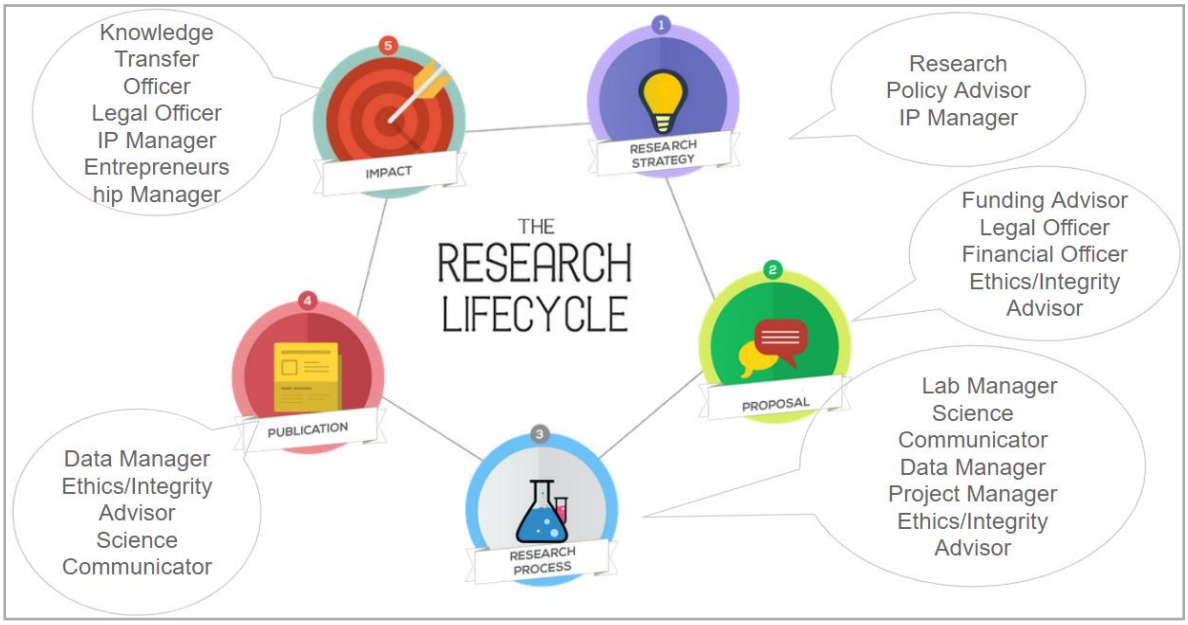

Figure 9 - RMAs within the research lifecycle (adapted from Bournemouth University (Source: https://blogs.bournemouth.ac.uk/research/2015/07/20/have-you-checked-out-the-interactive-research-lifecycle-diagram-yet-4/)

Looking closely at the different tasks involved in the research lifecycle, we can explore the four stages proposed in the BESTPRAC RSS Framework:

Research lifecycle stage	RMA tasks and roles
Before the proposal	• Identifying/ finding funding opportunities • Disseminating funding • Advising • Training • Gathering non-public information • Promoting quantitative and qualitative analysis of EU funding and organisational participation
Proposal	• Providing general information and support regarding proposal submission • Facilitating and setting up internal approval and signature process • Providing budget notes, explaining, and enforcing internal budget rules • Advising on the execution of the writing process and consortium formation and management • Advising on the content to be written (vs writing process) • Generally advising on legal aspects and providing organisational legal

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	documents • Linking to information or advising on IP, ethics, open access and open data • Featuring statistics and analysis
Grant preparation	• Facilitating the signature of the grant agreement • Facilitating the internal setup of the project • Elaborating internal and external communication strategies • Reviewing and discussing the GA and the grant preparation with the PI • Facilitating the consortium agreement and handling related issues • Communicating the project success (internal and external)
Project	• Supporting financial and technical reporting • Managing the consortium • Communicating internal procedures • Functioning as a helpdesk and providing administrative support • Managing and archiving contracts • Supporting amendments to the Grant Agreement and Consortium Agreement • Project Management • Defining the project's communication and dissemination strategy • Liaising between the coordinator, the funding agency, and the consortium (when an RMA institution is coordinating)

RMAs beyond the project

Research Managers and Administrators are also involved in other tasks which are not strictly related to the proposal or project implementation. As such, it is important to 'complete' the list above with the list below, taking into consideration the ARMA Professional Development Framework.

Beyond the research lifecycle	RMA tasks and roles
Postgraduate Researchers	• Supporting and guiding postgraduate researchers (With close relation to the support for research career development)

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Policy and Governance	• Contributing to Research Policy and Strategy • Contributing to the process for assessing research excellence • Supporting Research Ethics and Governance
Management Information and Related Functions	• Working with Information Systems • Making Statutory Returns
Service Organisation and Delivery	• Managing a Research Support Service • Organising and Structuring a Research Support Service • Mapping and Reviewing Research Support Service Functions

RMA skills and competences

Most importantly, to be able to perform in such different areas, **Research Managers and Administrators need to have a broad range of knowledge, skills, and attitudes**. Tauginiene (2009), identifies 3 main qualities and skills that an RMA should develop:

1) **generation, interpretation, and dissemination of information**: being aware of the newest information, understanding and forwarding the information in all phases of grant preparation and management;

2) **communication at many levels**: between researchers, researchers, and RMAs, between RMAs, as well as other stakeholders;

3) **problem-solving** with a high level of honesty, integrity, and ethics.

Recently, Susi Poli's (2020) NARMA 2020 presentation identified the following skills and aspects which RMAs should build on:

- Networking; navigating complex, multiple relationships; social capital
- Cross-cultural capability and team building in multicultural/sectoral groups
- Creativity and super-creativity
- Coaching, emotional intelligence and positive psychology
- Happiness at work is all about how to make others around you thrive
- Diversity and inclusion at work and in all groups
- Ethics and integrity but also academic freedom as a core of today's research
- Public engagement and a bit of activism
- Conceptual skills are not to be let out

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The same author also concluded that although we can find a **common set of compulsory/recommended skills** regarded as needed in today's RMA scene, these skills are regarded differently in various EU countries or organisations, meaning that they are **also culturally driven**. **Research Management and Administration is a professional field evolving at a fast speed**, as it reflects the necessity to mature and adapt to the R&I ecosystem. As such, new roles are emerging in RMA, to respond to the demand for new and more specialised tasks.

Testimonials of RMAs and their entrance into the profession:

- An Alternative Career Path: Research Management: https://www.psychologicalscience.org/observer/an-alternative-career-path-research-management
- The Unexpected Career Path to Research Administration: https://cayuse.com/blog/career-path/
- What do research staff do next? Career stories: https://www.vitae.ac.uk/researcher-careers/researcher-career-stories/what-do-research-staff-do-next-career-stories/siobhan-jordan

Research on Research Managers and Administrators

The broad scope of tasks and roles played by RMAs are intrinsically linked to the characteristics and maturity of the R&I ecosystem they are integrated with. As such, variations in R&I development, national R&I policies, funding schemes, and R&I governance can define the roles, tasks, and professional recognition of RMAs. Within institutions, levels of commitment to R&I and scientific areas, are also important variables in the definition of RMA's organisational structures, tasks, and responsibilities. For that reason, these different aspects have been translated into research studies in the area we can call **RMA studies.** Up to now, relevant contributions to the profession in terms of RMA training mapping and definition, have been mainly conducted by the existing associations and groups of individual RMAs (either within the framework of larger projects or as individual projects). The Research Administration as a Profession (RAAAP), for example, is a project aiming at identifying key skills, attitudes and behaviours of successful research administration leaders through a longitudinal survey.

Finally, another relevant debate is around the **RMAs' lack of professional recognition**. Several challenges have been identified:

1.) the recognition of a thin boundary between research but not the research itself, making a delimitation of RMA tasks an ongoing debate;

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2.) the diverse contexts of national R&D ecosystems are linked with RMA performance and recognition, thus calling for further research on this interdependence;
3.) the unique profile represented by some RMAs (PhDs, former researchers, etc.) places RMA studies inside an emergent research area developed by RMAs for RMAs.

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Lesson 5: Oral presentations

Learning outcomes:

LO#5 - The student can creatively elaborate and design a research plan adapted to a different research discipline (social sciences, economic sciences, natural sciences)

LO#11 - The student is committed to finding a balance between assertiveness and cooperation in the course of teamwork in research as a leader and a team member.

LO#12 - The student is open to perceiving and accepting the diversity of cultural and social context of research systems and practices.

LO#13 - The student is open to different research methods and is committed to finding consensus in an interdisciplinary research setting.

LO#14 -The student endeavours to understand the interests and aspects of the different stakeholders and is ready to consider them in the research process.

During Module 1, students are asked to develop their ideas about a research question or to work with an already funded research project (defined by the teacher according to the level and interest of the students). Depending on the chosen format the project to be developed and presented in Module 1 and Module 2 can have the following frame:

OPTION 1: Research project - students will continue to work on their ideas aiming to transform them into a work plan that can become part of a **project proposal to be submitted** to a funding application. The idea is to set the grounds for a realistic project proposal by turning ideas into concrete action.

OPTION 2: Action project - students act as research managers and use their ideas to plan a **research management activity** they would like to perform (for example, finding suitable area-specific funding calls for researchers to apply to, setting up a system to regularly inform researchers about funding opportunities or analysing policy on open science and proposing a strategy for action).

OPTION 3: Career project - students act as **potential job applicants** in an RMA area and use their ideas to build a portfolio and present themselves to the job market.

Communicate your research findings to different audiences

When communicating your research results, it is important to consider diverse audiences, made up of both academics and non-academics. In addition, writing in a comprehensible way

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to target readers with different levels of expertise is bound to help reach more audiences and improve the impact of research findings.

1. **Consider the broad spectrum of audiences:**
    a. **Scientific community** (researchers, reviewers for a grant proposal/article);

    b. **Policy stakeholders** (legislators, professionals working in governmental institutions);

    c. **Civil society** (general public; members of non-profit organisations).

2. **Tailor your writing and presentation to the audience:**
    a. Before writing, take into consideration which framework you are working for: i.e., journal article, conference, call for applications;

    b. Translate your results to show how they apply to real-world issues of interest to your target audience (Miller, 2007).

Writing your research proposal

Preparatory tasks

1. **Outline your research** according to the purpose of your writing: map the structure of your proposal with the necessary information per section (according to the organisation's proposal guidelines)

2. Talk to **previous grant holders** of the programme/call you are applying for to learn more about the submission process and successful tips (Vieira, 2020)

3. Think about **your audience**:
    a. learn more about who the reviewers of your proposal will be (scientific reviewers, funding agency staff, programme's professors)

    b. align your proposal with the programmes' or agency's mission

4. **Examine sample proposals** from your department, peers, and/or the organisation.

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Common elements of Grant Proposals by Katy Vieira (2020)

Short Overview (i.e., *abstract* or *executive summary*)	Here you **briefly present the most important elements** of your proposal. For longer proposals, you might be able to use a full page for this overview but for other proposals, you might have to condense it into just one paragraph. Either way, make sure you address the following issues: • What is the purpose or goal of your project, the need you are addressing, or the problem you are solving? • What are the expected outcomes of your project and how will you achieve them? • How will you assess or verify the success of your project? • Why is your project important? • Briefly, describe yourself and your professional background.
Tips	The first sentences are key to **catching the interest** of your audience. You can use different techniques: i. Bold sentences ii. A question or quote Include **definitions of concepts** when necessary.
Examination of a Need or Problem (i.e., *statement of need, problem statement*, *statement of problem*, *needs assessment* or *literature review*)	Your project is important because it is responding to a gap in resources, knowledge, or opportunity that needs to be filled. To **establish the value of your project**, you need to clarify the need or problem that your project responds to. Early in your proposal, make sure you establish the **context of this problem** (i.e., the background). If this problem affects a particular population, describe that group of people targeted. Include data, if appropriate. Particularly for academic grants, this examination may take the form of a **short literature review,** clarifying that you have read extensively on this topic and understand your project's scholarly context and significance. Also, for academic grants, it is important to clarify why the project will make a **wider, positive impact** and not just how it will answer a specific academic question.
Description of Your Project (i.e., *project narrative*; *project goals, objectives*,	Once you have established a need for your project, you must describe it. Make sure you answer these questions: • What are the **goals** of your project or your research questions? • What will your project's **expected outcomes** be?

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and methodology; or *strategies and tactics*)	• [As with many other kinds of outcomes, grant proposal outcomes should be **SMART** - specific, measurable, achievable, realistic, and timely.] • How are you going to achieve those outcomes? What **methods** will you use? • How will you **measure** or recognize your project's achievements? • How can you be sure that your project will productively respond to the need or problem you have identified? • What will the **timeline** for your project be? • Several questions focus on the **impact your project will have**. Delineating the impact is important because funders want to see that you have clearly **established the realistic benefits** of your work along with how you plan to verify and **assess your achievements**.
Tips	• Use introductory sentences to guide the reader and maintain a logical flow of ideas (Miller, 2007)
Budget (i.e., *resources*)	In grant proposals, you are asking for **funding or other financial support,** and you need to clarify why you are asking for particular amounts. Budgets are often formatted in **tables and figures**. Each amount should be clearly labelled, and you might need to directly follow your budget with a **justification statement** explaining the reason behind each cost, including motivating why certain materials and equipment are important for your project.
Conclusions	• Write **separate sections or paragraphs for each research question** (Miller, 2007) • Suggest **future research** looking forward

Final Revisions

- Ask a peer you trust and/or people with different scientific backgrounds to **revise your proposal**;
- **Re-read** to avoid repetitions;
- Double-check if **bibliographic references** are properly cited with correct referencing requirements

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Module 2 - Research Funding, Policy and Governance

Main goal: To get familiar with major drivers of European policy and how they condition research, in particular research funding and the governance of research institutions, while getting insights into professions linked to research funding and policy.

Lesson 1: Policy drivers, research agendas, European research policy

Learning outcomes:

LO#1 - The student can identify major policy drivers (e.g., UN developmental goals, cross-cutting issues) and assess their influence in shaping research agendas.

LO#2 - The student can identify examples of societal and economic drivers impacting and defining research policy (e.g., the COVID-19 situation).

LO#4 -The student can differentiate between policy and strategy and identify suitable examples in the context of the EU and at the research institutions level.

LO#13 -The student can discuss and formulate arguments and confront opinions in the context of real cases of scientific policies

LO#17 - The student demonstrates curiosity and interest in systemic approaches and the organization of the research ecosystem.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

Introduction - a vision for driving Europe's Research and Innovation policy

The European Union is an economic and political union counting 27 Member States. As a major collective enterprise entailing a vision for the future based on promoting peace and

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well-being of its citizens, the European Union aims to offer borderless freedom, security and justice while promoting sustainable development based on balanced economic growth and a highly competitive market economy starring full employment, social progress, and environmental protection.

The European Union sets out to achieve the goals by fighting social exclusion and discrimination, increasing territorial cohesion, and promoting solidarity amongst EU countries towards respecting cultural and linguistic diversity.

This vision demands **ongoing scientific and technological progress**. Thus, **effective Research and Innovation actions are central** to the current and future shaping of the European Union. One of the major driving forces behind the launching of the R&I policy was to **boost the competitiveness of the European integration** vis-á-vis its economic rivals. (The EU in brief: https://europa.eu/european-union/about-eu/)

This is illustrated by a quote from a representative of the European Commission at an informal leaders' meeting (23 February 2018):

Research and Innovation are crucial for our future. They are the only way to simultaneously and sustainably tackle low economic growth, limited job creation and global challenges such as health and security, food and oceans, climate and energy.

Such a statement sets the stage for **policymaking**. If Research and Innovation are central for the European Union, then policies and strategies will have to be put in place to define actions within the Research and Innovation field. **Policies** are *guidelines for organisational action and implementation of goals and objectives* that any governing structure needs to justify its actions. **Policies are frames to action**. (https://keydifferences.com/difference-between-strategy-and-policy.html#Definition). **Strategy** deals with the set of actions that allow the creation of a unique and valuable position in the organization (according to Michael Porter's definition of strategy, Harvard Business Review).

EU bodies participating in shaping the EU R&I agenda

At the heart of the European decision-making process are the **EU institutions**, such as the Parliament, the Council and the European Commission and others.

The main decision-making European institutions (and their tasks) can be simply described as:

- **European Parliament**: the voice of the people;
- **European Council**: setting the strategy;

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- **Council**: the voice of the Member States;
- **European Commission**: promoting the common interest.

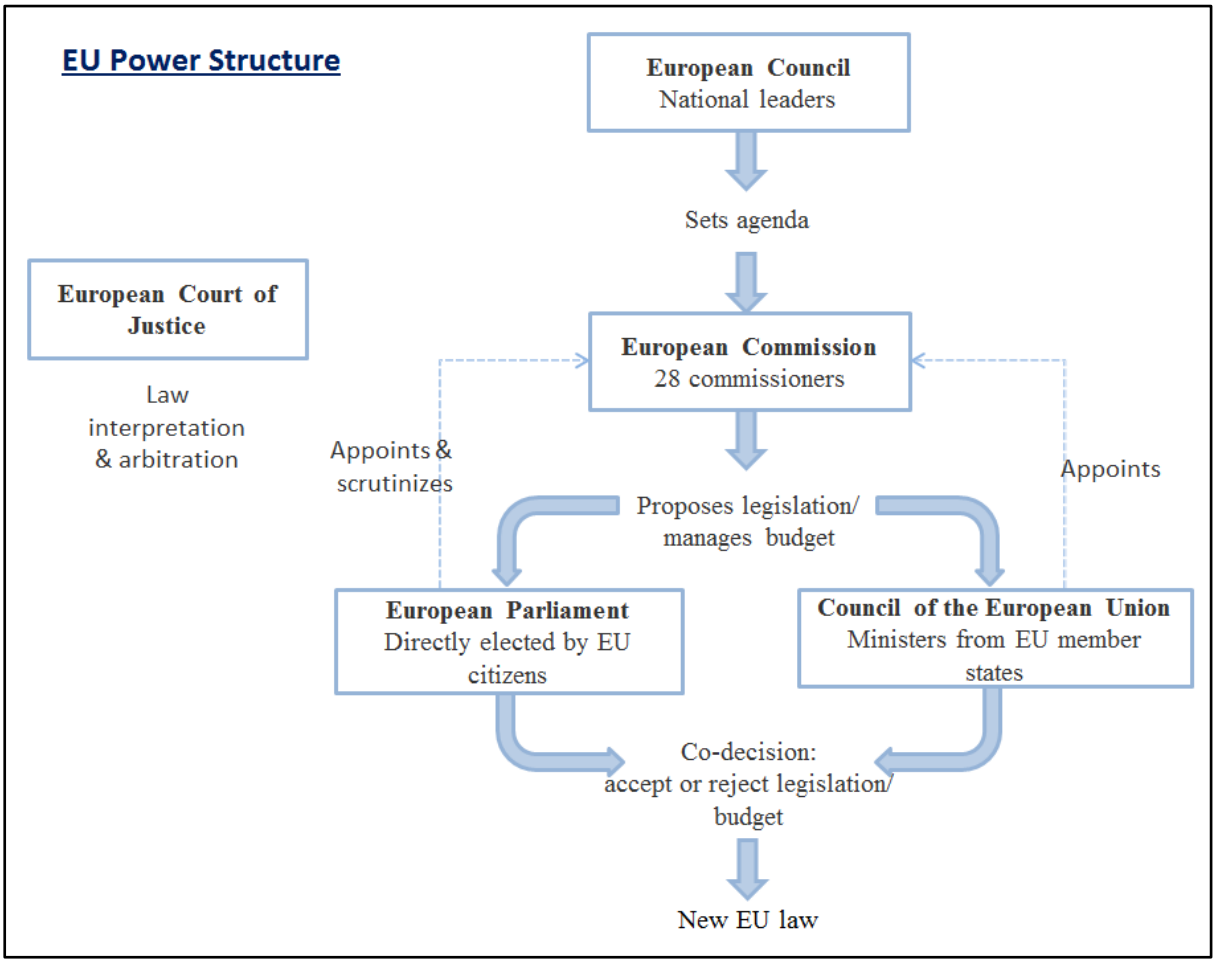

Figure 40 - The EU Power structure
(source: http://euap.hkbu.edu.hk/youngeurope/en/2014/07/29/how-does-eu-work/)

The European Parliament represents EU citizens and is directly elected by them; the European Council is made up of the Heads of State or Governments of the EU Member States; the Council represents the governments of the EU Member States, while the European Commission represents the interests of the EU as a whole.

The European Council defines the general political direction and priorities of the EU but does not exercise legislative functions. Generally, it is the European Commission that proposes new laws, and it is the European Parliament and Council that adopt them, while the Member States and the Commission then implement them.

At the core of the EU are the Member States — the 27 states belonging to the Union — and their citizens. The unique feature of the EU is that, although these are all sovereign, independent states, they have pooled some of their sovereignty to gain strength and benefits

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from the power of size. **Pooling sovereignty** means, in practice, that the Member States delegate some of their decision-making powers to the shared institutions they have created so that decisions on specific matters of joint interest can be made democratically at the European level. The EU thus sits somewhere in between the fully federal system found in the United States and the loose, intergovernmental cooperation system seen in the United Nations.

The European Union is based on the **rule of law**. This means that every action taken by the EU is based on treaties that have been approved voluntarily and democratically by member countries. Treaties are negotiated and agreed upon by all the EU Member States and then ratified by their parliaments or via referendums. Treaties lay down the objectives of the EU, establish rules for EU institutions, account for how decisions are made and detail the relationship between the EU and its Member States.

Treaties list policy areas in which the EU can formulate decisions. **In some policy areas, the EU has exclusive competence**, which means that decisions are taken at the EU level by the Member States meeting in the Council and the European Parliament. These policy areas cover trade, customs, competition rules, monetary policy for the Euro area, and common fisheries policies. In other policy areas, the decision-making competencies are shared between the EU and the Member States. This means that if legislation is passed at the EU level, then these laws have priority. However, if no legislation is adopted at the EU level, then the individual Member States may legislate at a national level.

Shared competence applies in many policy areas, such as the internal market, agriculture, environment, consumer protection and transport. In all other policy areas, the decisions belong to the Member States. Thus, if a policy area is not cited in a treaty, the Commission cannot propose a law in that area. However, in some fields, such as the space sector, education, culture and tourism, the EU can support Member States' efforts. And in others, such as overseas aid and scientific research, the EU can carry out parallel activities, such as humanitarian aid programmes and research frameworks. Decision-making at the EU level involves legal acts of various types which are applied in different ways.

A **regulation** is a law that is applicable and binding for all Member States directly. It does not need to be translated into a similar national law by the Member States, although national laws may need to be changed to avoid conflict with the regulation.

A **directive** is a law that binds the Member States, or a group of Member States, to achieve a particular objective. Usually, directives must be transposed into national law to become effective. A directive specifies the result to be achieved: it is up to the Member States individually to decide how this is done.

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A **decision** can be addressed to Member States, groups of people, or even individuals. It is binding in its entirety. Decisions are used, for example, to rule out proposed mergers between companies.

Recommendations and opinions might be issued by having no binding force *per se*.

Learn more at The European Union explained: How the EU works

External drivers of European R&I policy

There are different **drivers of R&I policy**, stemming from the needs/ pressures/ trends that push politicians into thinking it is necessary to transform the European Union into a **knowledge-based economy** - a system of consumption and production based on **intellectual capital** (the ability to **capitalize on scientific discoveries and basic and applied research**; see more at https://www.investopedia.com/terms/k/knowledge-economy.asp or OECD, 2005, *The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual, Third Edition* prepared by the Working Party of National Experts on Scientific and Technology Indicators, OECD, Paris, para. 71). These drivers are **external** because they are external to a given institution, as they **relate to society as a whole**.

The following text from the European Commission illustrates in more detail **why Research and Innovation are important for Europe** and what drives European policies on Research and Innovation.

*Investing in research and innovation is **investing in Europe's future.** It helps us to compete globally and preserve our unique social model. It improves the daily lives of millions of people here in Europe and around the world, **helping to solve some of our biggest societal and generational challenges**. From making 1.6 million Ebola vaccine doses available, to creating a battery 100 times more powerful than ordinary ones, through to developing hydrogen fuel cell powered buses for our cities, **research and innovation is everywhere around us**. This reflects the fact that society can only move forward as fast as it innovates. It can only provide lasting prosperity if it makes the most of the knowledge, entrepreneurial spirit and productivity of its people. And it shows that any economy can only stay ahead of the competition if it stays at the frontier of **cutting-edge research and innovation**. This is the challenge facing our Union today as we seek to maintain and improve the European way of life.*

*Countries around the world are investing massively on research and innovation in all areas of the economy. This is **intensifying global competition** and threatens the leading competitive position of Europe in key industrial sectors. Deepening Europe's innovation capability, ensuring the necessary investments, and **accelerating the diffusion of innovation across Europe** is therefore a question of necessity for our future prosperity.*

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The stakes are high – but so is Europe's potential. The next wave of innovation, combining physical and digital, will be ***rooted in science, technology and engineering****, where Europe has and needs to maintain a competitive edge. With 7% of the global population,* ***Europe accounts for 20% of global research and development investment*** *and around one third of all high-quality scientific publications. Europe is also home to a strong industrial base.*

Europe must build on these assets and on its values to develop its own distinct model of innovation. It should make the most of its collaborative, partnership-based culture, which helps to foster innovation right across our Union. And as it does so, it must ensure the high level of European protection of citizens' data and privacy – which is now the global benchmark – becomes a source of competitive advantage when it comes to new technologies, such as Artificial Intelligence or big data.

Reference: European Commission. (2018). *COM(2018) 306 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A renewed European Agenda for Research and Innovation - Europe's chance to shape its future* [The European Commission's contribution to the Informal EU Leaders' meeting on innovation in Sofia on 16 May 2018]. https://ec.europa.eu/info/sites/info/files/com-2018-306-a-renewed-european-agenda- for research-and-innovation may 2018 en 0.pdf

The text identifies several current **external policy drivers** that create demand for a clear and wide-scoped R&I policy in Europe. These external drivers include improving the daily lives of people, providing lasting prosperity, maintaining the European way of life, protecting a leading European competitive position in key industrial sectors, and taking advantage of European potential (in R&I, in collaborative and partnership spirit and through the strong industrial basis) and protecting European citizens' data and privacy.

The vision and principles defended by the European Union project provide a master frame for action, but the **European Union's endeavour must be built day by day**, responding to new challenges and demands from society. Nothing can be taken for granted, and such an ambitious and long-term project as the EU is no exception; it needs to be constantly fed and adapted, and all European citizens have a major role to play in this process.

As stated by the European Commission President Jean-Claude Juncker at the State of the Union, Strasbourg, 13 September 2017: *Our future cannot remain a scenario, a sketch, an idea amongst others. We have to prepare the Union of tomorrow, today.*

Some factors suddenly become very important and influence policy very strongly, **diverting the course of action**. One very recent example is the 2020 **COVID-19 pandemic** which had a massive impact on several areas, including R&I policy, by changing the R&I funding scenarios and, consequently, by **deviating the course of research** into areas that, in one way or another,

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could help face the pandemic. The **pandemic acted as the major policy driver in the whole world**, and it was, to a large extent, unpredictable.

The following blog (https://sciencebusiness.net/covid-19/news/live-blog-rd-response-covid-19-pandemic) provides examples of how universities and research institutes' R&I agendas were disrupted across the world, and how they started working very hard to find out how the disease could be stopped and its effects mitigated. The news between April, May and June 2020 provides clear examples of **how the crisis impacted research and innovation**, and what governments, funders, companies, universities, associations, and scientists were doing to stop or cope with the pandemic.

Policy versus Strategy

Is policy enough for governments or institutions to act? Is it enough to state that Europe needs to become a knowledge-based economy for that to happen? No. It is necessary to detail how that overarching goal of becoming a knowledge-based economy will be achieved. While **policy frames the action, strategy defines the action**. Strategy is what will be used for Europe to *develop its distinct model of innovation.* It is thus important to distinguish policy from strategy.

Although the distinction between policy and strategy may vary depending on the context, in this module we use definitions available in the relevant literature, which are often employed by institutions, including companies and research-performing organizations, but which are not identical to the ones used in EU documentation (in which strategy is used to imply policy action). In either case, what is important is that students understand the difference between the concept of **providing a framework for action** (called policy in this Module) **vs. the specific plan for action** (called strategy in this module).

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The table below shows how several definitions are available in the literature to support the distinction adopted in this Module.

Policy	Strategy
a guideline for organisational action and implementation of goals and objectives (…) translated into rules, plans and procedures	*the direction and scope of an organisation over the long term, which achieves advantage in the changing environment through its configuration of resources and competencies*
what is done to put the strategy into practice	*how an organisation pursues competitive advantage across its chosen direction*
	a formulated plan to achieve one or more goals under changing conditions. It's about setting a target and describing a way to reach that target

The following documents about the influence on research and innovation in Europe can be assigned to either the **policy** or the **strategy categories**:

- TRANSFORMING OUR WORLD: THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT: https://www.un.org/sustainabledevelopment/
- Brussels, 17.7.2012 COM(2012) 392 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Reinforced European Research Area Partnership for Excellence and Growth: https://ec.europa.eu/info/research-and-innovation/strategy/era_en
- Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth. European Commission Directorate-General for Research and Innovation Directorate Brussels. Publications Office of the European Union, 2018: https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme/missions-horizon-europe_en#what
- Horizon 2020 Work Programme for the Marie Curie S. Actions: https://ec.europa.eu/info/funding-tenders/opportunities/portal/
- Horizon 2020 Work Programme for the Widening programme: https://ec.europa.eu/info/funding-tenders/opportunities/portal/
- NOVA University of Lisbon strategic plan: https://www.unl.pt/en/nova/mission-and-strategic-plan

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- EU programme for education, training, youth, and sport (ERASMUS Plus): https://ec.europa.eu/programmes/erasmus-plus/node_en
- EUA Position report Europe's Universities Shaping the Future, 25 June 2020

When designing a research project, it is important to think about how the existing R&I policy and strategy can affect the proposed plan. If funds are requested to support a research project, the funder often demands specific elements to be included in the project to **meet policy or strategy requirements**. For example, a funder may ask the researcher to design a research proposal to meet one of the **UN Sustainable Goals** or may ask researchers to publish project results in **open access** or to follow specific **ethical guidelines** applicable to research involving human beings.

Thus, it is important to be aware of the wide portfolio of policies and strategies affecting European research and innovation. The list of R&I policies and strategies can be further completed with policy R&I agendas or strategy documents relating to R&I funding found at the following links.

References for policy documents:

- **General**:
  - https://ec.europa.eu/info/about-european-commission/what-european-commission-does/strategy-and-policy_en
  - https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/shaping-eu-research-and-innovation-policy_en
- **Open research**: https://ec.europa.eu/info/files/open-science_en
- **Regional policy**:
  - structural funds https://ec.europa.eu/regional_policy/EN/funding/
  - smart specialization strategies at country or regional levels: Example of a summary of main policies affecting research in a given country (Portugal): in chapter 3 of OECD report 2019 (reference: OECD (2019), OECD Review of Higher Education, Research, and Innovation: Portugal, OECD Publishing, Paris. https://doi.org/10.1787/9789264308138-en)

References for strategy documents:

- **International**:
  - Funding & Tenders portal https://ec.europa.eu/info/funding-tenders/opportunities/portal/
  - Work Programmes of European funding (e.g., Work programmes for H2020 (compare MSCA vs Thematic vs Widening), for Erasmus +, etc.
  - National: find national examples of funding programmes

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Lesson 2: The European research funding framework: funding programmes and calls

Learning outcomes:

LO#3 - The student can understand and contextualise European research funding frameworks and main European funding programmes and schemes to support research and innovation activities (e.g., Horizon Europe) and to identify synergies between funding schemes.

LO#7 - The student can analyse a given European call for funding from the perspective of its underlying policy (need for the call) and proposal (goals, activities, expected outcomes and impact).

LO#11 - The student can explain the pre-award work and how it fits into the research cycle.

LO#17 - The student demonstrates curiosity and interest in systemic approaches and the organization of the research ecosystem.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

Introduction to European funding

The European Union's vision relies on creating a sustainable and prosperous future for people and the planet based on European values. In the previous lesson, we have seen how promoting and supporting research and innovation can help attain this vision by boosting Europe's competitiveness and growth. While this is important, **tackling climate change is also a major concern**, which requires competitive R&I capacity. For this reason, helping to achieve the **UN Sustainable Development Goals** has become a major priority, which must be addressed in all European R&I funding frameworks.

Other priorities that encompass many European funding programmes are related to addressing **global challenges**, attaining **territorial cohesion,** and **reducing regional disparities**, or **strengthening the European Research Area**. Together, these priorities help **define a research funding framework** that is then translated into preconditions ruling the major European funding programmes.

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Several **large-scale European funding programmes address different policy goals and areas**.

- Watch this short video to understand how policies help define a research funding framework that is then translated into European funding programmes:
  EU Funding for your project?

Figure 51 - EU funding for your project
(source: https://www.youtube.com/watch?v=P62sjnHL59w)

Some takeaways from the video:

- European funding comes through **taxpayers' money** from all European countries.
- There are **five main European funds** discussed and agreed at the European Parliament and managed by national authorities: the **Cohesion Fund**, the **European Agricultural Fund for Rural Development**, the **European Maritime and Fisheries Fund**, the **Regional Development Fund,** and the **European Social Fund**.
- These funds support many important European policy areas, such as the **area of Research and Innovation**, which is employed to attain growth, job creation and sustainability of the planet.
- **Other Funds are managed directly by the European Commission,** such as Horizon Europe, the Erasmus Plus and others, that also support the area of Research and Innovation. These are attributed to beneficiaries competitively, using a **Call for Proposals**.

The main features of the European funds managed directly by the EU are detailed on the front page of the Funding and Tenders Portal of the European Commission. Examples include the **ERASMUS Plus Programme (EPLUS), Programme for the Environment and Climate Action**

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(LIFE), **Creative Europe (CREA)** and the EU programme by excellence dedicated to funding research activities, the **Horizon 2020** Framework Programme (H2020) which ran from 2014 to 2020.

Horizon 2020 (2014-2020) and its successor, Horizon Europe (2021-2027)

The European Commission's proposal for Horizon Europe is an ambitious Research and Innovation programme following Horizon 2020's footsteps.

Figure 16 - Horizon Europe (2021-2027)
(source: Video available at https://www.youtube.com/watch?v=g8BQNnX6_kY)

- Watch this short video to find out more about Horizon Europe (2021-2027) and its predecessor Horizon 2020 (2014-2020): Horizon Europe - the next R&I programme

Highlights from the video:

*The **Horizon Europe** programme will be based on **three complementary and interconnected pillars**. The first pillar (**Excellent science**) will support excellent basic science. It will strengthen the Union's scientific leadership and develop **high-quality knowledge and skills**.*

*The second pillar (**Global challenges and European industrial competitiveness**) will support research which addresses **societal challenges and industrial technologies** in areas such as health, security, digital and key enabling technologies, climate, energy, mobility, food, and natural resources. Alongside these areas, a limited number of **research missions and***

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partnerships *will be introduced. Any given mission will contain a portfolio of research activities.*

*The third pillar (**Innovative Europe**) will focus on scaling up **breakthrough and disruptive innovation** by establishing the **European Innovation Council**. The latter will offer a one-stop-shop for high-potential innovators.*

*In addition to these three pillars, there are provisions to improve the programme's delivery for **widening participation and strengthening the European Research Area**. These include measures to support member states in making the most of their national research and innovation potential. The regulation specifies the member states which will benefit from the actions aimed at widening participation.*

The Horizon Europe structure of funding programmes is illustrated below along with that of its predecessor, Horizon 2020.

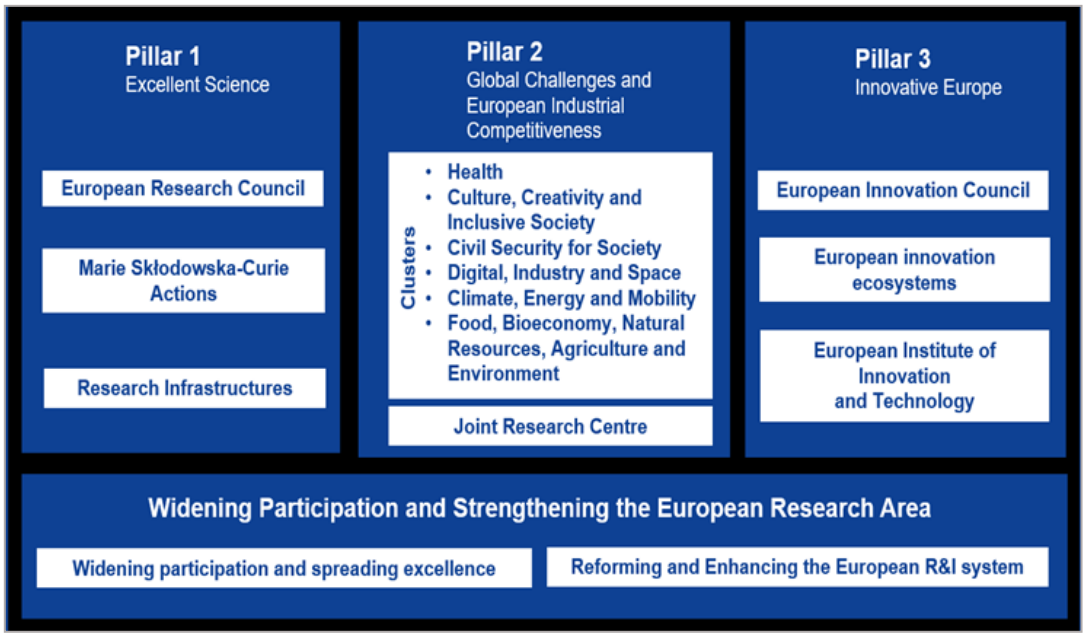

Figure 17 - Horizon Europe's main structure (source: https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_he-orientations-towards-strategic-plan_102019.pdf)

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Figure 18 - Horizon 2020's main structure
Horizon 2020's main structure
(source: https://secmotic.com/h2020-more-than-a-funding-program/#gref)

Insights into specific funding programmes

Marie Skłodowska-Curie

support actions from researchers at all stages of their careers, regardless of age and nationality. Researchers working across all disciplines are eligible for funding. The MSCA also supports cooperation between industry and academia and innovative training to enhance employability and career development."

- More at https://ec.europa.eu/research/mariecurieactions/node_en

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European Research Council

*encourages the highest quality research in Europe through competitive funding and to support **investigator-driven frontier research across all fields**, based on scientific excellence [...] Being 'investigator-driven', or 'bottom-up', in nature, the ERC approach allows researchers to identify new opportunities and directions in any field of research, rather than being led by priorities set by politicians [...] ERC grants are awarded through open competition to projects headed by starting and established researchers, irrespective of their origins, who are working or moving to work in Europe. The sole criterion for selection is **scientific excellence**. The aim here is to recognise the best ideas and confer status and visibility on the best brains in Europe, while also attracting talent from abroad.*

- More at https://erc.europa.eu/

Spreading Excellence and Widening Participation programme (Horizon 2020)

*addresses **widening actions** to tackle the low participation rates of certain countries in European projects by fully exploiting the potential of Europe's talent pool. It ensures that the benefits of an innovation-led economy are both **maximised and widely distributed across the European Union**. Synergies with European Structural and Investment funds are an important component [...] The interim evaluation of FP7 (November 2010) identified that some Member States, mainly those that joined the EU after 2004, had low participation rates in FP7 projects. Widening consists of three main actions: **Teaming**, **Twinning** and **ERA Chairs**, for which **specific eligibility conditions** apply. This ensures a targeted approach towards Widening Member States and Associated Countries. The Member States currently eligible for Widening support are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, and Slovenia.*

- More at https://ec.europa.eu/programmes/horizon2020/en/h2020-section/spreading-excellence-and-widening-participation

Keywords in European funding

1. Can you distinguish a Call from a Tender?

A **tender** usually refers to the process whereby governments and financial institutions **invite bids for large projects that must be submitted within a finite deadline**. Thus, in a tender, the project is predefined, and the organizations that have the greatest capacity to carry out the project for the best price will win.

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A **funding proposal** is a request for money to complete **a project that is proposed in response to a specific Call for proposals** open by a funding agency or donor organization. Such projects are usually humanitarian or community oriented. The call for proposals defines the area and the conditions necessary to apply but does not predefine the details of the project. A well-formulated proposal will tell a potential funder every necessary detail and strength of the proposed project.

2. Do you know what type of activities will be funded in an Innovation Action, a Research and Innovation Action and a Coordination and Supporting Action?

Research & innovation actions (RIA) - Type of action under the H2020 Programme that funds **activities aiming to establish new knowledge and/or explore the feasibility of new or improved technologies, products, processes, services, or solutions**. This includes basic and applied research, technology development and integration, testing and validation on small-scale prototypes in a laboratory or simulated environment, and closely connected but limited demonstrations or pilot activities aiming to prove technical feasibility in a near-to-operational environment.

Innovation Action (IA) - Type of action under the H2020 Programme that funds **activities aimed at producing plans, arrangements or designs for new, altered, or improved products, processes, or services**, including prototyping, testing, demonstrating, piloting, large-scale product validation, and market replication.

Coordination and support actions (CSA) - Type of action under the H2020 Programme that funds projects consisting mainly of **accompanying measures or complementary activities**, such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogue, mutual learning exercises, studies, networking, and coordination between programmes in different countries.

3. What is a single-stage deadline model versus a two-stage deadline model?

Calls for applications can have **one submission stage**, that is, applicants apply one with a full proposal, or be divided into **two submission stages**. On the first deadline, the applicants often submit a reduced version of the project and, if they are selected for the second round, they present the full proposal before the second deadline for submission.

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4. When is a project mono-beneficiary versus multi-beneficiary?

Mono-beneficiary actions - Actions that fund projects with **one beneficiary only**. Potential beneficiaries include many types of organizations, such as **Research Performing Organisations.**

Research Performing Organisations (RPOs) - Research is performed at institutions that hire researchers and other staff while providing conditions for t research to be carried out, such as the necessary scientific infrastructure, facilities, platforms, equipment, and services to support research. Research-performing organizations can be of many types. In addition to universities, research institutes and R&D companies, research is performed at other types of institutions (namely NGOs, hospitals, patient associations, regional authorities, public administration entities, museums, etc.).

Multi-beneficiary actions - Actions that fund projects backed by a **group of beneficiaries** (normally from different EU and associated countries). In this context, the group of beneficiaries (including organizations and individuals) is known as a **Consortium**.

5. What categories of countries exist within the European framework programmes?

Member states (MS) - EU member countries have signed the treaties of the European Union and are therefore subject to the privileges and obligations of EU membership.

Associated Country (AC) – A non-EU country that has entered into a specific agreement (*association agreement*) with the EU, to participate in a specific EU fund/funding programme. A country that does not have an association agreement cannot normally participate, even if it has some type of formal relationship with the EU (EEA member, EU accession country, a neighbouring country, etc.) – unless the basic act specifically provides for it (with or without funding; e.g. for the H2020 programme, the work programme may list countries that are automatically eligible for participation and funding).

Third country - Depending on the context, this term refers either to a country that is not an EU member state or to a country that is neither an EU Member State nor an associated country.

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6. What is a Widening country? And a high-performing, research-intensive country?

The **Composite indicator of Research Excellence** (with a corrective threshold of 70% of the EU average) has been selected to distinguish those countries identified as ***low R&I performing*** or ***Widening*** countries. Among these are the following Member States: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, and Slovenia. Associated Countries (subject to valid association agreements of third countries with Horizon 2020) include Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, North Macedonia, Georgia, Moldova, Montenegro, Serbia, Tunisia, Turkey, and Ukraine.

- The detailed scores of the composite indicator can be found on p. 5 (Excellence in S&T 2010) of the *Research and Innovation Performance in the EU Member States and Associated Countries 2013* at http://ec.europa.eu/research/innovation-union/pdf/state-of-theunion/2012/innovation_union_progress_at_country_level_2013.pdf

7. What are the Missions?

Partly inspired by the Apollo 11 mission to put a man on the moon, the **European Research and Innovation missions aim to deliver solutions to some of the greatest challenges facing our planet**. The Missions are an integral part of the Horizon Europe framework programme begun in 2021. Each mission is a **mandate to solve a pressing challenge in society** within a certain timeframe and budget.

- This short video explains the Mission concept: https://youtu.be/KlvjfPgwDKg

The role of RMAs in the Call for Proposals

Funding agencies regularly open calls for funding. A **call for proposals is a public competition for funding within a funding programme**. Often, these focus on specific R&I topics or groups of topics.

At the opening of the call, a group of **guiding documents** is generally made available to specify the set of rules applicable to the call and to define aspects such as: eligibility of applicants and institutions, maximum budget, indicated length for the project, eligibility of partners, eligibility of proposed activities, etc.

Typical guiding documents include:

- the Call's text*
- the work programmes

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- the guide for applicants
- the guide for evaluators
- ethical guidelines

- *The Call text for a European programme, typically from Horizon 2020, follows a **uniform format,** regardless of the context:

1) Heading containing basic information such as the name of the programme, name of the Call, type of action, date of publication and deadline.
2) Specific challenge.
3) Scope.
4) Information on the amount of funding available and the expected duration of the project.
5) Expected Impact.

RMA roles

Several professionals in Research Management intervene in various moments of the funding proposal elaboration, submission, and implementation. Starting from the drawing of a Call and the preparation and submission of a project proposal to the implementation of the research project. Some of these professionals work for funding agencies or government bodies, while others work directly with the research teams who will be carrying out the approved projects.

Figure 19 -RMA roles related to research funding

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Lesson 3: Funding proposals and evaluation criteria

Learning outcomes:

LO#3 - The student can understand and contextualize European research funding frameworks and main European funding programmes and schemes to support research and innovation activities (e.g., Horizon Europe) and to identify synergies between funding schemes.

LO#5 - The student is familiar with the general process and principles of evaluation and assessment criteria of research proposals: what funding agencies prefer, what they dislike, vocabulary required, how to interpret what is required in a specific call, aspects meaning advantage in the context of EU funded calls

LO#8 - The student can recognize the main components of a funding proposal and link them to the evaluation criteria of a given call for funding.

LO#11 - The student can explain the pre-award work and how it fits into the research cycle.

LO#18 -The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 -The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 -The student takes responsibility for his/her work.

Introduction - What does a European funding proposal look like?

A **funding proposal** is often the result of months of preparation to gather the right team and formulate a project that meets the demands of a specific **call for proposals** and has funding potential.

When you prepare a funding proposal, your paramount goal is to be funded! However, this is not always the case, as the whole process is very competitive. Indeed, the **success rates** of most funding programmes fall below 20%, meaning that, at best 20, proposals out of 100 submitted will receive funding. To a certain extent, applying for funding by **submitting a grant** (or funding proposal) is like playing a game: you play according to the rules, which imply designing a project that meets the **evaluation criteria** at its best and accepting that only the

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best proposal(s) submitted in the same round of competition win(s). Sometimes luck also plays a role. When several high-quality proposals are submitted but there aren't enough funds available to finance all of them, then luck may be a bonus - but only if your proposal is already excellent and very well written!

There are different types of funding proposals. Those presented by a single organization are known as **single-beneficiary proposals**. These include **individual fellowships** (to apply for a **fellowship)**, **travel grants** or **project proposals** meant to be carried out by a **single team of researchers at a single institution**.

Often European proposals require that multiple organizations, located in different countries, take part in the same project. These organizations form a **consortium,** in which one beneficiary is the **project coordinator** and the others are the **consortium partners**. Proposals involving consortia require substantial time for **networking activities**. In the pre-submission stages, a great deal of time is invested in contacting potential partners and negotiating their participation in the proposal and, subsequently, if the project is approved for funding, a lot of networking activities are required.

Pre-award RMAs can play a very important role in assuring that high-quality proposals are submitted by **addressing the evaluation criteria** and complying with the admission's conditions for the given call. It goes without saying that the applicants should be experts on the topic of the Call for Proposals and should contribute to the scientific/technical sections of the proposal. However, proposals require applicants to provide much more information than just the technical and scientific details of the proposed project. RMAs can specialise in **supporting applicants with the non-scientific parts of the proposal**. This kind of input is valuable as it can actively contribute to the proposal's probability of success!

European funding proposals

A complete proposal must contain a lot of information to be selected for funding, as it needs to meet compliance requirements and address all evaluation criteria. What does a European proposal look like?

Most **Horizon 2020/Horizon Europe** proposals share the same structure and are organized according to three selection criteria: **Excellence**, **Impact,** and **Implementation**. These criteria are defined and detailed to correspond to the challenge of each call for proposals; thus, the evaluation criteria are specific for each call.

Generally, the proposal is divided into two components: **Part A** contains the **administrative details** of the proposal and its partners while **Part B** contains the **technical description** of the proposed actions (Annex 1 to the Grant Agreement (Description of the Action:

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https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/gap/doa/h2020-doa-ria-ia-csa_en.pdf).

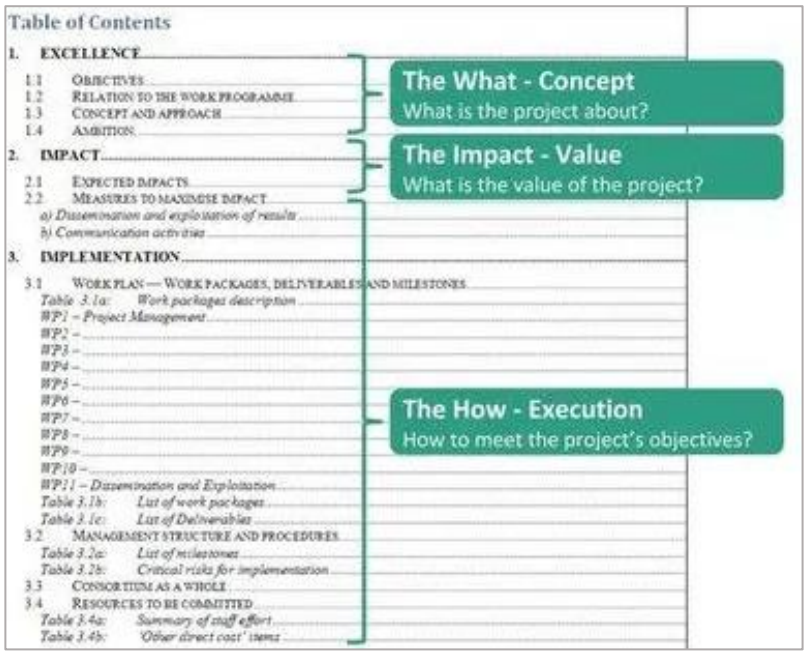
Part A contains:

- General information on the proposal (including an **Abstract**)
- Declarations
- Administrative data of all partners
- Budget
- Ethics (and Security) issues
- The Call's specific questions/challenges (if any)

Part B is divided into two parts containing, respectively:

- **sections 1, 2 and 3** and
- **sections 4 and 5.**

The first three sections are the core of the proposal, describing the action, and are structured according to the selection criteria.



These three key sections are:

Section 1 - Excellence

Section 2 - Impact

Section 3 - Implementation

The remaining sections are:

Section 4 - Members of the consortium

Section 5 - Ethics and security.

Figure 106 - Table of contents for Part B
(source: https://enspire.science/horizon-2020-proposal-template-guide-understanding-the-inner-logic-and-structure/)

Section 1 - Excellence

This section calls for the use of non-specialist language to explain the need for the project. Jargon should be avoided. Several aspects will be assessed here, including the novelty, the relevance, the timing of the proposed idea and the challenge that the approach represents.

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Figures, research data and statistics can (and should) be used to support the ideas and the approach described in this section.

Generally, section 1 is divided into the following headings:

- **1.1 Objectives**
- **1.2 Relation to the work programme**
- **1.3 Concept and methodology**
- **1.4 Ambition**

Section 2 - Impact

This section describes the sum of the influences and effects that the project is expected to have on all its potential target groups (**stakeholders**) and the impact anticipated on the project's field of action.

Generally, Section 2 is divided into the following headings:

- **2.1 Expected impacts**, including those listed in the Work Programme topic, but also the barriers and framework conditions involved in the maximization of impact.

- **2.2 Measures to maximise impact** requires a detailed description of three key measures:
  - **Communication** = How project impacts will be shared with society.
  - **Dissemination** = How project results will be shared with others.
  - **Exploitation** = How project results will be used and passed on.

Section 3 - Implementation

This section deals with the actual roadmap and work plan of the proposal, which must detail project objectives very clearly.

Generally, Section 3 is divided into the following headings:

- **3.1 Work plan**

The overall proposed work plan is generally divided into **Work Packages**, which represent the given set of tasks to be performed to address each of the project's **goals**. Each Work Package is expected to produce and yield several **Deliverables**.

Deliverables are **multi-format project outputs** (*e.g., documents, reports, technical diagrams, brochures, lists, literature reviews, software milestones or other building blocks of the project*) that must be produced at a given moment during the project's timeline.

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The work plan and the deliverables should all be organized in a **Gantt Chart** or via a details project timeline.

- **3.2 Management structure, milestones, and procedures**

The **Management Structure** describes the governing bodies of the project and outlines the decision-making rules and the details of the frequency of project meetings and internal communication moments among partners of the consortium. This activity is only relevant for large projects involving several organizations.

Relevant milestones should also be defined. Milestones are steps in the project that help assess the **project's progress**. They may correspond to moments when a key deliverable is issued, for example.

- **3.3 Consortium as a whole** describes the composition of the consortium's team/partners, emphasizing the added value of performing the project together.
- **3.4 Resources to be committed** details the budget needed to carry out the project.

Section 4 - Members of the consortium

This section describes each consortium partner. It includes a brief description of the institution and the individuals contributing to the project. Generally, this section does not have a page limit.

Section 5 - Ethics and Security identifies

This section includes all ethical and security issues raised by the project and should explain how they will be addressed. Generally, this section does not have a page limit.

Common elements in funding proposals

What has been described up to now is a **common structure of a European proposal**. Other funding agencies, national or international, utilise other types of structures, which might also be simpler. In any case, there are common elements in all proposal formats, and being familiar with one type of funding proposal will make it easier to identify similarities and differences in other types of proposals. Some contents are required in any type of proposal.

A typical proposal structure usually includes:

- Title.
- Summary or abstract.

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- State-of-the-art, describing the need for the project, similar studies, preliminary results, expected impacts and ambition.
- Main question and work objectives.
- Workplan, including methodology, timeline, deliverables, milestones, budget, description of team/institutions, management aspects, risk analysis and contingency plans, security, and ethics.

Learning and using the appropriate terminology

The European funding documentation is full of **specific vocabulary and terminology**. Some terms **describe the underlying policies** that shape a given call. Examples include terms such as *Circular Economy*, *Green Deal*, *Cross-Cutting issues*, *Frontier Research*, *Open Science*, *Responsible Research and Innovation*, etc. In grants, it is important to understand what the funders' terminology means and to use and **'recycle' the funders' wording** in the project proposal to help evaluators easily match the information required by the evaluation criteria to the actual contents of the proposal.

Other 'European' terms used are linked to the **vocabulary coming from European funding** itself, such as the *call for proposal*, *deadline*, *redress procedure*, *coordination and support action*, etc. Some of this vocabulary is introduced in this module, but there are plenty of words to master and this takes time and might be discouraging when one is attempting to assemble a funding proposal for the first time. Also, when one applies to other funding agencies, terms describing the same actions may be completely different. For example, in the American NIH vocabulary, a *call for proposals* is an *announcement* and the deadline is known as the *due date* (https://grants.nih.gov/grants/grants_process.htm).

Writing to persuade

The **writing style** of a grant is also very important and can be an influencing factor in the successful obtainment of funds. When writing about research, it is important to explain complex concepts in simple ways. Thus, one should choose an **effective and understandable writing style** using simple phrase structures, common words, and short sentences and paragraphs.

The aim of writing a grant is primarily to get funds, thus the grant's text needs to be convincing. A **persuasive writing** style is always an asset. This means using subtle techniques to make your text stand out from the others. Often advertising like and marketing tones can be inspiring.

Persuasive writing tips include:

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- choosing active present and future tense verbal forms over passive voices to show action;
- using *I* or *we* when indicating the main candidate or his/her team to 'own' the performance in the project;
- repeating key concepts throughout the text;
- highlighting the proposal's benefits early on;
- making the proposal visually attractive by using simple infographics;
- breaking the text up into clear headings;
- using short paragraphs;
- avoiding overuse of font-weight tools such as **bold** or *underline*.

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Lesson 4: Preparation of a project proposal

Learning outcomes:

LO#6 - The student is familiar with the general process and principles of evaluation and assessment criteria of research proposals: what funding agencies prefer, what they dislike, vocabulary required, how to interpret what is required in a specific call, aspects meaning advantage in the context of EU funded calls

LO#7 - The student can analyse a given European call for funding from the perspective of its underlying policy (need for the call) and proposal (goals, activities, expected outcomes and impact).

LO#15 - With the help of the teacher, the student can draft a simple budget for a proposal, according to the activities planned for the different project phases and milestones.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

Simulating a project proposal

Students will continue their project (started in Module 1) and further detail and plan its implementation. *The sections described in the lesson are particularly targeted to Project type 1 but can be easily adapted to match the other types of projects.*

Planning the project

Students will divide their work plan into coherent work packages, deliverables, and milestones and include an appropriate and realistic timetable to carry out their project. This can be done in groups or individually.

First, the goal and expected impact of the proposed research should be established. It is important to describe the **state-of-the-art** by briefly detailing the '**big idea**' driving the project and which previous data (published or unpublished) led to propose it. References to how the

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project could significantly add value to the field. It is extremely important that the **need** for the project is clearly described, and that it is **timely**.

A short statement about the **specific hypothesis** or the particular **goals** set out to be reached by the project, able to directly support or refute the 'big idea', should be included.

This cannot be separated from thinking about the **expected impact** of the project. What results are envisioned and what **change** will they produce? Which wider impacts do you anticipate your project will have?

Another very important aspect of project planning is **team building:** which team is required to be able to achieve the project's goals? This aspect will be addressed below.

Having clearly defined the goals and expected impact of the project, one can start planning the concrete activities and place them in a coherent and comprehensive **project work plan**. The activities to be performed must fit within the project's duration period and directly address the stated hypothesis/objective.

2. Partnership building

A crucial aspect of the success of any proposal is to ensure that the *best possible team* is available. In a research project, the ***best possible team*** is not only the team with the necessary technical know-how to implement the planned actions, but also the team with access to equipment, facilities or services needed. In other types of projects, the *best possible team* may be the team who has the richest network of contacts or has access to a wide range of people, institutions, services, etc. Also, a winning team must be suited communication-wise, to ensure that the project results have maximum visibility and accomplish their expected impact.

Many European calls for proposals demand the establishment of **international teams**, especially those requiring partners from at least three Member States. The reason behind the formation of such large international teams is to generate added value from the transnational character and bring this asset to impact at the European or global level. As these proposals are highly demanding in terms of impact, they consider a wide list of actors directly or indirectly participating in the action. Many stakeholders can take part, including companies, universities, research centres, NGOs (such as consumer associations, patient associations or others), public authorities, hospitals, policymakers, etc.

The challenge for the student is to identify the 'right' partner for his/her proposal. What type of expertise is necessary to accomplish the project? What type of people or institutions are needed? What for? Is there a good complementarity of expertise? Is there a geographical balance of partners? Which partners are core to the development of the activities proposed and should therefore be part of the consortium? Which ones should be involved in achieving

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the impact of the project (target audiences for communication, dissemination, and exploitation activities)? The project might require you to build the ideal consortium to deliver the project successfully.

With a clear idea of how the project could be implemented (work plan), which partners it requires (team building), and what types of funding are available, the challenge could be to **look for a suitable funding agency, programme or call to submit the student's research project proposal.** This could be a take-home task performed outside class time. It could entail 1) Screening work programmes 2) Shortlisting and prioritising topics, and 3.) Checking deadlines 4) Trying to estimate chances of success.

3. Budget preparation

The student will **draft a simple budget** for a proposal, according to the activities planned for the different project phases and milestones.

Suggestion: for the research proposal, set up a budget of maximum of 200,000 Euros for one year to be spent at a single host institution and not requiring co-funding. No subcontracting will be necessary.

Use the template below.

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INSTITUTION 1			
Direct Personnel costs			
Other direct costs			
Of which Subcontracting			
Indirect costs			
Total			
RTD activities			
Personnel costs	**Unitary Cost**	**Person-month**	**Cost**
Ph.D contracts			
Post-Doc contracts			
Other research contracts/fellowships			
Staff contracts			
Others:			
Total			
Equipment			
0			
0			
0			
Total			
Consumables			
0			
0			
0			
0			
0			
0			
Total			
Other specific costs			
Conferences			
Meetings			
Dissemination			
Publication costs			
Subcontracting			
Audit certificate			
Others:			
Total			
Total direct costs			

Figure 117 - Example of a budget template

In setting up a budget the following aspects should be considered:

- Generally, a research proposal requires people (called **human resources)** to perform the tasks set up. This must be accounted for in the budget. If the person designed to perform the tasks already works at a given institution involved in the project, it is common to estimate the time he/she will dedicate to the project as a **percentage of their work time** during the project's duration and calculate what this time represents in terms of salary cost. Sometimes projects require the specific **recruitment of new**

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people to perform the tasks, thus the budget should contain the full cost of the salary of newly hired people.

- Common research costs can be of many different types. These include Open Access publication costs, the purchasing of consumables, materials, services, software licenses, costs for preparing and submitting patents, costs of travelling and accommodation to attend conferences and events, expenses tied to collaborating with international partners, costs for field expeditions to collect data, etc.

- Some types of research often require the purchasing of specific equipment. The cost of this equipment can be included in the project costs, but only if it is used by the project's team within the project's duration (and not beyond). In accounting standards, a given piece of equipment has a prefixed lifetime. Hence, if the project is shorter than the equipment's expected lifetime, it is only possible to include part of the equipment's full cost as a project cost.

- Depending on the nature of the activities planned, projects may have all sorts of costs.

- All costs mentioned above are **Direct Costs** because they directly contribute to the implementation of the project.

- However, all projects also entail **Indirect Costs**, meaning costs that are linked to the maintenance of research facilities and services within the institutions performing the tasks but that are not directly linked to the project. They are also called **Overhead Costs**. It is no secret that many research institutions rely on overheads for their normal functioning.

- In some specific calls, the funder will only support part of the project costs. In these cases, there is a **co-funding rate**, meaning that the project must be supported partially by the own funds of the host institution. If the co-funding rate is 40%, the project will have to be co-funded by the host institution for 40% of its overall costs, while the remaining 60% will be financed by the funding body.

- **Subcontracting** is when a significant part of the activities planned in a project is performed by a third party who does not belong to the consortium. Subcontracting costs can be included in the budget, but they are not considered in the calculation of overhead costs.

- Also, if the proposal involves a team of different host institutions (**consortium**), the budget, if approved, will have to be distributed between the partner host institutions so that each one can carry out the tasks as planned.

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During the proposal phase, it is important to establish a **realistic budget** that complies with international, national, and institutional rules. An accurate budget estimation will make it easier to spend according to the project plan and will mitigate problems during the implementation plan.

Reflect on **what could be a 'bad' budget**. What problems may arise? Which current pitfalls are most prevalent? From the diversity of potentially problematic situations identified, the role a **pre-award RMA** may have in avoiding potential problems by providing the necessary support during the phase of budget preparation will become clear. Sometimes, certain institutions set up a process of **Budget Validation** carried out by pre-award RMAs or administrative services to prevent the submission of proposals with 'bad budgets'.

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Lesson 5: Institutional proposals, research strategy and governance

Learning outcomes:

LO#5 - The student can differentiate external from internal drivers of research policy.

LO#8 - The student can recognize the main components of a funding proposal and link them to the evaluation criteria of a given call for funding.

LO#10 - The student can explain the main governance structure of a given research institution.

LO#12 - The student can distinguish and discuss at which stage of policy and strategy development intervene pre-award and research policy/strategy-related professions.

LO#16 - The learner interiorizes and commits to the values and the mission of the institution.

LO#17 - The student demonstrates curiosity and interest in systemic approaches and the organization of the research ecosystem.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

This lesson explores the framework for the institutional funding proposals that **research-performing institutions** must prepare to retrieve funds for the development of their funding and impact strategies and/or to finance their assessment of research productivity and enhance the ranking of their institution. To prepare this type of funding proposal one requires extensive knowledge about institutional research organizations, a clear idea of the existing infrastructure supporting research, and awareness of how the work carried out at research-performing institutions is assessed and funded.

Thus, this lesson focuses on the **governance of the research ecosystem.**

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What type of research-performing institutions can the student identify?

This question could be used to guide students in searching for and mapping the scientific institutional ecosystem, based both on pre-existing knowledge and on information retrieved online.

Examples of **Research Performing Organizations (RPOs)** include:

- research universities,
- research centres (public and private),
- national governmental bodies/public administration,
- Research Councils (e.g., UK Medical Research Council),
- European governmental bodies/public administration (e.g. DG Research Joint Research Centre or the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA),
- research laboratories (e.g., USA Health & Human Services Laboratories),
- scientific societies (e.g. - Max Planck Society),
- R&I companies and SMEs,
- innovation centres,
- technology centres,
- NGOs

In many countries, the public research system is divided into several different institutions. Thus, national contexts can provide a good starting point to perform this mapping. In Portugal, for example, there are Research Units, Associate Labs, Collaborative Labs, State Labs, etc., each having its own specific institutional funding programme.

Research-performing institutions need funding to function correctly and to provide good conditions for research and innovation to flourish. There are many very different ways in which research-performing institutions can be funded. Some institutions receive non-competitive core funds, which, for public institutions, is generally coming directly from the national state's budget.

Other institutions rely heavily on open competition, to be awarded what is known as an **institutional research project**. To obtain this type of funding a grant proposal must be prepared, submitted, and approved for funding.

In addition, there are international funding programmes (e. g. European) devoted to institutional capacity building that can partially fund the operation of a research-performing

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institution. However, most RPOs generally rely substantially on national assessments and evaluation schemes for their funding.

Independently from the source of the funding (competitive or non-competitive), any fund distribution to research-performing institutions should be based on a system to assess the quality of research performed at a given institution.

Why do we need to evaluate Research Performing Organizations?

1. To advocate: to demonstrate the benefits of supporting research, enhance understanding of research and its processes among policymakers and the public, and make the case for policy and practice change;

2. For accountability: to show that money and other resources have been used efficiently and effectively, and to account for researchers' work;

3. To analyse: to understand how and why research is effective and how it can be better supported, feeding into research strategy and decision-making by providing a stronger evidence base;

4. To better allocate funds: to determine where it is preferable to allocate funds in the future, making the best use possible of a limited funding pot.

What indicators are used to evaluate the performance of an RPO?

Multiple **performance indicators** are relevant when assessing the quality of a Research Performing Organization, namely (but not limited to):

- **Publications**: number, impact, citations. Some references for **institutional bibliometric indicators** are:
  - **Scimago indicators** (https://www.scimagoir.com/methodology.php): Output, % International Collaboration, Normalized impact, % Q1, Specialization Index, % Excellence Rate, % Scientific Leadership, % Excellence with Scientific Leadership.
  - **Publications databases** that can provide bibliometric indicators: ISIWoS, Scopus, Scielo, Latinger, Google Scholar Individual publication profiles with bibliometric indicators: Researcher ID (Thomson Reuters), ORCID ID (open)
- **Open science practices**
- **Projects**
- **Funding sources**: private or public

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- **Staff:** number, qualifications, expertise
- **Subjects (diversity)**
- **Facilities and equipment available**

Figure 128- Research at Exeter short video
An example of performance indicators for an RPO
(source: https://www.youtube.com/watch?v=6JyK-48F_3I)

RPOs' research assessment

There is wide diversity in quality assessment systems applied to research-performing institutions across Europe. Any assessment system has a reason to exist due to the competition scenario in place. Given that resources are scarce, research-performing institutions compete to be able to:

- attract the **best talents** (researchers, students, RMAs), and
- offer the **best conditions** (infrastructure, equipment, services, environment) to be able to produce relevant discoveries, with the **greatest impact** on science, society, or the economy.

Hence, it is safe to say that external drivers, such as the **funding pressure competition**, are guiding the strategy of research-performing institutions. However, internal drivers, such as those making an institution competitive in its specific field of action. also, play a major role in an RPO's performance strategy.

Among the methodologies that can be used to assess the performance of an RPO are:

- **bibliometrics**: a range of techniques for assessing quantity, dissemination and content of publications and patents;

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- **case studies**: can provide the full context around a piece of research, a researcher, or their impact
- **peer review**: a review of research outputs by peers, typically other academics from the same or a similar field,
- **site visits**: on-site visit of an evaluating committee to a given department or institution;
- **document review**: a review of existing documentation and reports on a research topic.

According to the mixed methods approach, different models of assessment can be differentiated. Some of the most recognized **assessment frameworks** are:

- Performance-based research funding systems - multiple realities within Europe
- Research Excellence Framework (REF), in the UK
- STAR METRICS, in the US
- Canadian Academy of Health Science (CAHS) Payback Framework
- Excellence in Research for Australia (ERA)
- Evaluation Agency for Research and Higher Education (AERES), in France

	REF	ERA	Productive Interactions	NIHR	CAHS	STAR METRICS
Bibliometrics	✓	✓		✓	✓	
Case studies	✓					
Interviews			✓			
Document review			✓			
Data mining			✓	✓		✓
Data visualisation						✓
Peer review	✓	✓				
Economic analysis					✓	✓
Surveys						
Logic models				✓	✓	
Site visits			✓			

Figure 19 - Methods used in different research assessment frameworks (source: https://doi.org/10.1057/palcomms.2017.78)

The institutional proposal

Research assessment evaluation exercises that determine how much funding an institution will secure for several years demand considerable efforts of time and resources in assembling an institutional proposal and in coordinating its submission.

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During the assembly of the institutional proposal, a concrete action plan for a given period must be set. Hence, a strategic action plan must be designed, discussed, and produced. RMAs can have key roles in supporting institutional evaluation exercises, which are often very demanding and represent crucial steps in the life of research-performing institutions.

RMAs can intervene in different ways and moments: from the preparatory phases of evidence collecting, providing the policy review and proposal planning to the building of the proposal and the support through all evaluation steps, which can involve site visits at the external expert evaluators. Also, RMAs working on pre-award can have a role in assembling institutional strategic proposals.

The KU LEUVEN presentation is an example of an RMA working on a policy that can help Leuven university to prepare better for Research assessment exercises.

The student can be asked to **brainstorm on the areas needing RMA support to put institutional proposals together and to support the full cycle of institutional assessment exercises** at research-performing organizations.

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Lesson 6: Conflict of interests between policy, funding, and research

Learning outcomes:

LO#13 - The student can discuss and formulate arguments and confront opinions in the context of real cases of scientific policies.

LO#14 - The student can effectively communicate, negotiate terms, and persuade different target audiences including policymakers for programme bodies, senior management of research institutions, research managers, and researchers.

LO#16 - The learner interiorizes and commits to the values and the mission of the institution.

LO#17 - The student demonstrates curiosity and interest in systemic approaches and the organization of the research ecosystem.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

This lesson is devoted to exploring the **conflict of interest between research policies, funding frameworks (policymakers) and research *per se* (researchers, individuals)**.

Articles for discussion

- *Grit Laudel, The art of getting funded: How scientists adapt to their funding conditions, Science and Public Policy, Volume 33, Issue 7, August 2006, Pages 489–504, https://doi.org/10.3152/147154306781778777*

- *Marc A. Edwards and Siddhartha Roy. Environmental Engineering Science. Jan 2017. Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition. DOI: 10.1089/ees.2016.0223*

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An abstract and a summary describing the methods, results, and conclusions of the articles, or simply a summary of the articles, are used.

The aim is to explore the role and perspectives of different stakeholders (policymakers, research funding agencies, RMAs) in interpreting the conclusions drawn in the articles to better understand the **role of the actors involved in research and innovation**.

Context

Both articles address the consequences of the **highly competitive environment of academic research**. LAUDEL's article focuses on the consequences of the **funding pressure**, while EDWARDS & ROY focus mainly on the pressure raised by research performance metrics. LAUDEL emphasises how changes in the funding research scenario may lead to changes in the behaviour of researchers and the shaping of academic values. EDWARDS & ROY argue that these changes tend to generate unethical behaviours and may result in scientific error or fraud.

Points to cover in the discussion:

- Which changes to funding have occurred in the last decades?
- Which other factors have changed in the last decades that seem to affect the way research is conducted?
- What are the micro-mechanisms by which researchers adapt to the current **pressures** coming from the research environment?
- Which **behaviours** related to the way researchers conduct their research have been observed?
- Which **ethical dilemmas** are raised in the articles?
- If you were a Researcher/Funding Agency/Policymaker/ RMA, which values would you stand for? Take into consideration the **values** of the citizen, the researcher and those of the institution.
- What course of action would you recommend for the future?

During this lesson, time can be allocated to **assess the students' progress** in the development of their project proposal tasks.

Bibliographic references

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- Laudel, G. (2006). The art of getting funded: how scientists adapt to their funding conditions. *Science and Public Policy*, *33*(7), 489–504. https://doi.org/10.3152/147154306781778777

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Lesson 7: Oral presentations

Learning outcomes:

LO#3 - The student can understand and contextualise European research funding frameworks and main European funding programmes and schemes to support research and innovation activities (e.g., Horizon Europe) and to identify synergies between funding schemes.

LO#6 - The student is familiar with the general process and principles of evaluation and assessment criteria of research proposals: what funding agencies prefer, what they dislike, vocabulary required, how to interpret what is required in a specific call, aspects meaning advantage in the context of EU funded calls.

LO#7 - The student can analyse a given European call for funding from the perspective of its underlying policy (need for the call) and proposal (goals, activities, expected outcomes and impact).

LO#8 - The student can recognize the main components of a funding proposal and link them to the evaluation criteria of a given call for funding.

LO#9 - The student can draft a funding plan (a) in line with the institutional strategy of the organisation (b) that addresses external and internal drivers of policy and strategy, and (c) adjusted with the specific evaluation and assessment criteria, preferences of research calls (of the funding organisations).

LO#13 - The student can discuss and formulate arguments and confront opinions in the context of real cases of scientific policies.

LO#14 - The student can effectively communicate, negotiate terms, and persuade different target audiences including policymakers for programme bodies, senior management of research institutions, research managers, and researchers.

LO#18 - The student can accept others' views and work together to provide the necessary support for the proposal's preparation.

LO#19 - The student is critical regarding his/her work and that of others taking on a constructive attitude.

LO#20 - The student takes responsibility for his/her work.

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Roleplay

In this lesson, the student (or group of students) will engage in role-playing. Students will represent the **Principal Investigator** of a research proposal (or the main proposer of other types of projects) to present his/her proposal to a given target entity (**stakeholder**) and convince them to join the project as a member of the team, as a partner of the consortium, as a funder/sponsor of the project, or to engage in any other pre-defined goal that is suitable for the specific project.

The presentation should explain the goals of the project in simple, clear, and engaging terms, stressing the features and benefits of the project but also explaining potential limitations.

Each presentation should last **5 minutes maximum**.

Students can use any presentation tools available (e.g., PowerPoint, videos, pools, etc.).

Stakeholders could be:

- Company working in the field of the project
- NGO working in the field of the project (e.g., consumers association, patient association)
- Public administration entity related to the field of the project
- Social Sciences & Humanities researcher
- Natural sciences researcher

The interests of each of these different stakeholders should be explained beforehand.

The student/group of students impersonating the stakeholder entity should also react to the oral presentation by posing questions or providing comments on the project presented.

The presentations will be **assessed according to a predefined criterion**, depending on the type of project the student is involved in.

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OPTION 1: Research project

Students act as researchers and use their research ideas to develop a research project proposal

Evaluation guidelines:

- Is the need for the project e clearly expressed?
- Is the main goal clear?
- Will the project's idea be impactful?
- Is the state-of-the-art broad enough to present the research area but also detailed enough to lead convincingly to the research question?
- Is the approach suitable?
- Is the work plan clear and sufficiently detailed?
- Is the team appropriate?
- Was the project overall clearly communicated?
- Did the student play the role of a researcher?
- Would you fund this project?
- Would you accept becoming part of this project team?

OPTION 2: Action project

Students act as research managers and use their ideas to plan a research management activity they would like to perform (for example, finding a group of suitable, area-specific, funding calls for researchers to apply to set up a system to regularly inform researchers about funding opportunities, analysing policy on open science, and proposing a strategy for action, etc.)

Evaluation guidelines:

- Is the need for the project expressed clearly?
- Is the main goal clear in addressing a research management activity?
- Will the project's idea be impactful?
- Is the approach suitable?
- Is the work plan clear and sufficiently detailed?
- Is the team appropriate?
- Was the project overall clearly communicated?
- Did the student play the role of an RMA?
- Would you provide this project with what it requests?
- Would you support this project?

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OPTION 3: Career project

Students act as potential applicants for RMA jobs and use their ideas to build a portfolio and present themselves to the job market

Evaluation guidelines:

- Is the need for the project expressed clearly?
- Is the main goal clear and addressing a potential entry into an RMA career?
- Will the project's idea be impactful for the candidate?
- Is the approach suitable?
- Is the work plan clear and sufficiently detailed?
- Is the team appropriate?
- Was the project overall clearly communicated?
- Did the student play the of an RMA-to-be?
- Would you employ this person as an RMA?

A group of students may evaluate each other's performance during the oral presentation. The performance of the Principal Investigator-Stakeholder pair should also be assessed.

During the exercise, the teacher will assess the relevance and appropriateness of the evaluators' performance.

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Module 3 - Project Integration and Management

Main goal: To apply management tools and methodologies, to get insights into professional roles linked to project management and as a team member, can effectively contribute to the implementation of a project, in different areas.

Lesson 1: Project Lifecycle & RMAs as Professionals in the Project lifecycle

Learning outcomes:

LO#1 - The student knows how to identify the activities in the light of the project objectives, outputs, main tasks, performance criteria and resource requirements set in the proposal.

LO#2 - The student will identify the RMA professional roles involved directly and indirectly in post-award project management

The Education and Research ecosystem has been in rapid evolution during the past two decades, critically influenced by 'demands of contemporary environments' such as (i) **globalisation** and **increased mobility**; (ii) **global financial crisis**; (iii) **technological advancement;** and (iv) **knowledge-based economy** (Chan et al, 2017). In response, education, and research institutions (ERI) have been implementing structural changes and **enhancing the professionalisation of their managing structures** (Whitchurch, 2008), aiming at better adapting to these new challenges in an increasingly complex research ecosystem.

Moreover, R&I needs not only excellent researchers but also **highly skilled professionals working in research administration, research management, knowledge transfer and exploitation, science communication, research governance and research policy**, in order to release the full potential of R&I at institutional, national, and international levels. Although these professionals do not perform direct research tasks, they support researchers in common working ecosystems. These professionals have a name: **Research Managers and Administrators (RMAs)**.

Research Managers and Administrators: diversity and definition

Collinson (2006) highlighted several common features between professionals working in research management in British Higher-Education Institutions (HEIs), such as i) the wide range of roles; ii) the cross-boundary interaction with academics, and iii) their 'occupational identity issues'. These thin boundaries between academics and non-academics and new identities within HEIs were also evidenced by Whitchurch (2008), who proposes the term ***third space***

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professionals to refer to individuals who perform managing roles, with a diversified background and a non-academic contract, and who undertake activities between the professional and academic spheres.

On a similar note, the second type of space is defined by Shelly (2010) as the ***shifting area,*** highlighting the shared space where research management crosses into the academic domain. Santiago et al. (2006) had previously defined the increasingly specialised role of these professionals as "*being able to define missions, objectives and strategies; having capacity to manage financial and human resources and to assume strong management leadership, in contrast to traditional academic styles of negotiation and consensus building*".

More recently, Agostinho et al. (2020) proposed the term ***Professionals at the Interface of Science*** **(PIoS)** as an **umbrella identity** that encompasses all these professional roles and profiles.

Despite the different terminology and conceptual framework proposed to define these professionals, all authors acknowledge that **Research Managers and Administrators operate at different levels/ stages of research development**:

- **upstream of research** - to attract/ advocate for/define a strategy for research funding projects and partnerships (with both academia and industry);
- **during the research** - to support the research activity itself (e.g., post-award management, technological platform management, ethical compliance management, intellectual property management);
- **downstream of research** - broadening the impact of research (e.g., outreach, science communication, facilitating the impact on understanding, learning & participation; creativity, culture, and society; social welfare; commerce & economy; public policy, law & services; health, wellbeing & animal welfare; production; the environment; practitioners & professional services).
- **transversal areas** - RMAs also develop their work in cross-cutting issues that are transversal to upstream and downstream phases of research, such as **responsible research and innovation**, **gender**, **ethics,** and several broader areas of researcher development.

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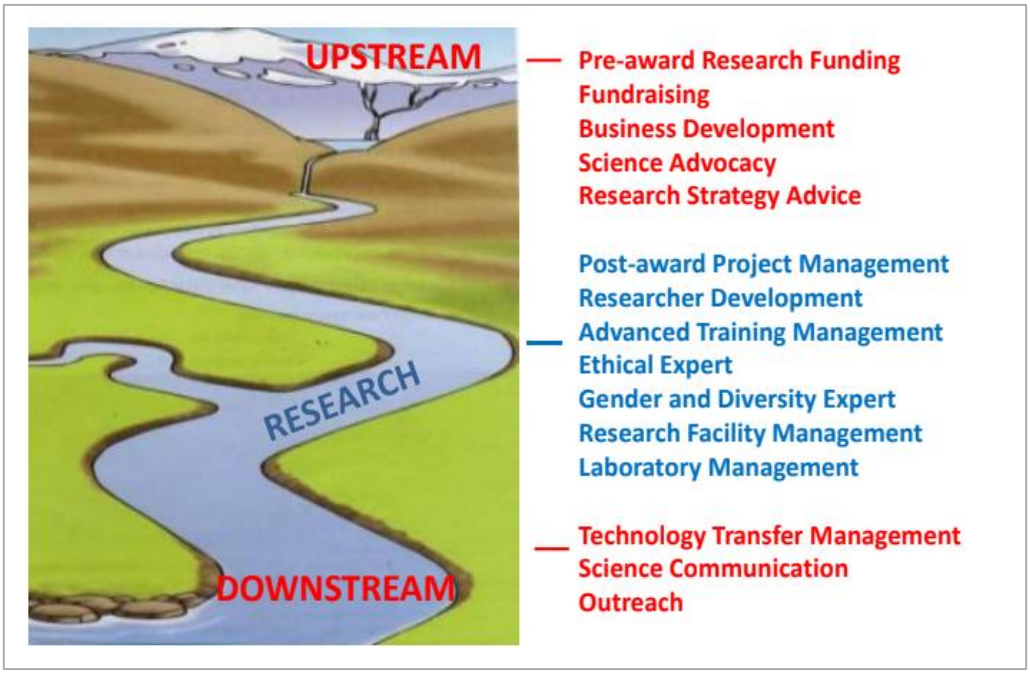

Figure 20 - Level of action where RMAs operate

This module focuses on the **project lifecycle** and on RMAs who perform project management tasks, often called **R&I project managers**.

Research & Innovation (R&I) project management

R&I projects are based on activities with a high level of complexity and interdependency and are normally time, resources, and money consuming. More frequently than not, there is a high risk and a level of uncertainty associated with these types of projects, so the management of R&I is of utmost relevance to the success of an R&I project (Mikulskiené, B. 2014; Dinsmore, P. & Cabanis-Brewin, J. 2011). Management processes allow us to deal with and control the activities of team members to successfully develop a project. An R&I manager's most relevant ability is that of being able to control the development and effectiveness of the R&I activities undertaken and to properly address uncertainties.

To understand what R&I management implies and how to employ its tools and techniques in the best way possible, we must know the meaning of R&I effectiveness (and how can we evaluate it) and consider which benefits can result from addressing R&I management. (Szakonyi, R. 1994; Mikulskiené, B. 2014).

Szakonyi (1994) identified **10 R&I activities** useful to measure **R&I effectiveness**.

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1. **Selecting R&I** – recognising and identifying R&I projects that best suit your organization's perspectives and specializations is paramount; without a **careful selection**, any concerns about project management are unnecessary.

2. **Planning and managing a project** – an R&I project need to have a quality and well-organized plan and a **suitable management** process in place; otherwise, the successful outcome of the project will be at risk.

3. **Generating new product ideas** - new product ideas, capable of having a **relevant impact on society** are important to present a strong project concept which is interesting for stakeholders.

4. **Maintaining the quality of R&I processes and methods** – in an R&I project, we must guarantee not only the reaching of the objectives proposed but also that these are met with quality. Assuring the quality of R&I processes and methods will allow us to work efficiently and produce **valuable outcomes**.

5. **Motivating technical people** – to ensure they bring their **expertise** into the project.

6. **Establishing cross-disciplinary teams** – even though this paper was written more than 20 years ago, it already stressed issues that are 'popular' nowadays. To have a project approved, the European Commission (EC) requires a project plan that addresses the strategic challenges of our society. To address these strategic challenges, which are often **complex and cutting through different fields**, cross-disciplinary teams play a fundamental role.

7. **Coordinating R&I and marketing** – on top of a good R&I project plan and the production of quality research results, a successful project must also include a plan outlining how the **knowledge developed** will be used and how society will benefit from it.

8. **Transferring technology to manufacturing** - when developing an innovation project with a high **Technology Readiness Level (TRL)**, even in academia, is important to anticipate how that technology can be transferred to society. As Dr Eugene Sweeney mentioned, during an Intellectual Property Webinar *Maximise the impact of your project*, promoted by the European IP Helpdesk on May 27th, 2020, *nowadays we need to present an Innovation Plan describing how we will **manage the assets** and elaborate a dissemination/exploitation plan*. The **impact of research** isn't a moment's trend but an important aspect to consider in European research projects. A **project-**

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specific dissemination and exploitation plan is often required and evaluated at the proposal stage.

9. **Fostering collaboration between R&I and finance** - the author only mentions the need to have good communication in place between the R&I staff and the department dealing with finances; but excellent communication should also occur with several **departments** inside the organisation, including the Human Resources department, Procurement department and Information Technology (IT) department.

10. **Linking R&I to business planning** - Mikulskiené (2014) states that *planning techniques help manage time and resources and assist the team with seeing the big picture; better understanding difficult tasks ahead and when they will happen; putting first things first by prioritising important tasks […]; minimising efforts on unfruitful side tracks; staying focused on the objectives; making better estimates of time and resource needs; improving communication among key personnel; seeing the need to look at alternative approaches or techniques; making better decisions when dealing with trade-offs between time, performance and resource constraints*.

Project Management: 10 knowledge areas

According to the **Project Management Institute (PMI),** the project management field is organized into **ten macro knowledge areas**, each involved in different moments of the research project lifecycle.

1. **Project Integration Management** - essentially refers to the integration and **coordination of all elements of the project**, namely project activities, resources, stakeholders, and any other project features. It is in this knowledge area that the responsibility to manage conflicts that may arise in the project development falls. Along with this, the competence to make trade-offs that allow the workings of several processes, developed by different teams and/or departments to work together in a coordinated way. The management of project integration is considered crucial to the success of an R&I project.
2. **Project Scope Management** - involves the characterisation of the product or result, namely its **functions and features**. Scope management should also include the activities which are instrumental to achieve the pre-defined functions and features of project results.
3. **Project Time Management** - involves six processes: 1) definition of the activities; 2) organisation of the execution sequence of the activities; 3) estimation

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of the activities' resources; 4) estimation of the activities' duration; 5) definition of an activities' execution schedule; 6) control and revision of the activities' execution schedule.

4. **Project Cost Management** - involves establishing the **project's budget**, ensuring that the funds available cover the extent of the project, and defining a monitoring system and relevant tools through which costs can be measured and managed.
5. **Project Quality Management** - involves the development of a plan detailing how quality assurance and control will be executed and how the achievement of **quality standards** will be monitored. Project quality plans should also detail what techniques or tools can be employed for **quality improvement**.
6. **Human Resources Project Management** - involves the establishment of a plan which identifies **roles and positions** needed for project development, including **training** requirements. It also entails a tracking system allowing for an evaluation of the **team's performance** and ensuring that activities are being executed as planned.
7. **Project Communications Management** - involves a communication plan detailing how and when communication takes place within the team, **among partners and with stakeholders**. A communication plan should also include a communication assessment strategy to ensure efficiency is frequently measured and adjusted when needed.
8. **Project Risk Management** - involves a plan defining how risks will be itemized, categorized, and prioritized. It should also establish **risk response strategies**, including who will be responsible for risk identification handling, and the regularity with which the risk register should be reviewed.
9. **Project Procurement Management** - involves a plan identifying the **acquisition of services and/or products** needed for the project's development, including how suppliers/contractors will engage in the project.
10. **Project Stakeholder Management -** involves listing the stakeholders, prioritizing their concerns, and identifying how they could impact the project. The control of the **stakeholders' engagement** should occur throughout the whole project, namely by constantly evaluating if their needs are being addressed and which adjustments are necessary to achieve their expectations.

The **project management areas** above are **vertical**, meaning that these ten areas coincide with the different project management process groups, whereas the **project management**

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process groups are **horizontally oriented** and will occur sequentially following the project life cycle.

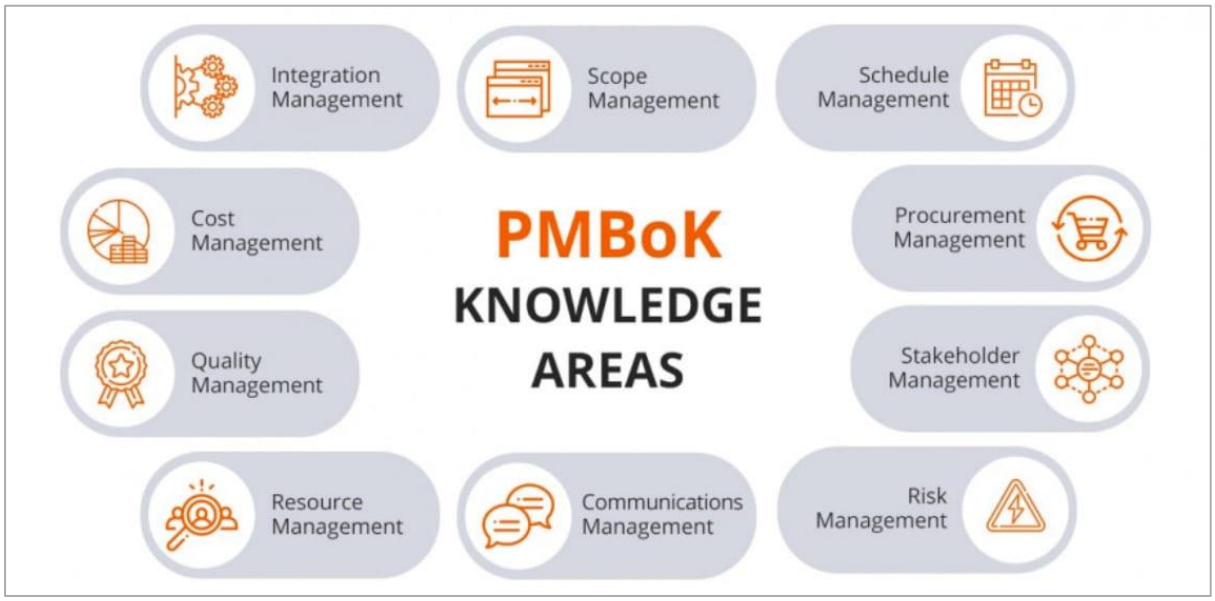

Figure 21 - PMBoK knowledge areas
(Source: https://www.businessprocessincubator.com/content/5-key-project-management-knowledge-areas-and-why-they-matter/)

Project Management and project life cycle

Project management accompanies a project through its lifecycle, and, in some cases, it might stretch beyond the closing of the project. Figure 22 illustrates a project lifecycle and its sequential stages (Kourounakis, N., & Maraslis, A., 2016):

1) project **initiation**;
2) project **planning**;
3) project **execution**;
4) project **monitoring and control**;
5) project **closing**.

Figure 132 - Project lifecycle and the main management tasks

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Project initiation

The first phase of an R&I project is the **project initiation phase** during which the project purpose and objectives are defined, and some initial project planning activities take place. At a research project management level, this stage is also known as the **pre-award phase**.

It includes 1) ***project planning***, where the research idea, the expected R&I project outcomes and the challenges addressed by the project are identified; and 2) **preparation of the grant proposal**, where the following aspects are defined and detailed:

a) project **scope**;

b) detailed **objectives and methodologies** to be implemented in the project's development;

c) activities timeline, typically in the form of a **Gantt chart**;

d) **milestones** and **deliverables**;

e) **resources** already available at the organisation;

f) **budget** and resources plan;

g) associated **risks**, identifying the potential problems that may arise and alternative solutions available.

After these activities are carried out, the grant proposal of the R&I project is **submitted to the identified funding call** and, upon evaluation and consequent approval by the funding agency, the project enters its second phase, during which contract procedures are made initiated, both with the funding agency and with the partners, in case of collaborative grants.

Project planning

The second phase is the **project planning phase**. At this stage, the objectives of the R&I project are verified, and the initial plan is revised and adjusted if needed (e.g., dates of the planned activities and resources allocated should be adjusted to the timeframe and budget defined by the grant agreement). At the research project management level, this stage is also known as the **post-award phase**.

During this phase, the project work plan and project management plan are structured and the **kick-off meeting** with all project partners is prepared (Kourounakis, N., & Maraslis, A., 2016).

Project execution/implementation

The **project implementation phase** often starts with a kick-off meeting, promoted by the project coordinator. At this stage, all project plans begin to be implemented to carry through right to the closing phase.

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Project monitoring and control

Simultaneously with the project's execution phase, the **project monitoring and control phase** occurs. During this phase, the R&I project execution activities are regularly reviewed and monitored to make sure everything is being developed according to the project work plan and to promptly address any deviations and risks. Also, this phase foresees all relevant communications with the funding agency, namely about **adjustment requests** - in case the deviations on the project cannot be handled without altering the initial plan - and concerning **interim scientific and financial reports** (Kourounakis, N., & Maraslis, A., 2016).

Project closing

The **project closing phase** represents the official end of the project when all project documents, reports and deliverables are finalised to be sent to the funding agency. At this stage, it is important not only to acknowledge the team involved in the R&I project, but also to discuss the **overall experience** and report on the **know-how** learned and the **best practices** implemented that might be useful to keep in mind for future projects (Kourounakis, N., & Maraslis, A., 2016).

RMAs in Research Management

When managing R&I projects, the RMA must focus on the efficiency and quality of the R&I activities and must make sure that the planned activities and budget are being executed according to the project work plan.

The RMA deals with a multitude of situations and issues, namely ***pre-award tasks*** such as:

- identifying the **funding schemes**;
- supporting the **proposal writing procedure**;
- **scheduling** the R&I activities and planning the **resources** needed to develop the project.

And ***post-award tasks*** such as:

- managing the **scientific and financial development** of the project – the RMA should keep track of the tasks being developed, and the costs associated with each task and proceed with adjustments and corrections when needed;
- presenting **reports** to the funding agency;
- managing the **finalisation of the project** – the RMA aids the principal investigator in gathering all project information, for an **evaluation of project indicators** to be carried out, to assess if these were met and to prepare the **final report**.

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RMAs are also involved in **science communication and the promotion of broader impact tasks** such as:

- promoting the **dissemination and communication** of the project's achievements;
- **managing the knowledge produced** by the project, focusing on its possible use and potential impact on society.

Due to the wide spectrum of RMAs' actions, within a Research Performance Organisation (RPO), we can observe **different types of RMAs** having diverse and specialized competencies (e.g.: pre-award managers and post-award managers, team managers, laboratory managers, communication managers, intellectual property managers).

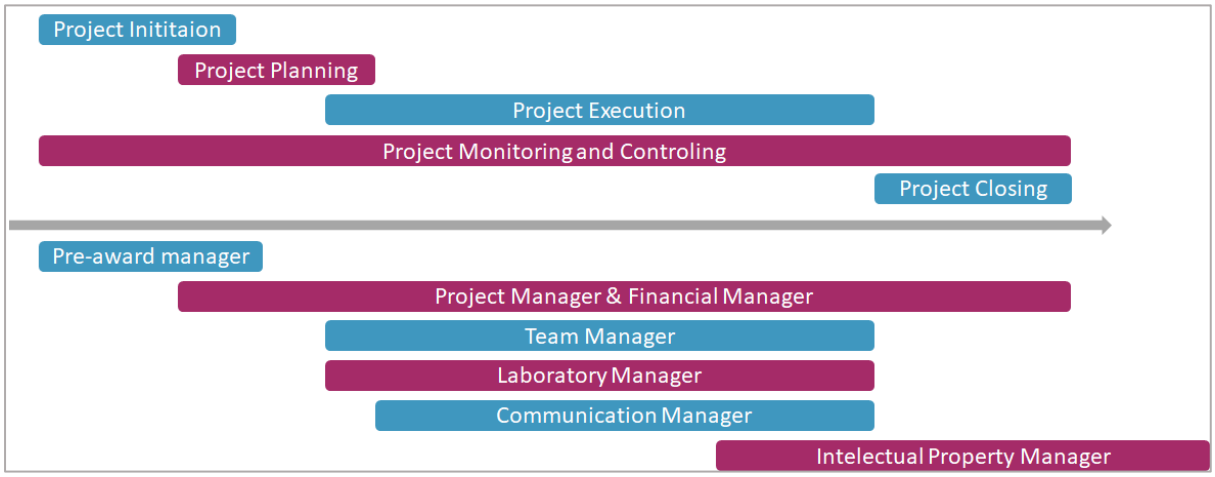

Figure 23 - RMA profiles within the research lifecycle

A pre-award manager is responsible for identifying the best funding scheme for a specific idea or research plan pursued by a researcher and supports the proposal writing procedure. The pre-award manager advises the researcher on the **specifics of the call** and must guide them in successfully addressing all topics on the application form.

A post-award manager is responsible for **financial compliance monitoring**, verifying if the financial execution of the project occurs according to the funding agency's financial rules and applicable national laws. The post-award manager also plays a significant role in aiding the principal investigator in dealing with the funding agency and giving support during the project modification processes, like **budget revision** due to project deviations. Throughout the project's execution, the post-award manager is responsible for the preparation and organisation of **report documents and financial reports submission**, on top of the project's closing procedure and **audit preparation**. The post-award manager may also have a tight collaboration with the pre-award manager, specifically on the establishment of the budget and resources plan for the application preparation.

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Team manager, laboratory manager and even communication manager roles can be executed by the project manager. This role separation depends on the internal organisation of the institution or specific project needs. The team manager is responsible for supervising the team of the project, **assessing the team's performance,** and dealing with internal conflicts that may arise. The laboratory manager is responsible for the **maintenance of the laboratory**, certifying that the project team has all resources needed available at the laboratory, and is in charge of requesting any material necessary to carry out the project activities.

An intellectual property manager is responsible for supporting the writing of the **IP protection requests** to be submitted to IP offices, preparing, and revising **the non-disclosure agreements** and for revising the IP clauses present in the consortium agreements. The role of the IP manager may be extended beyond the closing of the project since he/she accompanies the IP concession procedure - which may take up to 2 years - and is involved in the **licensing** agreements and **technology transfer** activities.

Project Management Offices (PMO)

Often, project managers are integrated into a **wider research support team**, such as within a Research Support Office or a Research and Innovation department. Nevertheless, the composition and diversity of such teams/offices vary depending on the type of RPO institution involved (university, private research institution, technological/interface institution, etc.) and on its level of professional maturity and development (often connected to great discrepancies in R&I performance between countries, even within Europe).

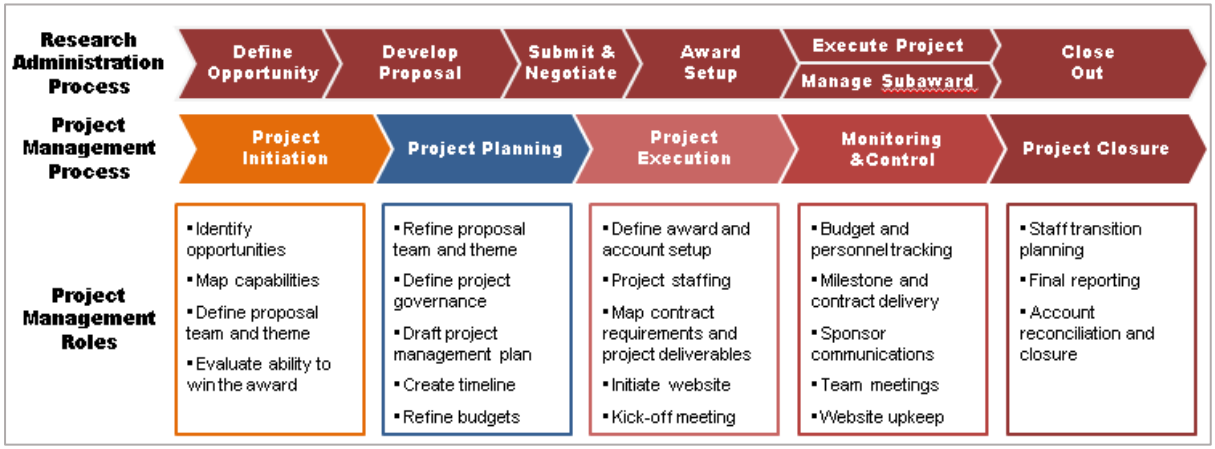

Figure 24 - Project Management Office - Example of the organization of the Arizona State University (Source: https://researchadmin.asu.edu/project-management-office-pmo)

Depending on the organization and on its level of professional maturity/development, there are different possible teamwork configurations for project managers, ranging from a large

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and **very specialized RMA team** (supporting project management as a team effort and addressing all aspects, including financial, communication, open science, etc.) to a small and **generalized team** (where the project manager has an overview of all relevant issues).

Several authors have analysed this issue, as we can see in the article Project Management Office Models – a review by Monteiro. A, et al. For example, the PMBOK categorizes PMOs based on their 1) **influence** and 2) **position** within the organization.

1) Based on the **level of influence**, we distinguish in:

- **Supportive PMO**: plays a consultative role in projects by supplying templates, best practices, training, access to information and lessons learned from other projects. This type of PMO serves as a project repository. Low degree of control.
- **Controlling PMO** provides support and requires compliance through various means. Compliance may involve adopting project management frameworks or methodologies, using specific templates, forms, and tools, or adherence to governance. A moderate degree of control.
- **Directive PMO**: takes control of projects through direct management. The high degree of control.

2) Based on the **position within the organization**, PMOs may be distinguished in:

- **Individual PMO** or *Project Management Office*: typically provides functional support (e.g., infrastructure, document management, training, etc.) to a single complex project or program. Sets basic standards and oversees planning and control activities for a single project.
- **Departmental PMO** or *Business Unit PMO*: a Departmental PMO provides support for multiple projects at a department or business unit level. Their primary challenge is to integrate different-sized projects within a division (e.g., IT, Finance) from small, short-term initiatives to multi-year programs with multiple resources and complex integration of technologies.
- **Corporate PMO** or *Enterprise PMO*: Corporate PMOs create standards, processes, and methodologies to improve project performance within an organization. They are typically responsible for allocating resources to different projects across the organization.

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Advantages and disadvantages of pre-award and post-award integration

While pre- and post-award research administration procedures differ, both functions are a vital part of research administration, and there are both advantages and disadvantages in the integration of these research management areas (The Advisory Board Company, 2011).

Pre- and post-award as separate RMA entities

Pre- and post-award RMAs act separately in **distinct units and offices**.

> **Advantages:** being exclusively dedicated to pre-award research management, the RMA can develop a **high level of specialization** and become knowledgeable in very specific niche areas.
>
> **Disadvantages**: a strict separation between pre- and post-award management can lead to **inefficient communication** and contribute to making it challenging for both pre-and post-award RMAs, to gain a holist perspective on the whole process of research administration

Hybrid pre- and post-award RMAs

Pre- and post-award RMAs act separately but within the **same unit or office**.

> **Advantages**: RMAs specialize in specific niche areas while developing **close communication** between pre- and post-award management procedures, which will ultimately improve the whole project lifecycle and provide benefits for the principal investigator.
>
> **Disadvantages**: This **co-presence** may lead to the **need for additional staff leaders** (e.g.: pre-award coordinator and post-award coordinator) and the RMAs must deal with the existence of different roles and responsibilities within the same office.

Integrated pre- and post-award RMAs

The RMAs work in the same office and there is **no separation** between pre- and post-award managers since all RMAs act on the **same procedures**.

> **Advantages**: being generalist RMAs (working as pre- and post-award managers) can contribute to **flexibility** in adjusting to high workloads both on the pre- or post-award procedures; also, **project monitoring is more streamlined** since the same RMA has managed the project from the beginning and has supported the development of communication with the principal investigator.

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Disadvantages: the **training** of an RMA that works as both a pre-and post-award manager is extensive and implies a large volume of knowledge to master.

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Lesson 2: Project Management Structure, Grant Agreement (GA) and Consortium Agreement (CA)

Learning outcomes:

LO#8 - The student will map the main internal and external actors' involvement across the project management stages and devise a strategy for their timely contribution to the implementation of the project (i.e., Stakeholder Management)

LO#13 - The student can follow the development of several simultaneous management tasks (e.g., team management, cost management) and prioritize the most relevant ones at different stages of project management.

Starting a research project

Essentially, the project management and the **project governance framework** will set the pace with which the project should be developed and how all project participants (research, management team and stakeholders) will intervene.
How these sets of roles or governance bodies will interact within the project is normally detailed in the project management plan. Each project, depending on its needs and specificity, may define certain **rules and mechanisms** between the governing bodies to aid the **decision-making processes**.

Key governance components and project management process groups

During the project's lifecycle, project management governance has eight major components that are mandatory and must be studied and analysed for the project's success. These **eight components** occur between the initiation phase and the monitoring phase. Full knowledge of the project environment is required to make sure the project is aligned with the organization's governance structure.

These alignments must be the focal point *when defining the project **governance framework** [1], **roles and responsibilities** [2] and **stakeholder engagement** and communication [3]. The project manager needs to ensure the governance plan's implementation during the project and should assess the effectiveness of the plan implementation. When performing this project governance monitoring the project manager should ensure that there are adequate **meetings** [4], **reporting** [5], evaluation and **risk control** [6] **issue management**, assurance [7], and*

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project management ***control processes*** [8] (Alie, S. 2015). Figure 25 maps these eight project management process groups' components (project lifecycle phases).

1) **Governance Models** - definition of **key elements** needed for project governance. This definition should be based on the project's scope, timeline, complexity, risk, stakeholders, and relevance to the organisation.

2) **Accountability and responsibilities** - the **definition** of these components is one of RMAs' core tasks. The non-definition of these components may result in negative consequences and a lack of effectiveness in meeting planning, control processes, risk assessment and the communication plan. This definition isn't solely based on stating who's accountable for a certain aspect or activity of the project, but it's also stating who's responsible and who should be consulted/informed about each of the project activities and deliverables.

3) **Stakeholder engagement** - definition of all stakeholders involved, what their **interests and expectations** are and how communication with them should occur. The stakeholder is anyone who can be **directly impacted** by the project deliverables (e.g.: the project team - scientific and financial team, funding agency and advisory board).

4) **Stakeholder communication** - definition of a **communication plan** based on the identified stakeholders and their interests. A good communication plan with stakeholders must detail how to deliver relevant, concise, and on-time information to the stakeholders involved.

5) **Meeting and reporting** - definition of the right balance between meetings and reporting. The stakeholder must understand the **content of the communication and its periodicity**. The RMA should assure that communication with the stakeholders is brief, concise and on target.

6) **Risk and issue management** - definition of how risks should be **identified, classified, and prioritized**. The lack of risk definition that could arise during project development may cause some setbacks and delay the application of the due adjustments; how you plan to handle the risk is more important than the risk itself!

7) **Assurance** - **definition of metrics** that can yield a view of the project's performance and ensure that risks are effectively managed. Some of the metrics

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include the effectiveness of the change control and risk analysis process; the capability to monitor deviations in project scope, time, cost, schedule, and the quality assessment of the project plan.

8) **Project Management Control Process** - it's the simplest component to define, but the most challenging to implement since it demands ongoing checking and balancing. The monitoring and controlling process is based on all tasks and project-related metrics and **measures project performance** by comparison with the baseline scope, budget, time, and resources. The RMA should engage constantly in this procedure to ensure that corrective actions occur on time.

Figure 145 - The main governance components in a research project

As previously stated, the **project management governance framework** can be replicable in different projects, but it's not possible to define a unique framework. An organization should create a framework based on its objectives, culture, and own governance models (Bernardo,

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M. 2010; PMI, 2013), aligned with the organization's strategies and ethical principles (Bernardo, M. 2010), that cover the following core elements:

- **Roles and responsibilities;**
- **Decision-making processes and levels;**
- **Methodologies;**
- **Competences;**
- **Communication process;**
- **Controlling process.**

Project management roles and responsibilities

A project can have a different set of **governance roles** according to its specificity and needs, namely:

- The **Principal Investigator (project coordinator)** - is the **intermediary** between the project partners and the funding agency;
- **General Assembly** - assembly of all the partners which should include one representative of each **partner organisation** and be chaired by the principal investigator;
- **Executive Board** - **directs and monitors** the project's development, normally constituted by the principal investigator and other project members appointed by the General Assembly (e.g.: task leaders);
- **Advisory Board** - **external stakeholders** who have specific expertise regarding the project scope and periodically provide their views and opinions on the project;
- **Project Manager (RMA)** - assists the principal investigator in all the management and monitoring tasks of the project; is responsible for the **day-to-day management** tasks of the project, the organisation of meetings, coordination of the reporting, and serving as a **helpdesk** for queries from the project partners.

Depending on the needs of the project, **other roles** might be appointed, such as:

- **Communication manager** - who is responsible for the management of all the **external communication** of the project's results and for promoting their **exploitation**;
- **laboratory manager** - who is responsible for the upkeeping of the laboratory and for guaranteeing the **appropriate conditions and the materials** needed for the project scientific team to develop their activities, etc.

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Team roles

There are different approaches to **studying team roles**. One of the most recognized was developed in the 1970s by Meredith Belbin and colleagues at the Henley Management College. Here, based on **long-term psychometric tests and studies of business teams**, Belbin's group proposed the following definition of team roles as *a tendency to behave, contribute and interrelate with others in a particular way*.

Belbin proposes **nine team roles divided into three categories** (based on https://www.belbin.com/about/belbin-team-roles/):

1. **Resource Investigator** uses his/her inquisitive nature to **find ideas** to bring back to the team.
    - **Strengths** - Outgoing, **enthusiastic**. Explores opportunities and develops contacts.
    - **Allowable weaknesses** - Might be **over-optimistic** and can lose interest once the initial enthusiasm has passed.

2. **Team Worker**: helps the team perform, using his/her **versatility** to identify the work required and complete it on behalf of the team.
    - **Strengths**: Co-operative, **perceptive** and diplomatic. Listens and averts friction.
    - **Allowable weaknesses**: Can be indecisive in topical situations and tends to **avoid confrontation**.

3. **Coordinator**: needed to focus on the team's objectives, draw out team members and **delegate work** appropriately.
    - **Strengths**: Mature, **confident**, identifies talent. Clarifies goals.
    - **Allowable weaknesses**: Be **manipulative** and might offload their share of the work.

4. **Plant:** tends to be highly creative and good at solving problems in **unconventional** ways.
    - **Strengths**: Creative, imaginative, **free-thinking**, generates ideas and solves difficult problems.
    - **Allowable weaknesses**: Might ignore incidentals and may be **too detached** to communicate effectively.

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5. **Monitor Evaluator** provides a logical eye, makes **impartial judgements** where required and weighs up the team's options in a dispassionate way.
    - **Strengths**: Sober, **strategic,** and discerning. Sees all options and judges accurately.
    - **Allowable weaknesses**: Sometimes lacks the drive and ability to inspire others and can be **overly critical**.

6. **Specialist**: brings **in-depth knowledge** of a key area to the team.
    - **Strengths**: Single-minded, **self-starting** and dedicated. Provides specialist knowledge and skills.
    - **Allowable weaknesses**: Tends to contribute on a **narrow front** and can dwell too much on technicalities.

7. **Shaper:** provides the necessary drive to ensure that the team keeps moving and does not lose focus or **momentum**.
    - **Strengths**: Challenging, dynamic, thrives on pressure. Has the **drive** and courage to overcome obstacles.
    - **Allowable weaknesses**: Can be **prone to provocation** and may sometimes offend people's feelings.

8. **Implementer**: able to plan a **workable strategy** and carry it out as efficiently as possible.
    - **Strengths**: Practical, reliable, **efficient**. Turns ideas into actions and organises work that needs to be done.
    - **Allowable weaknesses**: Can be a bit **inflexible** and slow to respond to new possibilities.

9. **Completer Finisher**: most effectively used at the end of tasks to polish and scrutinise the work for errors, subjecting it to the highest standards of **quality control**.
    - **Strengths**: Painstaking, **conscientious**, anxious. Searches out errors. Polishes and perfects.
    - **Allowable weaknesses**: Can be inclined to worry unduly, and **reluctant to delegate**.

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Figure 26 – Belbin's team roles with regards to 'thinking', 'action' and 'people'
(Source: http://www.belbin-italy.com/rtefc8f.html?id=503)

Agreements and contracts

After drafting the project management plan and project governance framework it is time to start preparing the **legal documents** that will bind the project team and the EC/Funding agency. These legal documents are, for example, the **Grant Agreement (GA)** and the **Consortium Agreement (CA)**. Regarding the CA, the EC suggests that the CA must be negotiated between all project beneficiaries and finalised before the signature of the GA.

The grant agreement (GA)

The GA is a contract between the EC and beneficiaries of an EU-funded project. This document defines the **rights and obligations of the beneficiaries** and includes other information regarding the eligible costs, forms and periodicity of payments, requirements for use, preparation of project results and the requirements for the use of the EC emblem.

Following the approval of the proposal, the EC sends the ***Evaluation Summary Report***, an invitation to prepare the grant agreement, to the Funding & Tenders Portal. At this stage, the EC essentially requests the beneficiaries to provide some **legal and administrative details** that weren't included in the original proposal.

EC-funded projects must be implemented according to the information which was included in the evaluated proposals; thus, the GAs must not differ significantly from the proposal, except for **required corrections and updates**, namely:

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- in the case an **ethical review** or **security scrutiny** occurred, during the period separating the project evaluation from the grant approval;
- when some details of the project **don't conform** with the applicable rules (e.g.: legal and financial rules);
- when there is the need to remove clerical errors or clear **inconsistencies**;
- when, under exceptional circumstances, a **participant is removed** from a consortium during the grant preparation phase.

As mentioned above, at this stage there is little room for changes, so the negotiation involved in this procedure is minimal. However, you have the chance to **correct any shortcomings identified by experts** in the *Evaluation Summary Report* if this revision process doesn't delay the grant agreement preparation beyond the deadlines. The signature of the GA takes place exclusively online, through the **Funding & Tenders Portal,** and this procedure must be completed **within 3 months** after the beginning of the grant agreement preparation.

Essentially, the GA's preparation is needed to:

- gather **legal, administrative, and financial information** from the beneficiaries (project participants who sign the GA) and any third parties linked to any of the beneficiaries;
- ensure the Description of the Action (**Annex 1** of the GA) and the estimated budget/ lump sum breakdown (**Annex 2**) **match the proposal**;
- establish the **key features of the GA**, namely: project start date; reporting periods; the amount of pre-funding payment; the need for a consortium agreement (CA); ethical issues; third parties linked to any of the beneficiaries; in-kind contributions provided by third parties; subcontracting, etc. [the last four points are detailed only if applicable];
- verify the **financial capacity** of the **coordinator's organization** - verification is required when the funded amount is equal to or higher than 500, 000 EUR unless the coordinator's organisation is: a public body; a higher or secondary education establishment; an international organisation; a legal entity whose participation is guaranteed by a Member State or an associated Country or a private individual in receipt of a scholarship.

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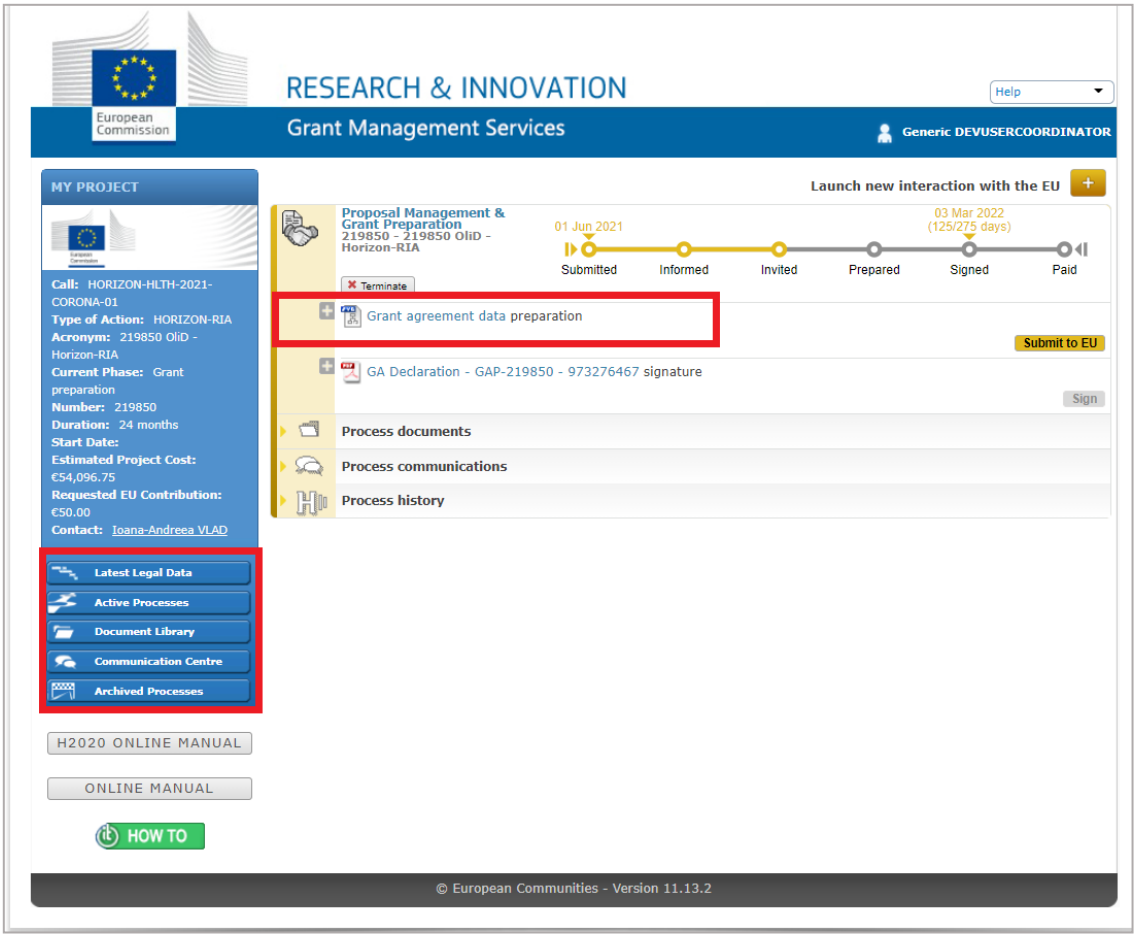

Figure 27 – Information about the GA preparation in the Funding and Tenders platform (Source: https://webgate.ec.europa.eu/funding-tenders-opportunities/display/IT/Proposal+Management+and+Grant+Preparation)

Consortium agreement (CA)

A CA is a **mandatory document** for multi-beneficiary H2020 projects and other national and international projects unless the call/work programme states otherwise. The consortium agreement should set the framework for the project implementation and the interaction between all project partners (coordinator's organisation, project coordinator/principal investigator, project manager, and partner organisations) by defining all rights and obligations amongst them.

The European Commission (EC) advises preparing the Consortium Agreement, or at least a draft version of this document, at the initiation phase, during the proposal preparation. Having an **early draft** will facilitate the discussion (and agreement) on important project aspects and sensible information.

The EC states that the **draft of the Consortium Agreement** should provide first thoughts on:

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- project implementation and **distribution of tasks** amongst the beneficiaries (coordinator and partners);
- internal organisation and management of the consortium and **user rights** on the Funding & Tenders Portal;
- project **budget** and distribution of EU funding;
- additional rules on **rights and obligations** related to background and results;
- liability, indemnification, and **confidentiality arrangements** between beneficiaries;
- **boilerplate provisions**: duration, termination, communication, applicable law, settlement of internal disputes, etc.

At the grant preparation phase, the consortium must have produced and agreed on a **final version of the Consortium Agreement** that should be officialised before the coordinator's organisation signs the grant agreement. The Consortium Agreement allows the beneficiaries (coordinator and partners) to agree on any specific details that are not included in the grant agreement but are deemed necessary by the consortium to have in writing (e.g.: organisation of work, intellectual property management, liability, future exploitation, and dissemination of results).

As previously stated, the EC procedure demands the preparation of a CA in almost every project. Although some information on how to draft this document is provided the EC does not endorse a specific CA model. A **specific working group** has been established to prepare a CA model specifically designed for H2020 projects. The working group includes the French National Association for Research and Technology, the European Association of Research and Technology Organisations, the European Liaison Office of the German Research Organisations, the League of European Research Universities, the Applied Research Organisation in Finland, the Centre for Innovation and Technology in North Rhine Westphalia, the Applied Research Organisation in Germany, and the Helmholtz Association of German Research Centres.

This working group, commonly known as the **Development of a Simplified Consortium Agreement (DESCA) core group** created an agile and detailed model CA. This **DESCA model** contains various options and clauses to provide **maximum flexibility and** to allow for the adaptation of the CA to specific project needs. The DESCA model also includes several elucidation notes to guide RMAs without legal training and first-time participants in its compilation. The DESCA is regularly updated: the latest version is dated 2020 (DESCA, 2021).

The items normally included in a Consortium Agreement are:

- **Preamble** - sets the **scene and context** for the Consortium Agreement and references any previously reached agreements between the consortium partners;

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- **Parties** - details the official name of each project beneficiary and may mention any interested parties bound to carry out some tasks during the project (**linked third parties**);
- **Definitions** - defines a list of **specific terms** to avoid misunderstandings regarding the extent of a specific right or obligation;
- **Internal organisation** – details **how the consortium will be governed** and managed; this section represents the largest part of the consortium agreement's contents. A project consortium normally involves beneficiaries from different Member States, with different languages and customs. **Efficiently facing this diversity** is of extreme importance for the proper management of the consortium and to achieve the project results paired with successful dissemination and exploitation of these.

Provisions of project governance normally cover the following issues:

- structure, coordination, and operation of the **management bodies** (e.g.: project steering committee, project quality committee);
- **roles and responsibilities** of these bodies;
- **voting rules**.

Some **additional provisions** may be detailed on this topic:

- frequency of **project meetings**;
- **communication and correspondence guidelines** between parties and with the management bodies;
- **follow- up and supervision** of the project - an internal **scientific and financial report** might be proposed to allow RMAs to actively monitor the project development throughout all partners;
- **rules** to be observed in case a partner wants to leave the consortium or if a new party wants to join after the start of the project.

Management and maintenance of user rights on the Funding & Tenders Portal

The Consortium Agreement should detail all roles and Funding & Tenders Portal user rights related to project information and project management tasks for each of the beneficiaries (e.g.: filling in forms, uploading documents, submitting information, and signing documents). There should also be detailed **provisions for certain scenarios** such as people leaving the project or changing roles in the project (or within their organisation) and applicants/beneficiaries wishing to end their involvement in the project before its expiry.

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Project implementation

Definition of the **tasks' distribution** per beneficiary, including:

- tasks assigned to each party;
- project schedule;
- procedure to amend project clauses;
- conditions under which other actors/organisations (e.g., linked third parties, seconded persons, or subcontractors) are brought into the project.

Project budget

- **Distribution,** by the project coordinator, of the payments received by the Commission/Agency; a **strategy to distribute funds** to the partners, namely making them available upon delivery of reports or deliverables, can be outlined. If a strategy is defined, the CA must include a clear definition of what must be submitted or fulfilled by partners to receive the funds and which percentage of the funds will be transferred. Also, it is a good practice to include, on the CA, the **bank account details** to which the funds must be sent;
- **Contributions** - the CA should address in detail the contributions made by each beneficiary and whether these correspond in cash or kind;
- **Receipts** - the CA should also tackle the potential implications of contributions and income received since, when these qualify as receipts, they will be considered at the project level. If receipts are expected, the CA should set out how this aspect will be managed. Additionally, a beneficiary's income may mean that the project grant is reduced because of the **non-profit rule**.

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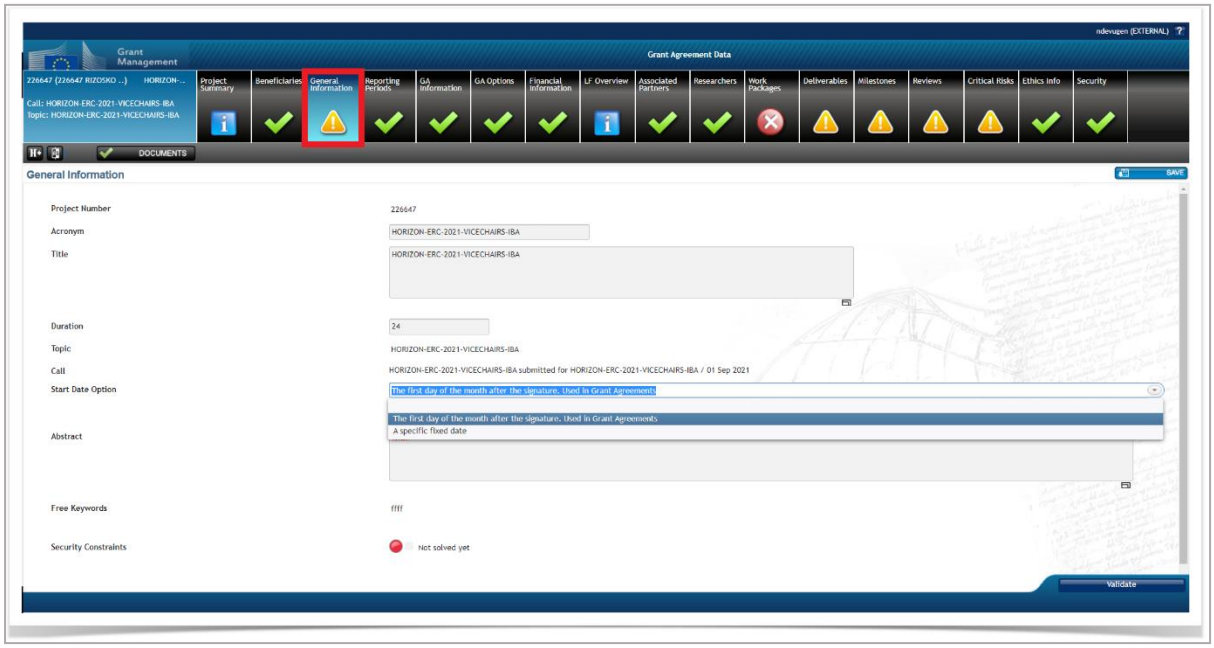

Figure 28 – General overview of a project on the Funding and Tenders Portal (source: https://webgate.ec.europa.eu/funding-tenders-opportunities/display/IT/Proposal+Management+and+Grant+Preparation)

Intellectual property rights (IPR) - Dissemination and exploitation of project results. The CA should define flexible and efficient rules to encourage and support cooperation between the beneficiaries with regard to intellectual property (IP).

Normally the following points are agreed on:

- **definition of the IP background** – setting the IP stage by defining project-relevant IPs and listing IPs already owned by beneficiaries on the CA signing date;
- **protection, dissemination, and exploitation of results** - the CA should outline rules on how to identify, report, protect, disseminate, and exploit project results. This topic is already regulated within the GA which establishes the requirement for any beneficiary to notify the other beneficiaries before disseminating project results, allowing for content reviews and, if appropriate, seeking the protection of the results through IPR;
- **management of joint ownership** - if two, or more, beneficiaries jointly produce results in the project and it is not possible to identify each beneficiary's contribution nor to separate the results to protect them, the beneficiaries will jointly own the results. The GA already states that joint owners should agree (in writing) on the terms of their joint ownership, but this aspect should be detailed in the CA as well;

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- **transfers of ownership** provisions;
- any additional rules on **access rights**;
- **management of third-party involvement** - if the involvement of other parties (non-beneficiaries of the project, including linked third parties) is needed to carry out the project or to exploit its results, the CA should explicitly mention this, especially if these other parties play a significant role.

Confidentiality obligations - definition of the conditions under which beneficiaries may disclose or use confidential information. To this effect, the CA should detail the following:

- a definition of what constitutes **confidential information**;
- confidentiality **obligations** (including their scope and duration);
- **penalties** for breach of confidentiality obligations (if necessary).

Liability, warranties, and penalties - definition of each beneficiary's liability for actions or omissions in the project. To this effect, the CA should cover the following:

- the **procedure** to be followed (e.g., for serving the party with a warning, allowing the notified party to object to the charge or to rectify the situation within a given timespan);
- **liability** for damage caused and the related **indemnification** (and possible limitations of liability, including *force majeure*);
- possible penalties for **non-compliance** (stipulating the terms of the penalties, e.g., amounts due, the procedure for imposing a penalty and the interest due in case of late payment).

Rejection of costs, reduction of the grant, recoveries, and damages

The Commission/Agency funding the project may **reject some of the costs declared** by the consortium or even **reduce the grant**. In these situations, the GA defines how financial responsibility is normally shared between the beneficiaries. However, if the financial responsibilities to be shared by the consortium differ from the ones defined on the GA, the CA should clearly **define the financial responsibilities** to be applied. The same procedure should apply to regulate the damages each beneficiary is liable to cause to the Commission/Agency.

Boilerplate provisions – a set of **standard contractual provisions** included in agreements of all kinds, such as:

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- start date and **duration** (i.e., entry into force and end, including early termination;
- methods for **resolving disputes** (in court, via arbitration or mediation);
- procedure for **amendments** (and the types of changes that require one);
- **contact points** for any correspondence;
- **law** applicable to the agreement.

RMAs' role in project management and decision-making processes

Whether they are defining the project management plan or the governance structure with the research team, advising on the grant agreement or acting as facilitators in the consortium agreement, **RMAs are involved (often as key players) in decision-making processes** which are crucial for the development of a research project. RMAs are often called to choose (or advise) from a set of alternatives; a choice which results in an action, a recommendation, or an opinion. To do so, RMAs must follow a series of sequential steps, from understanding the alternatives available to implementing the decision.

In this regard, different authors propose different rationales, for example:

1. GOFER (a model developed by the psychologist Leon Mann and his colleagues in the 1980s):
    - Goals clarification: survey values and objectives.
    - Options generation: consider a wide range of alternative actions.
    - Facts-finding: search for information.
    - consideration of Effects: weigh the positive and negative consequences of the options.
    - Review and implementation: plan how to review the options and implement them.
2. DECIDE (proposed by Kristina Guo in 2008)
    - Define the problem
    - Establish or Enumerate all the criteria (constraints)
    - Consider or Collect all the alternatives
    - Identify the best alternative
    - Develop and implement a plan of action
    - Evaluate and monitor the solution and examine feedback when necessary

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We can recognize these steps also as **key activities and core skills of RMAs** and, specifically, project managers.

There are several theories and **models of decision-making** that can be summarised in three main research perspectives:

- **Psychological**: examines individual decisions in the context of a set of needs, bibliographic references and values the individual has or seeks.
- **Cognitive**: involves an integrated feedback system between the individual/organization deciding, and the broader environment's reactions to those decisions.
- **Normative**: analyses the decision and decision-making based on the ability to communicate and share logic, using firm premises and conclusions to drive behaviour.

On a similar note, different **styles of decision-making** can also be identified.

Optimizing vs. Satisficing

As Herbert A. Simon acknowledges, decision-making is limited to the finite amount of information an individual has access to; thus, decision-making is constrained by the **limited** available information, the time at one's disposal and the mind's information-processing ability.

Two main decision-making styles were identified:

- **the satisfier**, who recognizes this necessary imperfection and prefers faster but less perfect decisions,
- **the maximiser,** who takes a long time trying to find the optimal choice.

For more information about the application of such perspective in the management context, the following article can be explored: The contribution of Herbert Simon to management and decision-making.

Intuitive vs. Rational

Daniel Kahneman proposed that **two separate minds compete for influence** within each of us:

- **System 1** is automatic and intuitive, rapidly consolidating data and producing a decision almost immediately and

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- **System 2**, requires more effort and input, utilizing logic and rationale to make an explicit choice.

An article from MIT magazine can provide insights about this approach to strategic decisions: https://sloanreview.mit.edu/article/a-structured-approach-to-strategic-decisions/

Combinatorial vs. Positional

Proposed by Aron Katsenelinboigen based on how the **game of chess** is played and an individual's **relationship with uncertainty**. Defines two main decision-making styles:

- **the combinational style** is characterized by a very narrow, clearly defined, primarily material goal,
- **the positional style** involves performing semi-complete links between the initial step and the outcome (as opposed to pursuing a concrete object). Each move from this type of player would maximize options as opposed to pursuing an outcome.

For more information see The concept of indeterminism and its applications: economics, social systems, ethics, artificial intelligence, and aesthetics.

RMAs and decision-making

Regarding the application of such perspectives in the **tasks and roles of an RMA**, we can highlight the following studies:

- The 2004 article Decision-making: Theory and Practice provides a **literature review of the main theoretical models of decision-making**, especially applied to how senior managers make decisions in practice. This study shows that *attention to aspects such as the decision-making context, the nature of the decision-making processes, people's styles, and the agendas of decision-makers, as well as the presentation of results, may significantly improve the impact of a decision-support project*.

- The 2012 article Becoming Aware of the Unknown: Decision Making During the Implementation of a Strategic Initiative discusses the relevance of becoming aware of the **uncertainties** in the performance of decision-making by managers.

- The 2019 PLOS article Ten simple rules for providing optimal administrative support to research teams emphasises the importance of being **decisive**.

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Lesson 3: Project management integration

Learning outcomes:

LO#5 - The student has a basic insight into some main time and project management tools and methodologies.

LO#9 - The student will be able to identify and measure the resources needed for project implementation (team and their time allocation, the physical and infrastructural resources needed, plus other needs) and integrate this information with a budget and a calendar plan (i.e., Project Management Plan).

LO#11 - The student will apply methodologies and tools for effective project management, including time, people, and tasks management, as well as reporting.

LO#12 - The student will be able to contribute to the identification and prioritization of the management, financial and legal issues to be addressed at different stages of the project life cycle (i.e., Project Integration Management).

Project Integration Management

Planning, integration, and execution are the most relevant responsibilities of RMAs. R&I projects normally have a short life span (e.g.: on average 3 years duration) and need controlled and specific resources for their development; hence, to successfully develop an R&I until its completion requires **formal and thorough planning** (Kerzner, H. 2003; Westland, 2020).

As mentioned before, the ten project management knowledge areas occur in any of the sequential phases of an R&I project (project management process groups). One of the most important areas is **project integration management as it holds a project together**. Project integration management is based on management actions that allow the **coordination of multiple activities** of the project, making them work together in an organized way. Project management integration is present in all project process groups (project life cycle phases) and includes the actions below (Westland, 2020).

Preparation of the project's charter/application - Planning phase

The project charter justifies the **reasoning behind project initiation** and serves as a base for the **scope definition**. The charter outlines the reasons to develop the project but also tackles the following elements: objectives, deliverables, task list, resources, and financial and quality

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plans. After the establishment of the project charter, the **project boundaries** are defined and all the following processes (planning, executing, and controlling) can successfully take place.

Preparation of the project's scope statement - Initiation and planning phase

The scope statement defines what is part of the project and what isn't. It lists all **actions and works** to be developed during the project lifecycle, setting the **project deliverables,** and **defining criteria** that can measure the project's success.

Preparation of the project management plan - Planning phase

The project management plan is a **formal document** that will guide the project's execution and control and should be revised during the project lifecycle. The RMA is responsible for the development of this plan, which will **consolidate all project management plans** (scope management plan, cost management plan, quality management plan, process improvement plan, human resources plan, communication management plan, procurement management plan).

Management and control of the project work/activities - Execution phase

In the execution phase, the deliverables are already being developed and the RMA must manage **technical and organisational aspects** of the project, to ensure that the goals are achieved with success.

Monitoring of the project work/activities - Monitoring and control phase

Monitoring and controlling processes are crucial as they allow **early detection of potentially negative impacts** on the project and prompt implementation of changes if required.

Project closing procedures - Project closing phase

At the end of each phase, **experiences and lessons learnt** by the team should be duly documented and registered, regardless of whether they were successful or not. This information coming together during the closing phase can be aggregated and serve as **support for future projects**. This practice is also relevant for the consolidation of the team and/or organisation and to increase the know-how in addressing certain challenges and applying **good practices** to future R&I projects.

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As stated above, project integration management is a set of **interlinked management processes** that are carried out throughout the project lifecycle. These management processes allow RMAs to successfully manage project development by integrating all management plans and involving all project stakeholders.

To set the right tone for this project integration phase it is a good idea to carry out a **general revision, involving all project participants**, of all processes implemented to date and an outline of future inputs expected from every partner.

Project management plan

The project management plan is a central document when it comes to the management process of a project. In some European Commission-sponsored projects it is **required as a project deliverable** to be presented by the 6th month of the project's implementation. Within the project management plan, all project components are defined, coordinated, and integrated into a **single plan**. The project management plan is a formal and essential document for the project team, since it establishes the **basis for all project activities** and how these will be developed, by defining how the project is to be executed, monitored, controlled, and closed (PMI, 2017; EU, 2016).

The **project management plan integrates all other project management plans**, namely the ones listed below (PMI, 2017).

- **Scope management plan** - describing how the scope framework of the project will be defined, developed, monitored, controlled, and validated. This plan can include the following components: a) Process for preparing a project **scope statement**; b) Process enabling the **tasks' distribution** (e.g.: **Work Breakdown Structure**) from the detailed project scope statement; c) Process establishing how the **scope baseline** will be approved and maintained and e) Process specifying how formal **acceptance of the completed project deliverables** will be obtained.

- **Requirements management plan** - defining how the project requirements will be analysed, documented, and managed. This plan can include the following components:
  - a) How **requirements activities** will be planned, tracked, and reported;
  - b) **Configuration management activities** such as: how changes will be initiated; how impacts will be analysed; how these will be traced, tracked, and reported, as well as the authorization levels required to approve these changes;

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- c) **Requirement's prioritization** process;
- d) **Metrics** that will be used and the rationale for using them, and
- e) **Traceability structure** reflecting the requirement attributes captured on the traceability matrix.

- **Schedule management plan** - outlining the **roadmap for project execution,** including the criteria and activities to develop, monitor, and control the project schedule.

- **Resources management plan** - detailing information regarding the rates (**personnel and other resources**), estimation of travel costs, and other foreseen costs that are necessary to estimate the overall project budget, guiding how project resources should be categorized, allocated, managed, and released. This plan can include the following components:
  - a) **Identification of resources** - Methods for identifying and quantifying human and physical resources needed;
  - b) **Acquiring resources** - Guidance on how to acquire the human and physical resources needed for the project;
  - c) **Roles and responsibilities** – The function assumed by or designated to a team member, including the rights to apply project resources, make decisions, sign approvals, and accept deliverables;
  - d) Project **team resource management** - Guidance on how project team resources should be defined, staffed, managed, and eventually released;
  - e) **Training** - Training strategies for team members;
  - f) **Team development** - Methods for developing the project team, and
  - g) **Resource control** - Methods for ensuring adequate physical resources are available as needed and that the acquisition of physical resources is adapted to the project needs.

- **Costs management plan -** detailing how the **project costs** will be estimated, budgeted, managed, monitored, and controlled. It also stipulates **team members responsible** for controlling tasks. This plan may also define an internal strategy for the **money transfer between partners** that differs from what is stipulated in the GA, but that is essential to be established in the CA.

- **Communication management plan** - focusing on how project communication will be planned, structured, implemented, and monitored to **ensure maximum effectiveness**. It may also detail specific **communication tools and technologies** that are required by the project.

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- **Quality management plan** - identifying the quality requirements and/or standards for the project and its deliverables and documenting how the project will demonstrate **compliance with quality requirements and/or standards**.

- **Risk management plan** - defining how to conduct **risk management activities** for a project, and how these will be structured and performed. This plan can include the following components:

    - a) **Risk strategy** - Describes the general approach to how the project risks will be managed;
    - b) **Methodology** - Defines the specific approaches, tools, and data sources that will be used to perform project risk management
    - c) **Roles and responsibilities** - Defines the lead, support, and risk management team members for each type of activity described in the risk management plan and establishes their respective responsibilities and
    - d) **Timing** - Defines when and how often the Project Risk Management processes will be performed during the project, following the project schedule.

- **Procurement management plan** - defining activities to be undertaken during the procurement (purchasing) process. Normally, **each institution already has its procurement procedures** clearly defined and based on the applicable national law; therefore, it is common for this plan not to be detailed, or even included, in the project management plan.

- **Stakeholder management plan** - defining and documenting the **approaches and actions that will increase support and minimize the negative impacts** of stakeholders throughout the project development. This plan should also clearly identify key stakeholders, along with the level of power and influence they may have on the project.

Overall, the project management plan can perform as a **detailed resume of all actions to be undertaken during the project** management processes. Each **topic-specific management plan integrated into the master project management plan** should be detailed according to the project's specific needs. For instance, smaller projects might need less detailed plans, as opposed to larger projects, involving a significant number of entities, which might need extended and more comprehensive plans. Apart from the details and specificities of each project, the project management plan must be **robust but flexible** enough to address a

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project that may mutate and suffer alterations during its development (PMI, 2017; EU, 2016).

Kick-off meeting

Although several meetings will be held during a project's lifecycle, the kick-off meeting (KOM) is vital because it **sets the tone** for the entire project. The KOM's main purpose is to communicate the objectives of the project, establish the commitment and bonding of the team and explain the roles and responsibilities of each stakeholder (PMI, 2017). Normally, **the KOM gathers all project participants**, such as the project coordinator, the project manager and team members from both the coordinator's organisation and the partners' organisations. The participation of the partners' organisation managers should be encouraged since a **physical meeting** will make communication regarding the more administrative and financial aspects of the project easier (PMI, 2017; Usmani, 2020).

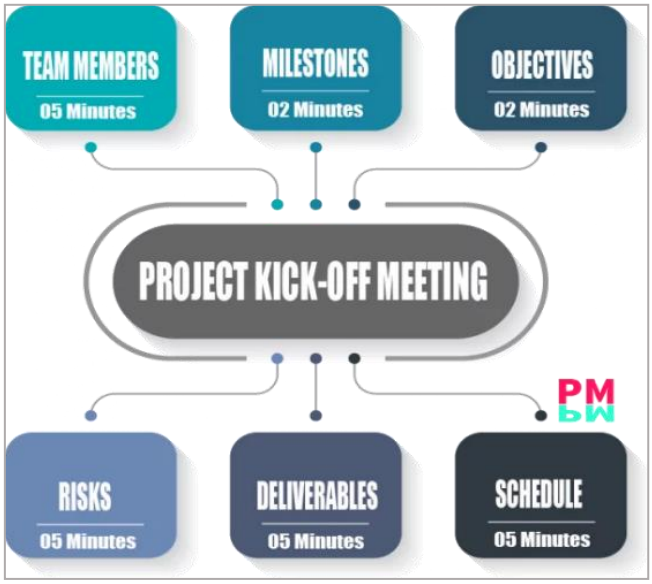

Figure 29 – Main points to consider in a project Kick-off-meeting
(Source: https://project.pm/kick-off-meeting/)

Good practices at Kick-Off meetings

The KOM represents a great opportunity to **brief all partners** (research and management team) on the **scientific and financial obligations** of the project and the management of the communication between the coordinator and the partners. It is recommended to ask the project manager and the financial manager to **prepare a presentation** detailing the following topics:

- financial rules stated by the EC/Funding agency to define **eligible costs**;

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- deliverables and/or financial reports **submission dates**;
- implementation of internal scientific and **financial reports** - why, how, and when to submit them;
- **budget distribution** presentation - how and when the instalments will be paid to the partners;
- **contact points** at the coordinator organisation - who the partners should contact for scientific or financial queries or support.

Internal and multi-sectorial meetings to kick off a project within an organisation

Apart from the Kick-off meeting, where all project partners and other relevant stakeholders gather, it is also recommended to set up an **internal meeting within the organisation** participating in a project. This represents a chance to bring together all **potential departments** bound to have some influence on the project, such as Human Resources and Acquisition and Procurement Departments. At this meeting, the RMA should moderate the communication between the mentioned departments and the needs of the research team members directly involved in the project. For example, at this meeting, the RMA should share the procedures and bureaucracy the Human Resources and the Acquisition and Procurement Departments will have to comply with to contract new staff members for the project or simply to acquire goods and services necessary for the project's development. This **sharing of information** at this stage is intended to **create internal awareness among the project team** about the need to initiate a determined process of recruiting or acquisition in due time, avoiding delays in the project execution.

Communication Management

Managing an R&I project combines overseeing the **work and activities** to be developed and collaborating with the different **actors** involved (who may have different roles, and levels of commitment and may participate at different stages of the project's implementation). Working closely with the research team, the RMA must provide advice and support to the **Principal Investigator (PI)** and his/her team in managing the planned research activities. In addition, the RMA must also connect with different actors, such as the **funding agency** (and its contact points), the **consortium partners** (in case of collaborative projects, different management teams must liaise effectively), as well as all the **institutional structures** involved in management tasks (such as HR, Procurement, Financial offices, etc.). Mastering communication skills is vital to perform such tasks.

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Interpersonal communication

Communication is recognized as a key competence in every situation and is especially relevant when managing teams. Two aspects are particularly significant in developing effective communication: **knowing your audience** and **choosing your approach**.

On top of understanding the ***Dos and Don'ts* of winning communication** with each individual (sensible matters or preferred approaches to topics), the key skill is to learn how to **adapt your communication** style for any scenario that may come your way. A self-assessment of one's communication style and an analysis of other communication styles and techniques available may be useful to develop a powerful approach.

Communication styles

A scan of the literature on the topic yields several **models that acknowledge and categorize different communication techniques and styles**, such as the DiSC® Model which is based on the work of psychologist William Moulton Marston in the 1920s. This model classifies people's behaviour into four types (**Dominance**, **Influence**, **Steadiness** and **Conscientiousness**) by looking at their preferences on two scales:

- **Task** versus **People**
- **Fast-Paced** versus **Moderate-Paced**.

Connecting the behaviours and preferences identified by the DiSC model yields the representation in Figure 30.

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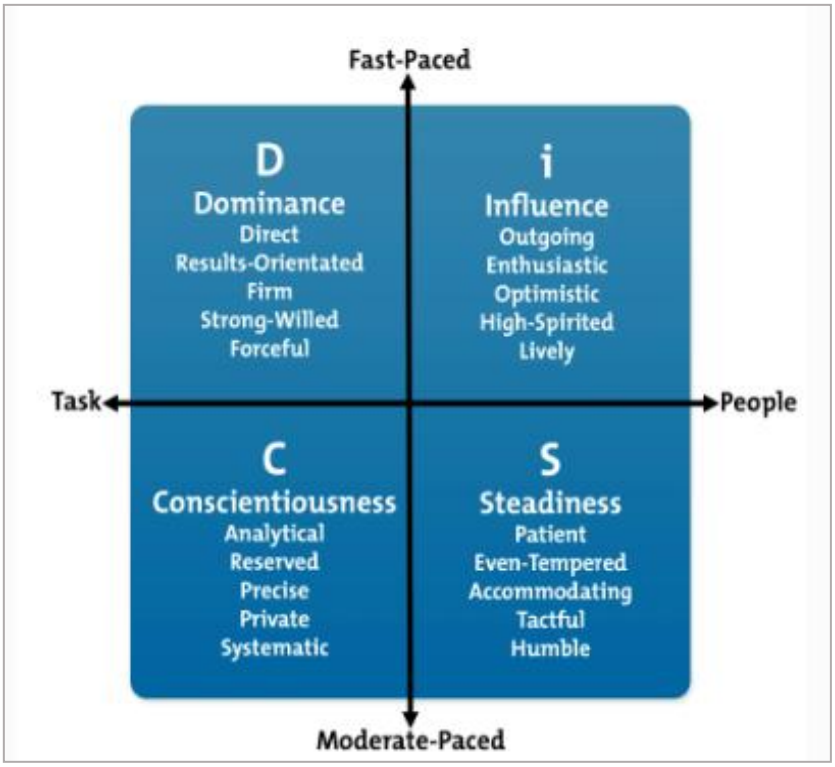

Figure 3015 – The DiSC Model for communication styles
(Source: https://www.mindtools.com/pages/article/newCDV_92.htm, reproduced with the permission of http://www.everythingdisc.co.uk.)

Dominant style approach:

- Don't ramble on or waste time.
- Stay on task.
- Be clear, specific and to the point.
- Don't try to build personal relationships or chitchat.
- Come prepared with all objectives and requirements in a well-organized manner.
- Present facts logically; plan your presentation efficiently.
- Provide alternatives and choices so people can make their own decisions.
- If you disagree, focus on the facts.

Influencer style approach:

- Talk and ask about their ideas and goals.
- Plan interaction supporting their goals and ideas.
- Allow time for relaxing and socializing.
- Don't drive to facts, figures, and alternatives.
- Help them get organized and put details in writing.
- Don't leave decisions in the air.
- Provide ideas for implementing action.
- Provide testimonials from people they see as important or prominent.

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- Offer incentives for their willingness to take risks.

Steady style approach:

- Don't rush headlong into business or the agenda.
- Be interested in them as people.
- Draw out their personal goals and objections.
- Don't force them to make a quick response.
- Present your case logically, non-threateningly and in writing.
- Break the ice with some personal comments.
- Ask specific questions. (How?)
- Don't interrupt as they speak. Listen carefully.
- Look for hurt feelings if the situation impacts them personally.

Conscientious style approach:

- Approach them in a straightforward, direct way.
- Recognize they may be uncomfortable speaking to large groups.
- Ask them if they see the issue the same way as you do.
- Provide them with information and the time they need to decide.
- Don't be informal, casual, or personal.
- Build credibility by looking at each side of the issue.
- Don't force a quick decision.
- Be clear about expectations and deadlines.
- If you disagree, prove it with data and facts or testimonials from reliable sources.

Conversational basics

In all cases and for all communication styles, several principles can empower fruitful communication. One possible approach can be summarised as the LSD method - Listening, Summarizing and Disquisition:

- **Listening**: pay attention to nonverbal signs; perform active listening.
- **Summarizing**: repeat, in your own words, the most important message, leaving room for corrections and/or stimulating the audience to add more.
- **Disquisition**: ask questions to get a better understanding; they can be closed questions, open questions and/or follow-up questions.

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Figure 31 - The LSD method
(short video available at https://www.goodhabitz.com/en-gb/online-courses/categories/communication-and-languages/conversation-technique/)

The University of Technology of Eindhoven developed a Hand-out Interview Technique that summarises these different **conversation stages** and provides concrete examples for each of the 3 steps (Listening, Summarising and Disquisition).

Communication effectiveness is not only about choosing your words carefully. **Body language** is also a relevant factor, as your body can either help you get your message across or send the wrong message entirely.
In this regard, a list of **tips and good practices** were shared in the BESTPRAC Training school *Leaders for the future: knowledgeable and successful leaders in Research Administration*, such as:

- If you have an important request, don't send an email. It's best to ask **face-to-face**.
- Your passion and emotions are more contagious in person. Persuading over the phone presents similar hurdles; you may not have their full attention and you won't have the
- opportunity to see the **facial expressions or gestures** of the person on the other side.
- So, if you're asking something of someone, ask to **meet in person**. Go to them.
- Your **posture** will send an instant message to your listener.
- Stand up tall! It does make a difference in perceptions of **confidence**. Before you even open your mouth, you've made the first impression.
- **Eye contact** is an important tool to increase the perception of trustworthiness.

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- Use **hand gestures** to support and emphasize your main messages and have a natural smile, which makes you more likeable and believable. When you are confident, your audience is more relaxed, open, and ready to listen.
- **Be consistent with body language and words**. If your body language and words conflict, the listener must decide which to believe.
- The listener almost always relies on **nonverbal cues** to make his/her decision.

RMAs' role in advising and influencing

Advising is an important RMA role that requires a diverse set of skills to deal with expectations, boundaries, pitfalls, emotions, and confidence. Advising can be done without consciousness but, for efficient and fair team management, it should **be considered a skill to train and develop**.

To this end, in 2017 NACARA, an association of professional advisors, counsellors, faculty, administrators, and students working to enhance the educational development of scholars developed its Academic Advising Core Competencies Model to identify the broad range of understanding, knowledge and skills that support **academic advising**. The aspects identified by the model are all transferable to the RMA context and can be useful in clarifying the RMAs' advising roles and responsibilities and in highlighting the contributions given by advising activities in an R&I setting. This framework looks at advising in **three content components**:

- **Conceptual component** - provides the **context** for the delivery of academic advising. It covers the ideas and theories that advisors must understand to effectively advise their students.
- **Informational component** - provides the **substance** of academic advising. It covers the knowledge advisors must gain to be able to guide the students.
- **Relational component** - provides the **skills** that enable academic advisors to convey the concepts and information from the other two components to their audience.

A summary of the three components above is available at NACADA Academic Advising Core Competencies Guide (PG23) (Abridgement).

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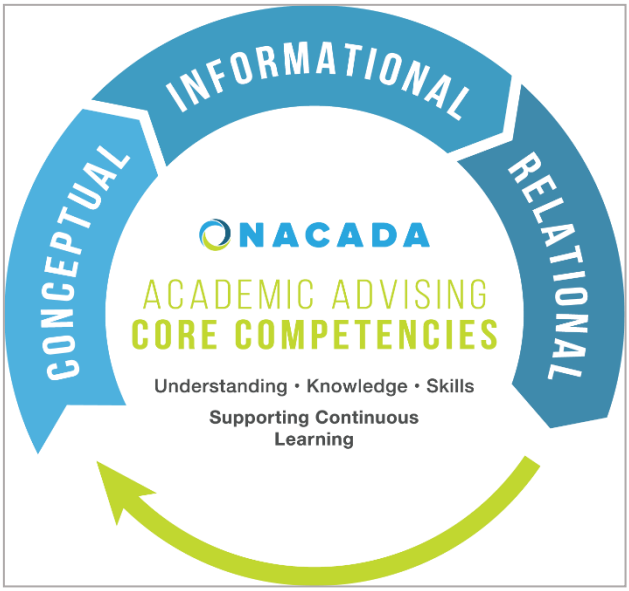

Figure 32 - NACADA Academic Advising Core Competencies Model (source: https://nacada.ksu.edu/Resources/Pillars/CoreCompetencies.aspx)

Transferring this model to the specific roles of RMAs allows us to highlight the following aspects:

Knowledge competencies

1. Advisors (or RMAs) must be **familiar** with the history, values, vision, mission, goals, and culture of the institution in which they work.
2. Advisors must possess intimate knowledge regarding their **institution's internal specific policies**, procedures, rules, and regulations and know whom on-site to contact when clarification is needed.
3. **Credibility** is critical for an advisor role, as the advisor must never provide an un-researched answer and must know where to find the vetted source.
4. The confidential and trust-based nature of the advising relationship requires advisors to acknowledge the **legal guidelines of advising practice**, including privacy regulations and confidentiality.
5. Advisors must understand the characteristics, needs, and experiences of the **R&I community.**
6. Collaboration with other institutional departments and getting **deep knowledge about the R&I facilities and resources** available for R&I activities is key.

Attitude competences

1. Articulate a **personal philosophy of advising**, since advisors bring with them values, beliefs, and assumptions that can have a major influence on their performance.

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2. Develop **interpersonal interactions** that promote understanding, learning, and trust through active listening, clear verbal interchange, and body language that is consistent with the speaker's words.
3. Communicate inclusively and respectfully.
4. Facilitate **problem-solving**, **decision-making**, **meaning-making,** planning, and **goal setting**.
5. Engage in **ongoing assessment** and **self-development** of the advising practice.

Regarding the attitude competencies, the BESTPRAC Training school *Leaders for the future: knowledgeable and successful leaders in Research Administration* identified the **following skills as pertinent for RMA advising**:

- **Communication skills**: explaining, arguing, presenting, influencing, and being able to give feedback.
- **Listening skills**: listening to what others say, what others mean and also what others do not say but still mean; keep asking questions.
- **Conflict-resolving skills**: understanding resistance and reluctance in yourself and others. Insights in conflict styles: compromising, problem-solving, avoidance, forcing.
- **Relationship skills**: Building a relationship, understanding others, respect, positive approach, interest, collaboration, and understanding responsibilities.
- **Personal skills and insight**: Resilience, relativizing, self-reflection, letting go, insight into qualities, pitfalls, and irritations.
- **Empathic skills**: Placing yourself in other's shoes, understanding stakes and needs.
- **Analytic skills**: Being able to analyse the problem, distinguish between cause and effect, see connections, and propose solutions.

Advising and influencing go hand in hand, especially in those areas related to project implementation for which the RMA is not directly responsible but still needs to push decisions in a certain direction. As such, influencing is also a crucial and instrumental role.

To settle an **advisory/influencing plan**, the RMA must:

- Have a **clear opinion** about where to go and how to get there (it can involve making a point, promoting a solution, or placing a boundary).
- Be honest and based on expertise, using **evidence-based rational arguments** (such as facts, information, and numbers)
- **Build a collaboration**: understand what others think/want/feel (because it is also about building a commitment and an agreement)
- Know his/her boundaries: identify the correct **timing and the willingness** of the target audience and put an **adequate communication strategy** in place.

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Lesson 4: Project Monitoring and Control

Learning outcomes:

LO#5 - The student has a basic insight into some main time and project management tools and methodologies.

LO#9 - The student will be able to identify and measure the resources needed for project implementation (team and their time allocation, the physical and infrastructural resources needed, plus other needs) and integrate this information with a budget and a calendar plan (i.e., Project Management Plan).

LO#11 - The student will apply methodologies and tools for effective project management, including time, people, and tasks management, as well as reporting.

LO#12 - The student will be able to contribute to the identification and prioritization of the management, financial and legal issues to be addressed at different stages of the project life cycle (i.e., Project Integration Management).

Financial Management

Financial management takes place from the very beginning of the project lifecycle but in different forms, depending on the stage of the project. During the initiation and planning phase, financial management is related to the preparation of the project's budget, based on **estimated costs**. This estimation of costs is defined according to the project's needs in terms of human resources, procurement acquisitions and other types of acquisitions. During the executing phase, financial management is focused on **cost control**, which is essentially the process of monitoring the project's incurred costs and managing the **changes to the cost baseline**, defined in the project's budget (PMI, 2017).
To be able to update the project's budget, the RMA needs to constantly monitor and revise the actual costs incurred during the execution phase of the project. The RMA must also engage in analysing the relation between the costs incurred and the work being accomplished through the expenditure. Otherwise, the RMA would only be considering the **outflow of project funds** without matching it with valuable information coming from the project's **accomplishment of activities.** (PMI, 2017).

According to the Project Management Institute, Inc. (2017), **project cost control** includes:

- influencing the **factors that create changes** to the authorized cost baseline;
- ensuring all **cost change requests** are acted on promptly;
- **managing the actual changes** when and as they occur;

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- ensuring cost expenditures **do not exceed** the authorized funding by period, by activity, and in total for the project;
- **monitoring cost performance** to isolate and understand deviances from the approved cost baseline;
- **monitoring work performance** against funds consumed;
- **preventing unapproved changes** from being included in the reported costs or resource usage;
- **informing relevant stakeholders** of all approved changes and associated costs;
- keeping expected **cost overruns** within acceptable limits.

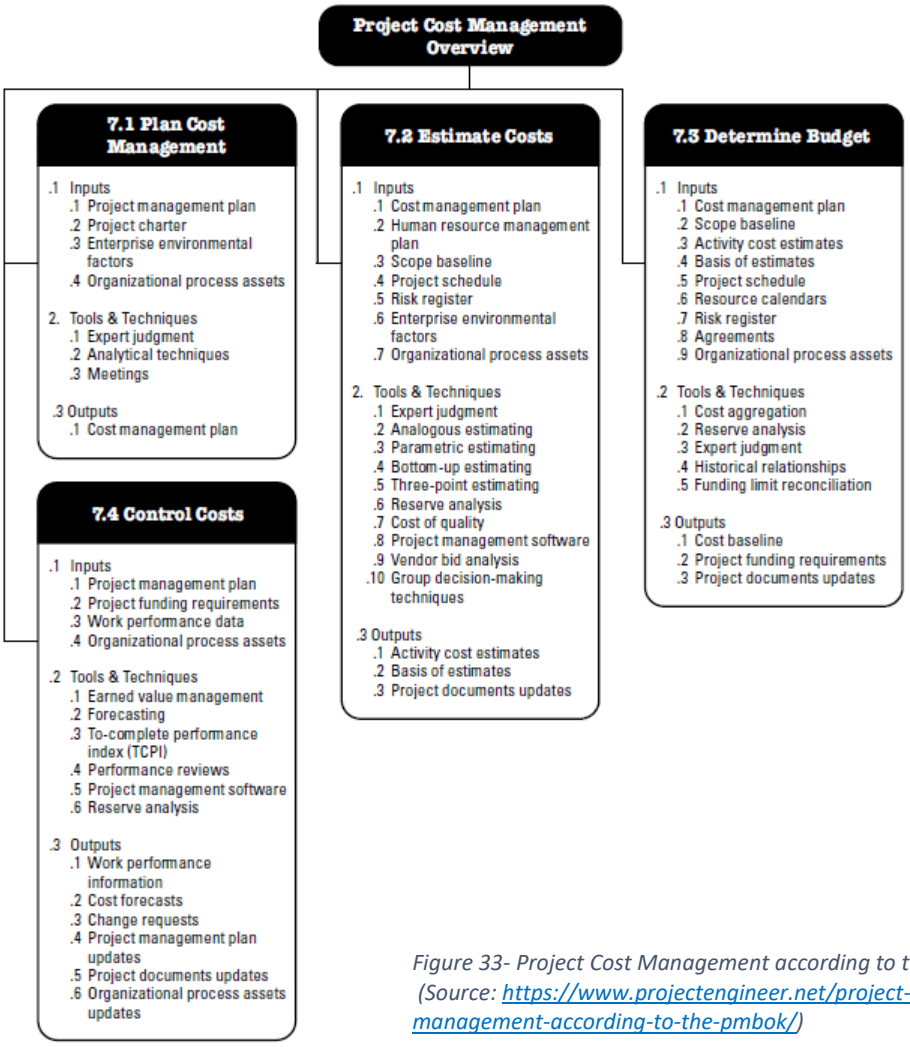

Figure 33- Project Cost Management according to the PMBOK (Source: https://www.projectengineer.net/project-cost-management-according-to-the-pmbok/)

To perform successful financial monitoring and control the RMA should adapt and make use of the best tools for each type of activity, also depending on the type of project in question, since certain projects have different **cost categories** and different **funding forms** (actual, lump sum, flat-rate, and unit costs). Apart from the adjustments required by each funding scheme,

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the RMA's financial control will be strongly linked to the organisation's internal practices and the reporting activities required by the EC/Funding Agency. In terms of organisational processes assets, the PMI (2017) observes the following aspects as **potential influencing factors in the process of financial control**:

- existence of formal and/or informal cost **control-related policies**, procedures, and guidelines;
- cost control **tools**;
- monitoring and **reporting methods** used.

When working on a large project, with several partners, it's useful to unify the strategy and instruct all partners to use the **same financial control tools**. This will allow the RMA to aggregate the information sent from all partners with a smaller risk of misinterpretation and error and reduce the amount of time spent preparing the financial report that should be submitted to the EC/Funding Agency. The RMA should **implement financial reporting practices within the consortium**, but sometimes this is not possible due to restrictions in the partners' organisations. Some organisations might have strict policies and procedures in place that won't allow them to accommodate a certain system or reporting methodology.

Depending on the available project costs (e.g.: human resources), a certain type of **control document** should be used by all partners (e.g.: timesheets). The coordinator should, when possible, implement in the consortium **specific templates** to be used by all beneficiaries to comply with the EC/Funding Agency obligations.

Financial rules in relevant research EC funding schemes

To support and promote the project partners' efficient financial management the RMA should be **up to date with the financial rules and obligations** associated with each type of project for which he/she is responsible. The RMA must know what the **eligibility criteria** are and the **evidence** that each type of cost needs to have for it to be reported to the EC/Funding agency.

Under the scope of the H2020 framework, the EC has in place different types of **funding schemes** and **actions** directed to the HEI and research institutions.

Research and Innovation Actions (RIA) - Actions to fund R&I activities that aim to establish new knowledge and/or explore the feasibility and application of **new or improved technologies**.
Funding rate: **100%.**

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Innovation Actions (IA) - Actions to fund activities that directly aim to produce plans or designs for **new or altered products, processes, or services**.
Funding rate: **70%;** except for **non-profit organisations**, for which the funding rate is **100%.**

Coordination & Support Actions (CSA) - Actions to fund, primarily, **accompanying measures** such as standardisation, dissemination, awareness-raising, communication, and networking of R&I projects. These actions don't fund the R&I activities *per se*, but the **dissemination and networking activities** linked to them.

Frontier Research Grants – European Research Council (ERC) - Grants assigned to researchers to fund projects, in any field of research, that seek to establish/consolidate research teams or programmes and that aim to pursue **ground-breaking research**.
Funding rate: **100%.**

Marie Skłodowska-Curie Actions (MSCA) - Actions to fund **research training and career development**, international and intersectoral mobility, partnerships between academic and non-academic organisations, doctoral programmes, staff exchanges and outreach activities.
Funding rate: **100%.**

Types of costs

All EC-funded projects must comply with a **set of financial rules to report eligible expenses**. Additionally, each beneficiary must comply with the financial rules and abide by all applicable **national laws** in his/her own country.

The standard financial budget of an H2020-funded project is constituted of **direct costs** and **indirect costs**, which can be funded in different forms (e.g.: actual costs, unit costs, flat-rate costs, and lump sum costs) (EU Grants: H2020 AGA).

- **Direct costs** are all costs directly **related to the research activities** carried out during the project's development. These may be broken up into the following costs categories:
    - **personnel costs** - costs tied to employees (or equivalent), natural persons working under a direct contract;

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- **subcontracting costs** - costs related to the subcontracting of tasks that are part of the project and that were categorised in the Description of Action (Annex 1 of the GA);
- costs tied to financial support to **third parties**;
- **other direct costs** - costs related to travel expenses and associated subsistence allowances, equipment costs, and costs for other goods and services.

- **Indirect costs** are costs that are not directly related to project activities but are **linked to the organisation's functioning** (e.g.: utilities and rents, infrastructure maintenance, including water, gas, and electricity bills).

Figure 34 – Direct Costs and Indirect Costs: classifications
(short video: https://www.youtube.com/watch?v=V6JqOzyuaF0)

- **Actual costs** are the **real costs** incurred by the beneficiary.
  Eligibility criteria:
  - effectively **incurred** by the beneficiary who is declaring the costs;
  - incurred **during the project's duration** period;
  - **foreseen** as eligible costs in the estimated budget of the project;
  - **directly connected** to the project's objectives;
  - **identifiable and verifiable** (paid directly by the beneficiary's account and supported with legal documentation);
  - in **compliance** with applicable national laws on taxes, labour, and social security;

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- reasonable, **justified** and must comply with the principles of sound financial management, regarding economy and efficiency (best value for money).

- **Unit costs** - are amounts defined per unit. For example, the MSCA project RISES declares a **unit amount per month** of secondment = temporary transfer of a staff member (project team member) from organisation A (academic partner) to organisation B (industrial partner).
  Eligibility criteria:
  - calculated by multiplying the number of actual units used to carry out the work (e.g.: **number of hours** or **secondment months** worked on the project) by the amount per unit;
  - the number of units must be essential for the project;
  - the units must be used or produced during the project's duration;
  - beneficiaries must be able to show the link between the number of units declared and the actual work produced on the project; through the presentation of **records and supporting evidence**, beneficiaries must prove how the number of units declared was used for the project.

- **Flat-rate costs** - are an amount defined by the application of a **fixed percentage** regarding other types of eligible costs (e.g.: indirect costs are calculated based on a flat rate of 25% of the total eligible costs, except for subcontracting costs).
  Eligibility criteria:
  - calculated by applying a flat rate to certain costs (actual, unit or lump sum costs);
  - beneficiaries must be able to show, through the presentation of **records and supporting evidence**, that the costs to which the flat rate is applied are eligible. The actual costs are not relevant.
- **Lump sum costs** - are a **global amount** deemed to cover all costs of the project or a specific category of costs.
  Eligibility criteria:
  - the lump sum costs must correspond to the amount of lump sum costs set out in **financial guidelines** (Annex II of the GA);
  - the work must have been carried out following the Description of the action (Annex I of the GA);
  - beneficiaries must be able to show, through the presentation of records and supporting evidence, that the action tasks have been carried out as

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described in the **Description of the action** (Annex 1). The actual costs are not relevant.

Within the same grant, **different forms of costs can be implemented**. For example, a budget category (e.g.: personnel costs) may be calculated by unit costs, while another category (e.g.: equipment, travel, and subsistence allowance) may be calculated by actual costs.

One important aspect to consider when preparing, and later managing, an H2020 project budget is **defining the work packages (WPs)** of the project. The WPs are the primary justification for the budget requested. A well-linked relationship between the WPs and the budget requested is useful both for the **proposal evaluators** to properly assess if the requested budget is reasonable, and for the coordinator and partners to keep track of activities during the execution phase of the project. The figure below exemplifies the information that H2020 RIA applicants must fulfil to justify each of the WPs defined for the project's development.

SUM OF ALL BENEFICIARIES AND ALL PARTNERS FOR ALL THE WORK PACKAGES							
	ALL BENEFICIARIES (without 3rd parties)		ALL 3rd PARTIES		ALL BENEFICIARIES (with 3rd parties)		
COST CATEGORY	UNITS	BE TOTAL COSTS	UNITS	TP TOTAL COSTS	UNITS (TOTAL)	AVERAGE COST PER UNIT	BE+TP TOTAL COSTS
COSTS WORK PACKAGE: 1 Work Package 1							
A. DIRECT PERSONNEL COSTS							
A1: Employees (or equivalent)							
SENIOR SCIENTISTS	0.00	0.00			0.00		0.00
JUNIOR SCIENTISTS	0.00	0.00			0.00		0.00
TECHNICAL PERSONNEL	0.00	0.00			0.00		0.00
ADMINISTRATIVE PERSONNEL	0.00	0.00			0.00		0.00
OTHERS (Specify)	0.00	0.00			0.00		0.00
A2. Natural Persons under direct contract	0.00	0.00			0.00		0.00
A3. Seconded Persons	0.00	0.00			0.00		0.00
A4. SME Owners without salary	0.00	0.00			0.00		0.00
A5. Beneficiaries that are natural persons without salary	0.00	0.00			0.00		0.00
A6. Personnel for providing access to research infrastructure	0.00	0.00			0.00		0.00
B. OTHER DIRECT COSTS							
B1. Travel	0.00	0.00			0.00		0.00
B2. Depreciation costs * (complete equipment sheet)							
Equipment	0.00	0.00			0.00		0.00
Infrastructure	0.00	0.00			0.00		0.00
Other assets	0.00	0.00			0.00		0.00
B3. Other Goods and Services							
Consumables	0.00	0.00			0.00		0.00
Services for Meetings, Seminars	0.00	0.00			0.00		0.00
Services for Dissemination Activities	0.00	0.00			0.00		0.00
Website	0.00	0.00			0.00		0.00
Publication Fees	0.00	0.00			0.00		0.00
Other (shipment,insurance, translation, etc.)	0.00	0.00			0.00		0.00
B4. Costs of Large Research infrastructure	0.00	0.00			0.00		0.00
B5. Costs of internally invoiced goods and services	0.00	0.00			0.00		0.00
C. DIRECT COSTS OF SUBCONTRACTING							
	0.00	0.00			0.00		0.00
D. DIRECT COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES							
	0.00	0.00			0.00		0.00
E. COST OF IN-KIND CONTRIBUTION							

Example not to complete

Figure 35 – Example of a budget justification per WP

Project Financial Monitoring setup

At the beginning of the execution phase, the RMA should set up the relevant communication line, with the European Commission (EC) and the project partners, to start preparation of the documents needed for the **1st instalment payment**.

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The RMA should prepare (and send to the EC) the **bank account information** for the 1st instalment payment using the EC-specific template (Financial Identification form). This form is mandatory to launch the awarding procedures for a contract (GA).

To simplify and standardise the form used to collect all partners' bank account details, the RMA can **use the EC Financial Identification form or introduce a template**, to be used by all consortium partners, that is already utilised at his/her organisation.
When sending this information request (bank account details), the RMA can additionally send over to partners templates for the project's financial monitoring (e.g.: timesheets, internal reporting template). The **uniformization of the templates** used by the consortium will aid the RMA in aggregating all beneficiaries' information in preparation for the report and simplify the regular monitoring of the project's financial execution.
Details regarding the instalment payments to the partners (**periodicity and budget execution targets**) are already defined in the Consortium Agreement (CA), but it is important to repeat these procedures and make sure all partners are fully aware of when the payments are to be made and/or which scientific or financial information is needed to process the payment.
The coordinator can establish that the **financial distribution** should comply with a set of internal rules (defined in the CA). For example, the EC normally transfers around 60% of the global funding as the 1st instalment payment. The coordinator can specify, on the CA, that partners receive a smaller percentage of the 1st instalment and those remaining payments (to reach the total 60%) will be made following the **delivery of an internal report** justifying the work produced and the expenses incurred. All these **internal consortium practices** must have been **negotiated with the partners** beforehand and included in the signed CA.

Financial Monitoring

As previously mentioned, the RMA should constantly update the financial execution of the project and **assess the relationship between the expenditures incurred and the work produced**. To perform the financial monitoring, the RMA must compare the actual project financial execution with the budget and work plan defined on the proposal and verify that the following aspects are met:

- the actual project expenditure ***per* cost category** is within the cost limits defined in the budget distribution;
- the actual project expenditure corresponds to the activity's execution timeline (**costs *per* WP**).

Using the instruments and practices detailed in the CA and shared during the setup phase of the financial monitoring, the RMA should regularly verify the global financial execution. This practice will allow us to notice which partners are **under or overspending** and promptly

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initiate the needed measures to rectify the situation. To make this observation and analysis easier, the RMA can prepare a **checklist** (or another type of document) allowing to perform a check of the percentage of financial execution expected in a determined moment of the project (e.g.: in a 36-month project, on month 12th, the expectation was to already have a global financial execution of 33,33% but the actual financial execution is only 18%...).
By accessing this information on a timely basis, the RMA can promptly anticipate the **for-project reallocation** and even **foresee prorogation periods** for the development of different tasks.

Expenditure Framework

Another RMA task related to financial monitoring is gathering **expenditure justifications** and support documents. All **project expenses** must be directly linked to the development of project activities and objectives and the RMA is responsible for collecting this framework of expenditure and for attaching the **supporting documents** (e.g.: deliverables' development outputs, timesheets, boarding passes, conference participation certificates, open access publications links, copies of printing material, etc.).
Supporting documentation can be requested by the EC as official proof that:

- declared working hours or **human resources' costs** were effectively spent on developing the project deliverables;
- working **hours declared** match the actual **hours worked** by the project team members;
- travel, subsistence allowance and conference registration costs declared did occur and the named participants attended the **conferences as declared**;
- **publications** and other forms of project dissemination, including printing materials, follow the **EC rules** (open access and funding scheme publicization, including logos and acknowledgements as requested).

Accounting– Connecting the financial department and the project

It is not expected for the RMA to master accounting terms and financial procedures undertaken by the financial department. Nonetheless, the RMA should always have close **contact with the financial department** since financial monitoring activities are extremely dependent on the information provided by this department.

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The acquisition requests of the project should be validated and analysed by the RMA, to ensure that the goods or services requested are related to project activities, correspond to what was defined on the foreseen expenses and are within the limit of the budget. As mentioned above, it is not required for the RMA to have a deep knowledge of national laws and the organisation's financial practices, but some basic notions (e.g.: knowledge of the limitation of the amount of the acquisition through which a certain procedure of procurement can be applied) to facilitate the **analysis validation of the expenses requests** are necessary to carry out the tasks and forward the expense requests to the financial and/or acquisition and procurement departments along with all the information they need to initiate the acquisition procedure.

Measures to maximise project control

To facilitate operations, the RMA should use **tools** that will assist him/her with the **control and monitoring of all project management aspects** (e.g.: tasks development, working hours fulfilled, budget execution).

There are several tools available for this purpose, namely:

- Asana;
- Slack;
- Podia.

Asana

The **online tool Asana** allows you to create **project plans** and **Gantt charts**, coordinate your tasks, establish milestones, and monitor the projects' progress. With Asana you can create a **set of project tasks** in four different layouts (task list, task board, task chronogram, task calendar), assign a **responsible person** for each task, add a **deadline date,** and even **define the priority of the task** (low, medium, or high). Another important feature of Asana is the **Portfolio**. Through this option, you can control and monitor the **project's progress**, consult the project updates, and the number of tasks pending and keep track of how many tasks were completed, uncompleted, or delayed.

Slack

Slack offers an **internet relay chat type of resource**, allowing you to create chat channels with your team and **share files** in an easier and faster way. The slack app enables the **creation of workflows** and is compatible with other apps like Google Drive and Office 365.

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Podio

Podio is an online tool, like Slack, that allows you to **create communication channels with the project team** and share files, being compatible with several more commonly used apps (e.g.: Dropbox, Google Drive). This tool also allows you to manage tasks' development by breaking down workflows into smaller, more manageable, tasks.

Time management

According to PMI, time management *includes the processes required to **manage the timely completion of the project*** and is a crucial aspect of the successful completion of the project (PMI, 2013; Dinsmore, P.C. & Cabanis-Brewin, J. 2011).

Time management can be broken up into the **seven processes** listed below:

1) **schedule management plan** includes the establishment of policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule;
2) **activities definition** includes the identification and documentation of the activities to be developed to achieve the project's deliverables and outcomes;
3) **activities sequencing** includes the identification and documentation of the relationship between project activities;
4) **activities resources estimation** includes the estimation of the type and quantities of resources (e.g.: materials, human resources, equipment), or supplies needed to develop the project activities;
5) **activities duration estimation** includes the estimation of the number of workdays or hours necessary for the completion of the project activities with the estimated resources;
6) **project schedule development**: elaborated following an analysis of the project activities sequence, duration, and resource requirements;
7) **project schedule control** includes the monitoring of the project activities' status to update the project's progress and manage the necessary changes to the schedule baseline for the project to be completed as planned.

Schedule Management Plan

Time management processes and associated tools are established in the schedule management plan, which is, in turn, integrated into the project management plan. The

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schedule management plan identifies and **details the scheduling method and tools**. This plan also determines the **format** and identifies the **criteria** of the project schedule development and control. The scheduling method chosen for the schedule management plan will define the framework and algorithms necessary to elaborate the project schedule model, which is a representation of the plan to execute the project's activities, including time intervals, dependencies, and other planning information.

Some of the more commonly known scheduling methods are the **critical path method (CPM)**, the **critical chain method (CCM)** and the **work breakdown structure (WBS)** (PMI, 2013; Ray, S. 2020; Mrsic, M. 2017; Heagney, J. 2016, Kourounakis, N. & Maraslis, A. 2016).

The **CPM** is an **algorithm** for scheduling a set of project activities and is based on the identification of the longest stretch of dependent activities and the measurement of the time required to complete the activities from start to finish. This algorithm assumes that all resources will be available at any given time of the project and that, if one activity is delayed, all the delay will carry over to the next activity, delaying the whole project.

The **CCM** is a **schedule network analysis technique** that contemplates the activities' dependencies, the availability of limited resources (e.g.: human resources, equipment, materials, and work rooms), and buffers necessary to complete project deliverables (PMI, 2013; Ray, S. 2020; Mrsic, M. 2017).

Work Breakdown Structure (WBS)

WBS is the **most 'popular' time management tool,** essentially based on a **hierarchical division** of project activities and tasks into smaller and more manageable tasks. The basic idea behind the WBS is the **deconstruction of a task** into smaller tasks - **work packages** - until they can't be partitioned any further. This deconstruction process allows making a better estimation of the task execution timing and costs, making task development management easier (Heagney, J. 2016; Kourounakis, N. & Maraslis, A. 2016, Project Manager, 2020).

WBS is based on the following components:

- **task number and description**;
- **task leader** - could be a team member or even a beneficiary institution; being the task leader doesn't mean being the only team member/institution t working exclusively on the referred task, but being the team member/institution **overseeing the task** and ensuring that it's successfully developed;
- **task dependency** - some tasks might directly depend on the start or conclusion of another task; it's convenient to have all the tasks dependencies **duly flagged** to ensure that the final deliverables are completed in time and successfully;
- **cost of the task**;
- **start and finish dates of the task**;

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- **task status** - the task status should show to whom the task is assigned (task leader) and the **task's progress** (e.g.: in progress, late, completed).

Project reporting

Project reporting is a crucial part of the communication exchange with the EC/funding agency. Through the report, the project coordinator and partners **document and summarise the status of the project's progress**. In project reports it is relevant to present information regarding scope, schedule, budget, quality of the work developed, risks issues, project modifications and management aspects. Additionally, in the report, it might also be relevant to include information regarding the **project's metrics and indicators**, so the progress of the project can be duly evaluated.

Reports are an important instrument for project controlling and decision making, and in H2020 projects there is a set of dates, defined in the GA, defining when a project report needs to be presented to the EC during the project execution phase (**progress report**) and during the closing phase (**final report**) (Kourounakis, N., & Maraslis, A. 2016).

The RMA of the coordinating organisation is responsible for gathering the information needed to present both the progress report and the final report. The RMA should make **early contact with all the partners** and inform them of the reports' submission dates, to agree on and establish a **set of deadlines** (already negotiated in the CA) when the partners should send the required information to the coordinator or via direct submission on the Participants Portal of the EC.

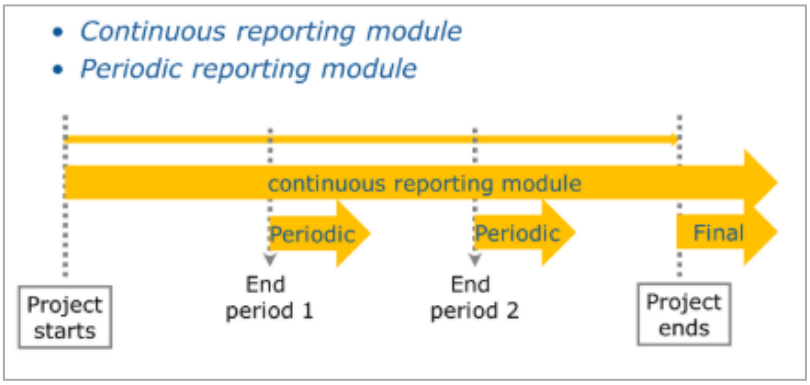

Figure 36 - The reporting process in an EC-funded project

Project audits

Audits of a research project can be carried out either by a specially designated audit department, the Project Management Office, an approved management committee or an external auditor. Audits are **formal reviews of the financial management of a project,** often aiming to assess the extent to which the project management standards and funding rules are being upheld.

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The European Commission may request an audit of the funded projects either during the project or at any time **up to 2 years after the final payment**. These audits mainly concern the financial implementation of the action and can include technical and other aspects.

Within the framework of the H2020 programme, there are two levels of financial controls: ex-ante controls and ex-post controls.

- **Ex-ante controls** refer to the Certificate on the Methodology used to calculate unit costs (CoMUC) and to ex-ante assessments on direct costing of Large Research Infrastructure (LRI).
- **Ex-post controls** occur on two levels: **first-level audit**, which is aimed at obtaining the Certificate on the Financial Statements (CFS) and **second-level audit**, which includes the **on-spot check** by the auditors appointed by the EC.

Audits can be conducted by the Commission's staff or outsourced to external persons or bodies appointed by the Commission. An on-the-spot visit and desk review is usually part of the audit.
The RMA responsible for the project's financial management is often called to prepare audits. In November 2017, the EC issued a document with detailed information on the Indicative Audit Programme which can be analysed to avoid errors in the financial management of H2020 projects. For each cost category, the document lists items that will be checked (a specific article of the GA) by the auditor, as well as the general procedure that will be performed.
After an audit, the EC prepares and sends an **audit report** and, if deemed necessary, the receiving institutions have 30 days to request a **contradictory audit procedure**.

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Learning outcomes:

LO#4 - The student has a basic insight into negotiation theories and conflict management models, as well as the practice of dispute resolution.

LO#6 - The student is aware of the concept and methodology of risk management

LO#10 - The student can effectively define and articulate, brainstorm and select the most adequate management solutions and evaluate their effects on achieving the project's goals.

Quality Management

Project quality management encompasses project management and project deliverables and involves all processes necessary to analyse and **achieve the quality required for the development of the project's deliverables**.

Quality management applies to all projects, regardless of their nature and of that the project deliverables. Project management quality is directly linked to what stakeholders need from the project deliverables. It can have a rather narrow focus, making it easier to achieve project objectives. Generally, RMAs only aid in overseeing the implementation of the project quality management plan since this is **typically a researcher's task from within the consortium**. Quality management and the implementation of the project quality management plan are extremely important to guarantee that deliverables are produced according to the **stakeholders' needs and expectations** (Ray, S. 2020; PMI. 2017).

A project quality management plan is composed of three central processes:

- **quality planning;**
- **quality assurance;**
- **quality control**.

Quality planning

Involves the identification of the **quality requirements** for the project deliverables and includes the definition of how the project should be managed, and how the **compliance demonstration** will be registered and documented. Additionally, the project quality management plan details the metrics that should be used for the **quality assessment** of the project deliverables. It also includes a **quality assessment checklist** to register and organise the baseline achievements required for the successful development of project deliverables (Ray, S. 2020; PMI. 2017; Rever, H. 2007).

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Essentially, the project management plan's crucial function is to advise on how the quality of project deliverables will be managed and controlled during the execution phase of the project. Quality management planning is elaborated considering certain inputs (e.g.: project charter, project management plan), tools and techniques, and it should provide a set of outputs, namely the project management plan and **quality metrics** (PMI. 2017).

Quality assurance

Refers to the conversion of the quality management plan into a set of planned and systemic activities, that are put into practice in a **quality system** to achieve the quality requirements of the project deliverables. The quality management process is used to ensure and increase the probability of the project deliverables being developed with the required quality. Also, it allows the **identification of ineffective processes** and spots causes of poor quality in the development of project deliverables. The assessment of quality assurance occurs through the implementation of quality checklists or audits (Ray, S. 2020; PMI. 2017).

Quality control

Corresponds to the **constant monitoring of quality metrics** and the **recording of quality activities' results**, both identified in the project management plan. The monitoring and recording of these metrics are required to ensure that the project deliverables are being completed within satisfactory levels and **meet the stakeholders' needs and expectations**. The process of quality control is implemented throughout the execution phase of the project, to demonstrate that stakeholder acceptance and quality criteria are being achieved. (Rever, H. 2007; PMI, 2017).

Internal practices of quality assurance and control, such as the ones mentioned above, may also be **supported, and complemented by external institutions or actors** who perform similar assessments.

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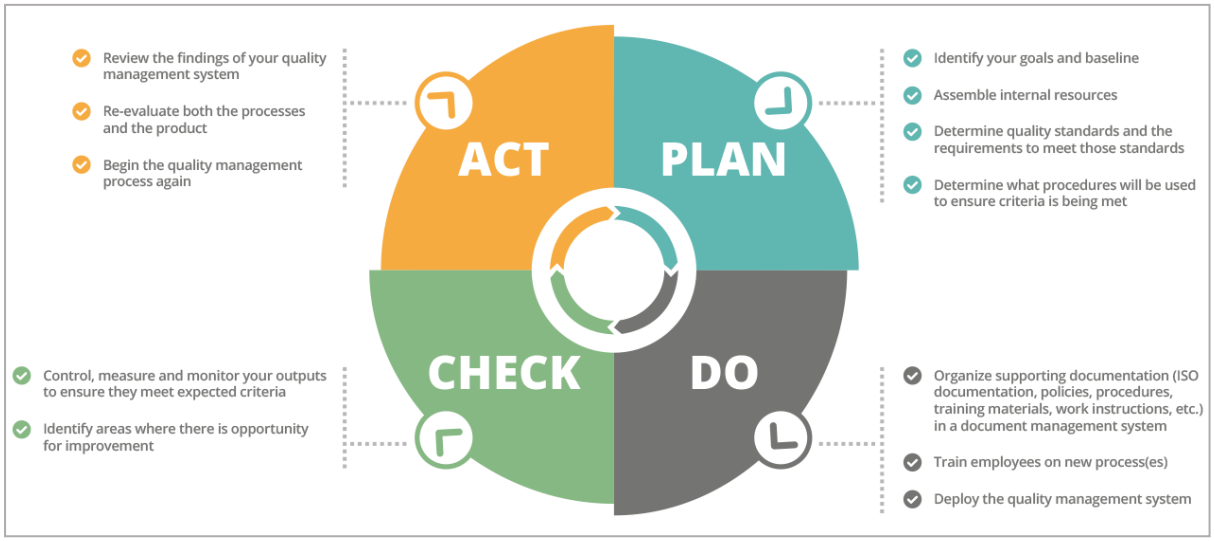

Figure 37 - The four main components of a quality management system
(Source: https://info.docxellent.com/blog/main-components-quality-management)

Risk management

Risk management is one of the most important processes of project development and involves the identification, planning, analysis, controlling and communication of risks. Risk assessment is essentially **scouting for threats (and opportunities)** to the project's success. Projects always involve a probability of risks occurring that may cause issues and conflicts in project development and affect each of the project management knowledge areas (Aziz, H. *et al*. 2018; PMI, 2017).

What are the risks?

Understanding the relevance of risk management is important to define what risks are and what type of risks we can find. Risks are **uncertain events** or conditions that may have either a positive or a negative impact on the project's outcomes. A negative risk may cause disastrous repercussions on project development, but a positive risk may lead to new opportunities that weren't initially foreseen at the beginning of the project. Apart from the differentiation of positive and negative risks, a project may experience two levels of risks: **individual project risks** and **overall project risks** (Aziz, H. *et al* 2018; Bridges, J. 2016; PMI, 2017).

According to PMI (2017):

- **Individual project risks** are **uncertain events or conditions** that can have a positive or negative impact on one or more project objectives.
- **Overall project risks** stem from the **uncertainty of the project *per se*** and depend on all sources of uncertainty, including individual risks.

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Project success optimisation

To face these probabilities of risk (negative/positive – individual/overall) it's important to have **risk-specific coping strategies**: knowing how to implement exploitation strategies when faced with a positive risk and how to implement mitigation strategies when tacking a negative risk. **Unmanaged negative risks** may lead to consequences such as project delays, cost overruns and poor project performance. On the other hand, positive risk (opportunities), when duly addressed, may lead to benefits such as time and cost reduction and improvement of the project's performance (PMI, 2017).

Project risk management has the objective of identifying and managing risks that aren't considered in the other project management processes, with the focus being the project's success optimization. In risk management, the **project success optimisation** is achieved by increasing the probability and/or impact of positive risks and reducing the probability and/or impact of negative risks (PMI, 2017).

Risks can occur at any time during the project's lifecycle and in any of the ten areas of knowledge of project management. Each knowledge area has its particularities, so the potential risks for each of the areas will be different. Project risk management is an **iterative process** that is applied during project development. In the first phase of the project, risks are identified and addressed (planning of the project) and, during the project execution phase, they should be monitored and managed to ensure the project is developed as planned (PMI, 2017; Aziz, H. *et al* 2018).

Project risk management encompasses the following processes:

- **risk management planning;**
- **risk identification and analysis;**
- **risk response planning and implementation;**
- **risk monitoring.**

Figure 38 - Risk Management: definition, strategies and processes

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Risk management planning

The risk management plan defines how the **risk management activities** will be conducted during the project. This plan should be detailed during the project planning phase and may be updated and revised during the project development phase if significant changes occur during the project lifecycle (PMI, 2017).

Risk identification and analysis

Risk identification consists in **documenting the existence of individual and overall sources of project risks** and gathering information so the project team can duly identify the risks during the project development and correctly address and manage them. The identification of risks is an **iterative process** that can occur during the project's lifecycle since new individual project risks may arise during the project's development and the level of overall project risks can change as well.

For it to be a viable tool for risk analysis and response, the description and documenting of the individual project risks must be made coherently and consistently to make sure that the risk is clearly understood (PMI, 2017).

Risk analysis involves the **prioritization of individual project risks** by assessing their occurrence and impact probability throughout the project's development. It's important to note that the assessment of the risks is subjective since it is based on the risk perceptions of the project stakeholders. Therefore, **bias induced by risk perception** should always be considered. An effective risk assessment requires the complete and explicit identification and management of the risks. In risk assessment, it's also important to use some visualization tools to highlight the risks and assist decision-making. The **risk matrix**, as shown below, is a **visualization tool used to determine the risk level**, considering both the **impact** and the **probability** of risk events (PMI, 2017; Aziz, H. et al. 2018; Lavanya, N; Malarvihi, T. 2008).

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Figure 39 – Risk assessment matrix (Wilson, F.2021)

Risk response planning and implementation

Planning risk responses involves the development of options, the selection of strategies and the agreement on the actions to be undertaken to address individual and overall project risks. Through this process, the project team will have documented the identification of the appropriate ways to face and address risks that may arise during the project's development (PMI, 2017). According to PMI:

> *effective and appropriate risk responses can minimize individual threats (negative risks), maximize individual opportunities (positive risks), and reduce overall project risk exposure. Once risks have been identified, analysed, and prioritized, plans should be developed [..] for addressing every individual project risk the project team considers to be sufficiently important, either because of the threat, it poses to the project objectives or due to the opportunity it offers.*

Risk responses must be adequate to the level and magnitude of the risk and realistic in facing the project's specific context. A **person responsible** to carry out the risk response should be appointed. He/she should identify specific actions to implement the risk response strategy, defined in the risk management plan, including primary and backup strategies. **Backup strategies** are needed if the primary risk response strategy isn't fully successful. In this case, **secondary risks** must be considered, since these types of risks arise as a consequence of the application of the primary risk response (PMI, 2017).

The implementation of risk responses consists of the application of the **risk response strategies** defined in the risk management plan. The process of **risk response implementation**, applied during the entire project execution phases, allows the rolling out of

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the planned risk responses to address the **overall project risk exposure**, including increasing the positive risks and reducing the negative ones (PMI, 2017).

Several types of exercises will be proposed to present students with **diverse options for risk management and mitigation**:

- **mind map** for risk management and mitigation;
- **brainstorm** for solutions;
- the **Kanban board** (https://kantree.io/blog/tips/2016/08/kanban-board);
- **assessing potential solutions** (use the graph: low effort, high effort, low impact, high impact);
- **chronograms** and **Gantt charts**;
- proposing adjustments to **overcome a problem**.

Conflict management models

It is very common for conflicts to emerge during the development of a research project, especially since these involve different actors with different ideas, backgrounds, and cultures. Risk assessment phases, when potential threats in the project's viability and implementation are discussed and solutions are collaboratively developed, are moments when **conflict management skills** are crucial for the RMA. To manage conflicts successfully, the RMA must start by understanding **how conflict emerges**.

Lately, Karen A. Jehn and Elizabeth A. Mannix developed several studies on the subject and proposed **three macro types of conflicts**:

1. **Task conflict:** conflicts about the **content and/or outcomes** of the team's task.
2. **Relationship conflict:** conflicts deriving from **interpersonal issues** within the team, with no relation to the tasks.
3. **Process conflict:** conflicts about how tasks will be accomplished, **who's responsible** for what, and how things should be delegated.

In the 2015 article A Review of Conflict Management Techniques in Projects, the author states **task conflicts increase the quality** of decisions and performance in projects, while **process conflicts reduce team productivity**, team performance and team morale. Levels of relationship conflicts are low in high-performance teams. Often conflict tends to cascade from tasks to processes to relationships, so it is not always simple to identify the original conflict type. Nevertheless, it is important to acknowledge that different types of conflicts must be addressed in different ways.

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The same article also lists 10 of the **most common conflicts taking place in projects**.

1. **Shared/common resources**
2. **Differences in project goals/objectives**
3. **Cultural differences**
4. **Differences in values**
5. **Personality issues**
6. **Differences in technical opinions**
7. **Differences in approaches**
8. **Schedules**
9. **Costs**
10. **Administrative procedures**

Different authors have provided input on different **techniques to handle conflicts**. With regards to typical conflicts arising within the project implementation and management, the following approaches seem relevant (citation from the 2015 article A Review of Conflict Management Techniques in Projects):

- **Asserting**: ensures the win to one party at the expense of the other party. It is a **one-way solution** (Barki et Hartwick,2001).
- **Domination and forcing** create a **win-lose situation** for the parties in conflict (Lam et al., 2007).
- **Integration style**: an effective approach for project performance, creating a **win-win situation** for all parties involved (Leung et al., 2005; Lamet al., 2007).
- **Avoiding**: the **most disruptive** style of conflict management in projects (Brahnam et al., 2005). In this style of conflict resolution, one party is indifferent to the feelings of the other party and avoids contact (Barki et Hartwick, 2001).
- **Accommodating**: **one party sacrifices** its own needs, desires, and expectations to satisfy the other party.
- **Compromising** style of conflict resolution: both parties **give and take**; winning something and losing something (Barki et Hartwick, 2001; Ohlendorf, 2001).
- **Confrontation** or **problem-solving**: tries to **satisfy all parties** in conflict by keeping all the facts and figures in the picture and using **scientific problem-solving** techniques. It creates a win-win situation for all parties in conflict (Verma, 1998; Ohlendorf, 2001; Heldman, 2003; Mosaic, 2012). Understanding each party's standing through a **pre-caucus** is a foundation of conflict management (Billikopf, 2003).

The author identifies the most frequent **conflict management techniques**, with the 5 most common being:

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1. Avoiding/ Withdrawal
2. Compromising
3. Confronting/Problem Solving
4. Accommodating
5. Smoothing

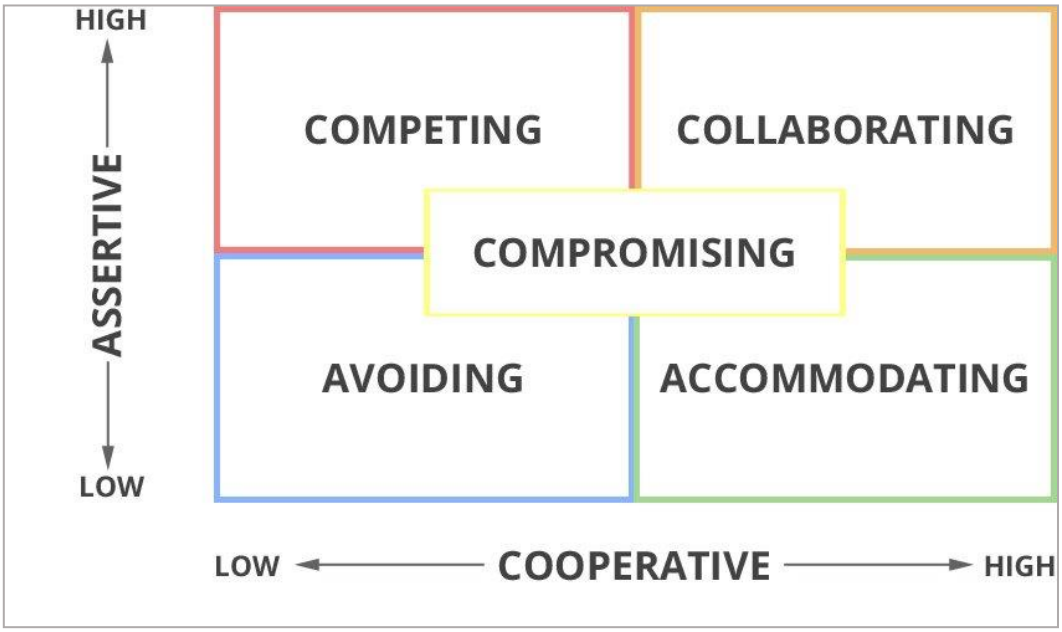

Figure 40 – Conflict management techniques
(Source: https://www.projectmanagementqualification.com/blog/2019/04/01/conflict-management-guide/)

Does conflict always generate a negative outcome? Not necessarily! Often, a conflict presents opportunities for improvement and many authors have emphasized the importance of **constructive conflict**. Embracing different ideas and views and clarifying common work issues can be an exercise in which people learn more about each other and consider new solutions to move their institution toward its goals and mission.

Applying **constructive criticism** at the RMA workplace can bring lots of challenges but also lots of positive results. Of particular relevance are the insights provided by Kathleen M. Eisenhardt, et.al in the article How Management Teams Can Have a Good Fight where the authors distilled a set of **six tactical characteristics found in high-performing teams**:

- They work with more, rather than less, information.
- They develop multiple alternatives to enrich the debate.
- They establish common goals.
- They try to inject humour into the workplace.
- They maintain a balanced corporate power structure.

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- They resolve issues without forcing a consensus.

Negotiation

During project implementation, the **RMA** acts as a **facilitator of conflict** with an ultimate goal: solving that benefit both parties. This is what matters in negotiation! If we look again at the conflict management techniques, we can conclude that the most successful negotiators start by pursuing a collaborative approach/integration style. Successful negotiators will make both sides feel winners as negotiations tend to go much better if both sides perceive they are in a win-win situation.

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Lesson 6: Team Management and leadership

Learning outcomes:

LO#3 - The student has a basic insight into the theories discussing the features and dynamics of team roles, procession and decision making

LO#7 - The student will get familiar with the most important leadership models

LO#14 - The student can select and apply the most adequate leadership model according to the given circumstances.

Managing a research project means collaborating with **different actors and teams**: the PI and his/her scientific team, the funding agency and its contact points, the consortium partners (in case of collaborative projects) and their management teams, the other institutional offices and divisions involved (such as Human Resources, Procurement, Financial, Open Access/Library, Data Protection Officer, etc.), as well as the RMA colleagues at the office/institution.
Working in a team is a crucial competence in project management, especially for an RMA. An RMA can also coordinate efforts from the different actors involved in project management as well as in project implementation. This lesson is thus devoted to **leadership**.

Management and Leadership

Management and leadership roles are interlinked but are not the same. There are several **definitions** of leadership, but the following one provided by Steve Myers* clearly states their differences
(*citation from https://www.teamtechnology.co.uk/leadership/management/definitions-of-leadership-and-management):

- **Management** controls or directs people/resources in a group according to **principles or values that have been established**.

- **Leadership** is setting a **new direction or vision** for a group to follow, i.e.: a leader is a spearhead for that new direction.

To better understand such differences, you can see some examples of Leadership without Management and Management without Leadership and the article Three Differences Between Managers and Leaders.

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Leadership theories

Studies about leadership span more than 100 years, with different concepts of leadership being debated through time and numerous models and styles being proposed by several authors. In this regard, **three seminal leadership theories** stand tall.

1. ### Situational Leadership Theory

   Proposed by Paul Hersey and Ken Blanchard in the 1970s, this theory considers how effective leadership requires a rational understanding of the situation and appropriate response, rather than a charismatic leader with a large group of dedicated followers. Its key principle is that there is no single *best* style of leadership. Effective leadership is thus **task-relevant,** and the most successful leaders are those who adapt their leadership style to the individual or group they are attempting to lead or influence, also considering the task, job, or function that needs to be accomplished.

2. ### Transformational Leadership Theory

   Developed by Bernard M. Bass (1985) as an extended work of Burns (1978), transformational leadership and transactional leadership are part of the Full Range Leadership Model. Transformational leadership models emphasize the **role model of a leader** who works with teams to identify the need for change, create a vision to guide this change through **inspiration**, and execute transformation together with committed members of a group.

3. ### Transactional Leadership Theory

   Focuses on the exchanges that occur between leaders and followers, where **leaders promote compliance** in followers through both rewards and punishments. Transactional leaders differ from transformational leaders because they don't inspire others; they **reward good work** or positive outcomes.

Different reviews and critiques of all three models can be found in the 2014 Situational, transformational, and transactional leadership and leadership development.

Leadership models

Building from the Transformational Leadership Theory, Dulewicz & Higgs brings together, in their 2003 article A new approach to assessing leadership dimensions, styles context, the latest thinking on **competencies**, **emotional intelligence** and **intellectual ability** with

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concepts of lead performance. Here, the authors identify the following **features of effective leadership**:

Key competences:

- **Envision** – the ability to identify a clear future picture, which will inform how people direct their efforts and utilise their skills.
- **Engage** – finding appropriate ways for everyone to understand the vision and provide their contribution.
- **Enable** – acknowledging the talent and potential of individuals and creating the environment in which these can be released.
- **Inquire** – being open to real dialogue with those involved in the organisation and encouraging free and frank debate on all issues.
- **Develop** – working with people to enhance their capability and help them make informed contributions.

Personal characteristics:

- **Authenticity** – being genuine and not attempting to 'play a role'; not acting in a manipulative way.
- **Integrity** – being consistent in what you say and do.
- **Will** – a drive to lead and persistence in working towards a goal.
- **Self-belief** – a realistic evaluation of your capabilities and a self-conscious belief towards achieving required goals.
- **Self-awareness** – a realistic understanding of 'who you are', how you feel and how others see you.

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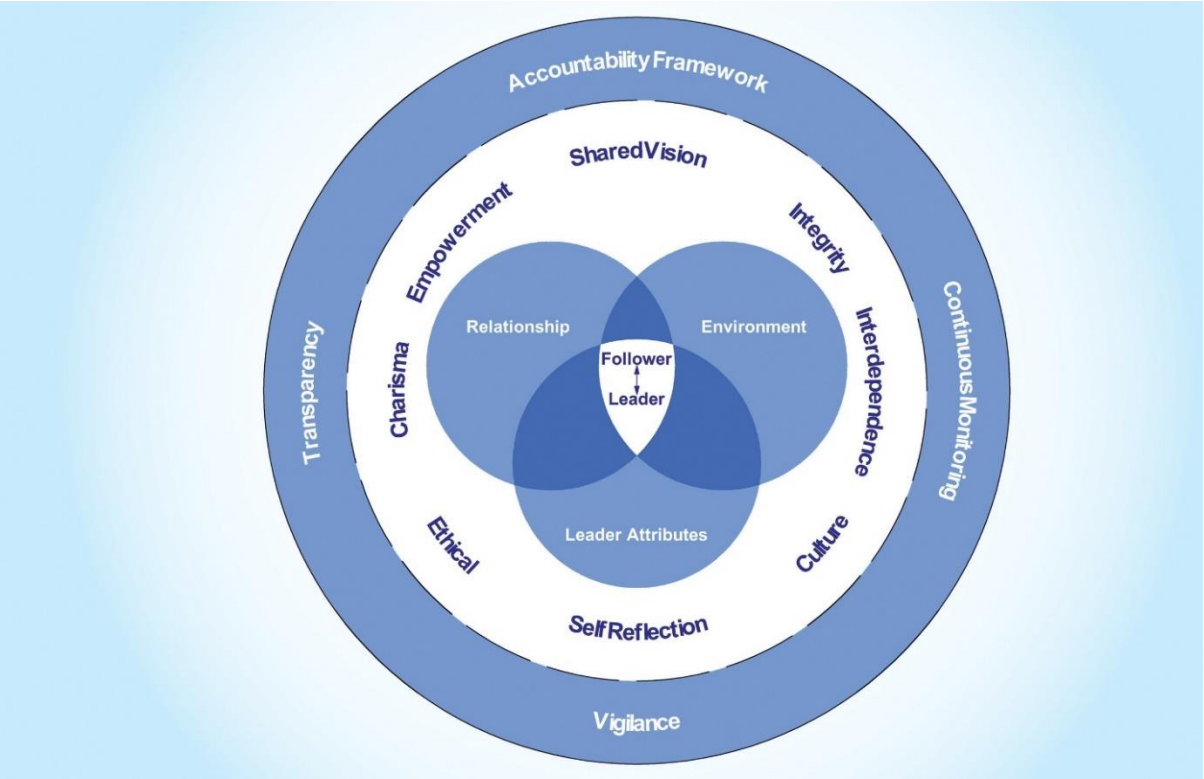

Figure 41 - Transformational Leadership Theory: what every leader needs to know (Source: https://doi.org/10.1016/j.mnl.2011.01.014)

Personality types

Although the latest studies show that the composition of teams, in terms of personality profiles, does not seem to predict team development very well, the same findings suggest that the Myers-Briggs Personality Types (MBPTI) may be used as an instrument for **personal development** and as a vehicle for group members to gain a better understanding of each other.

The **Myers-Briggs Personality Types** were developed by Katherine Briggs and Isabel Myers as an adaptation of **Carl Gustav Jung's theory of psychological types** from the 1920s. The assessment model started with the goal of assisting women entering the industrial workforce for the first time. Since then, it was further developed and popularized and, from 1975 onwards, it has become the **best-known and most used personality type assessment**.

In brief, the Myers-Briggs theory is based on **16 personality types**, which Jung viewed as **stereotypes**. Jung identified four preference points related to what type of person one prefers to deal with:

1. People and things (**Extraversion or *E***) or ideas and information (**Introversion or *I***).

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2. Facts and reality (**Sensing or *S***) or possibilities and potential (**Intuition or *N***).
3. Logic and truth (**Thinking or *T***) or values and relationships (**Feeling or *F***).
4. A well-structured lifestyle (**Judgment or *J***) or one that goes with the flow (**Perception or *P***).

Related to these personality types, the same authors developed the MMDI™ system, proposing **eight leadership styles** applicable to different situations, groups, or cultures.

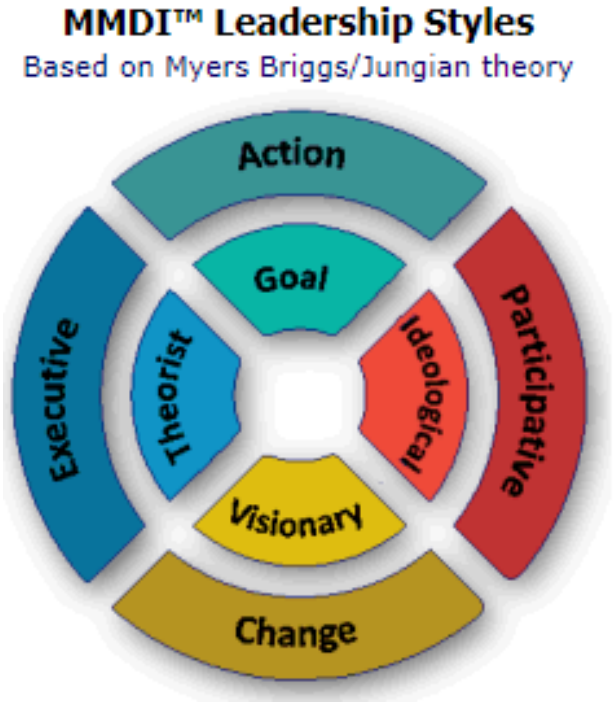

Figure 416 – MMDI Leadership styles
(Source: https://www.teamtechnology.co.uk/leadership/styles/)

The eight leadership styles of the MMDI™ system are described below:

Participative leadership

Participative leaders achieve through people, teamwork, and collective involvement in the task. They promote ownership amongst followers to make them feel jointly responsible for the decisions taken and the resulting achievements. Participative leaders make the group itself become the focus of the team, as the team members achieve through their **relationships and collaborative work**.

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Ideological leadership

Ideological leaders achieve through the promotion of certain ideals and values. They are founded on a **strong belief system** that is shared by the group. Ideological leaders make the group focus on supporting those beliefs or advocating the causes with which they are associated.

Change-oriented leadership

Change-oriented leaders achieve through the **exploration of new/better ways** of doing things or by trying to uncover the hidden potential in people, issues, or situations. They promote change based on a better future (even if they don't know yet what lies ahead) and then **learn from experimentation** where that potential might lie. Initiatives that succeed are pursued further to uncover even more potential.

Visionary leadership

Visionary leaders develop an **astute sense of the unknown** and can often envisage, in general terms, the various ways in which the organisation might respond to future challenges and help position the organisation to meet those challenges. They present a vision, a **direction**.

Executive leadership

Executive leaders achieve through the introduction of a structure in the ways things are done, such as creating an organisational structure, naming processes and procedures, identifying skills/competencies of people involved, etc. Executive leadership can lead, directly and/or indirectly, to the **development of a control structure** or a quality assurance process.

Theorist leadership

Theorist leaders try to **identify the best models** or explanations of how the organisation works and how it can improve its performance. They acknowledge the latest research about leadership theories and incorporate the winning ones into their understanding of how the organisation they are leading operates.

Action-oriented leadership

Action-oriented leadership involves acting and **leading through example**. These types of leaders achieve by focusing on the task at hand and its completion. Often other team members act as supporters of the action-oriented leader, who is the **prime achiever**.

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Goal-oriented leadership

Goal-oriented leadership involves setting clear, specific, and achievable goals. This type of leadership is based on experience/previous knowledge and characterised by a **realistic outlook**, taking into consideration the context in which the organisation operates, and the risks being taken. These leaders may establish a **hierarchy of goals** or define a step-by-step approach towards a long-term objective.

Students may be invited to try out this **personality/leadership test:** https://www.teamtechnology.co.uk/tt/t-articl/mb-simpl.htm. They may be asked to share their results to generate a discussion around personality types, the main characteristics of each type, strong points, how these personality types can fit into teamwork, and how to avoid conflict by acknowledging that each person has different characteristics (and this very diversity represents an added value inside a team, rather than a problem).

Leadership in action: when RMAs take the lead

Working for an R&I institution and/or for many of the different types of private and public actors that compose the R&I ecosystem, an **RMA can perform leadership roles**, such as leading the R&I management office, guiding a group of RMA colleagues in a particular task force or being the responsible for the management of an R&I project.
When looking at leading a team, it is important to understand the leadership processes and their development over time. In the article Leadership in Teams: A Functional Approach to Understanding Leadership Structures and Processes, McMorgeson et al. identify **15 leadership-driven operations**, divided into two mutually dependent phases of team activity: **transition phase** (planning activities) and **action phase** (towards goal accomplishment).

1. **Compose the team** – bringing together the **best available people for the job**, considering complementary competencies and ability to work together towards a common goal.
2. **Define the mission** – clarifying the team's **purpose.**
3. **Establish performance expectations** - setting appropriately challenging and motivating team **goals**.
4. **Structure and plan** – assigning tasks and responsibilities, **scheduling** and so on.
5. **Train and empower team members** – including **coaching sessions** performed by the leader.
6. **Sense-making** — defined as *identifying essential environmental events, interpreting these events given the team's performance situation, and communicating this interpretation to the team*.
7. **Provide feedback** – both to individuals and to the collective team.

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8. **Monitor the team** – examining the team's processes, performance, and external context.
9. **Manage team boundaries** – representing the team's interests to individuals and groups outside the team, both to protect the team from interference as well as to persuade others to support the team; coordinating activities with other teams.
10. **Challenge the team** – stimulating its performance, assumptions, and ways of working.
11. **Perform team tasks** – participating in, intervening in, or otherwise performing some of the team's task work.
12. **Solve problems** – diagnosing and resolving issues that prevent performance.
13. **Provide resources** – for example, information, equipment, finance, and people.
14. **Encourage team self-management** – empowerment, accountability, and responsibility.
15. **Support the team's sociality** – encouraging positive and supportive behaviours between team members

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Lesson 7: Oral presentations

Learning outcomes:

LO#1 - The student knows how to identify the activities in the light of the project objectives, outputs, main tasks, performance criteria and resource requirements set in the proposal.

LO#8 - The student will map the main internal and external actors' involvement across the project management stages and devise a strategy for their timely contribution to the implementation of the project (i.e., Stakeholder Management)

LO#9 - The student will be able to identify and measure the resources needed for project implementation (team and their time allocation, the physical and infrastructural resources needed, plus other needs) and integrate this information with a budget and a calendar plan (i.e., Project Management Plan).

LO#11 - The student will apply methodologies and tools for effective project management, including time, people, and tasks management, as well as reporting.

LO#12 - The student will be able to contribute to the identification and prioritization of the management, financial and legal issues to be addressed at different stages of the project life cycle (i.e., Project Integration Management).

LO#13 - The student can follow the development of several simultaneous management tasks (e.g., team management, cost management) and prioritize the most relevant ones at different stages of project management.

Case Study

In this lesson, students will be challenged to apply the knowledge and skills acquired in Module 3 - Lesson 1 by presenting a plan to **optimise their performance at the services/organisational level**.

Students will work in groups of four. A **consortium project** will be delivered as a **case study** to each group at the end of Module 3 - Lesson 2. The group must develop a plan that includes the different perspectives of the project lifecycle, from the awarding of funding to the establishment of a management plan, identifying the steps to follow, flagging important time points in the project, dealing with contract negotiation, budget distribution, CA, IP, etc.

In the end, this plan should mirror an ideal path to optimise the performance at the services/organisational level through a **strong and detailed strategy** leading to successful project completion.

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The work should be presented by all members of the team in a **10-minute presentation** followed by **5 minutes of open discussion**.

Module 4- Research Impact and Public Engagement

Main goal: To get familiar with the complex relations between research and societal actors and to get insights into facilitation approaches and roles played by the Research Managers and Administrators

Lesson 1: Impact - why does research matter?

Learning outcomes:

LO#1 - The student can understand the concept of research impact and the different areas of impact beyond academia

LO#2 - The student can distinguish between output, outcome, and impacts

LO#5 - The student will become familiar with and differentiate several RMA facilitation roles that add value to research (such as science communication, societal engagement, technology, and knowledge exchange)

LO#9 - The student can explain the benefits that impact-driven research can bring to the economy and society

LO#16 - The student can explore several paths to maximise research impact (for example by finding the ways to incorporate the most relevant 17 sustainable development goals into the research project).

Research Impact

When the definition of **research impact** is sought in the literature, a clear distinction can be found between **academic impact,** defined as the intellectual contribution to a field of study within academia and **societal impact**, looking at effects going beyond academia.
This separation can be justified by the fact that academic assessment was often split from the research impact reaching outside academia. Nowadays, research impact is acknowledged as **all-encompassing** and tends to include all the changes brought about through research.

Depending on the goals and objectives at stake, different organizations and stakeholders have provided focused **definitions of research impact,** such as:

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- the European Commission's Better Regulation Guidelines and related toolbox describe research impact as *all the changes which are expected to happen due to the implementation and application of a given policy option/intervention. Such impacts may occur over different timescales, affect different actors and be relevant at different scales (local, regional, national and EU). In an evaluation context, impact refers to the* ***changes associated with a particular intervention which occurs over the longer term***.
- the Research Excellence Framework REF UK defines it as ***an effect on, change, or benefit to*** *the economy, society, culture, public policy or services, health, the environment, or quality of life,* ***beyond academia***.
- according to the Australian Research Council's definition, *research impact is the* ***contribution*** *that research makes to the economy, society, environment or culture, beyond the contribution to academic research* .
- the US National Science Foundation defines it as *the* ***potential [of the research] to benefit society*** *and contribute to the achievement of desired society outcomes*.

Although most research impact definitions stress the positive effects of research, it has been argued that both positive and negative determination is subjective (what benefits one does not always benefit another). Albeit some **positive effects may turn out to have negative repercussions over time** (e.g.: long-term assessment of drugs may identify potentially negative effects for one's health).

Levels and scales of research impact

Research can have an impact at **different scales** (from individual research activities to institutional performance) and in **different areas**, such as:

- **Academic impact**
- **Cultural impact**
- **Economic impact** (contributing to cost savings, costs avoidance or increases in revenue, profits, or funding)
- **Environmental impact**
- **Social impact**
- **Impact on health and wellbeing**
- **Policy influence and change**
- **Legal impact**
- **Technological developments**

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Academic impact refers to the contribution that research makes in shifting the understanding and **advancing scientific knowledge**, method, theory, and application across and within disciplines.

Impact reaching areas outside academia embraces all the diverse ways in which **research-related knowledge and skills benefit individuals, organisations, and nations.**

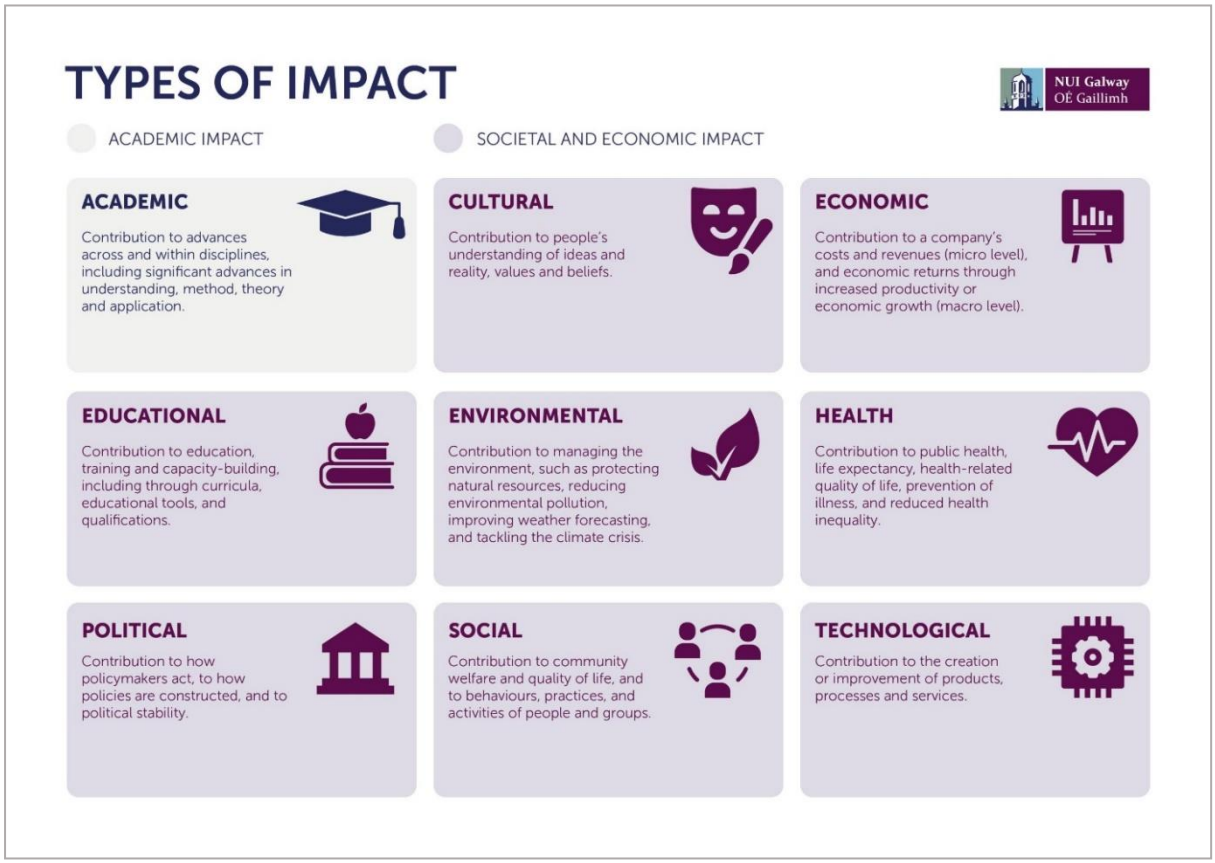

Figure 43 - Types of research impact
(Source: https://stories.nuigalway.ie/what-is-research-impact-/index.html)

For all areas of research impact effects can be of different natures:

- **conceptual**: contributing to the improvement of **knowledge** (e.g., understanding of policy issues, reframing scientific debates, etc.)
- **instrumental**: contributing to **influencing the development/amendment of practices** (e.g., influencing the development of policy, shaping legislation, etc.)
- **capacity building**: contributing to the development of **individual or collective competencies** (e.g., technical, and personal skill development of the research community, empowering research institutions with tools to improve research performance, etc.)

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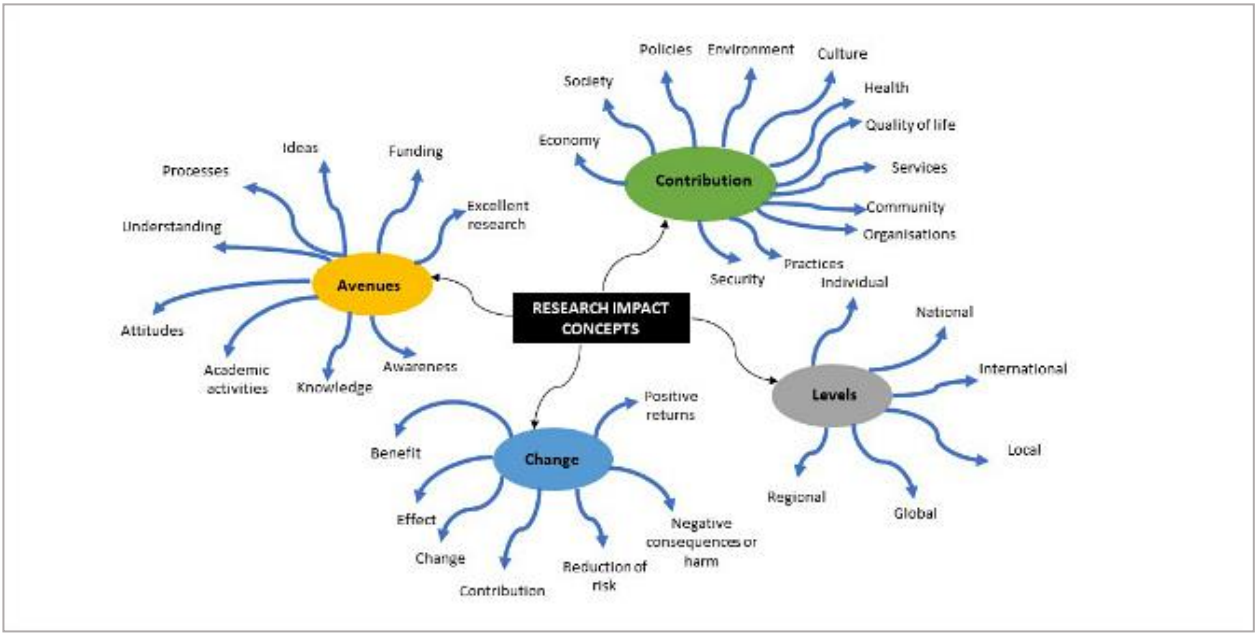

Figure 44 - What does research impact actually do?
(Source: https://www.methodspace.com/blog/concept-research-impact-pervades-contemporary-academic-discourse-actually-mean)

Major scientific achievements and impact case studies

Let's explore some **scientific achievements** revealing the different levels of research impact:

- Lists of major scientific achievements
  1. The 50 Greatest Breakthroughs Since the Wheel
  2. Timeline of scientific discoveries

- Several **science outreach** associations and magazines have selected the **major scientific achievements over the last 10 years**, such as National Geographic's Top 20 scientific discoveries of the decade or the Smithsonian Magazine article The Top Ten Scientific Discoveries of the Decade.

- Below are selected **science communication articles** providing an overview of some of these major discoveries:
  1. Astronomers Capture First-Ever Image of a Supermassive Black Hole.
  2. Editing genes: CRISPR genome editing.
  3. CERN Detects the Higgs Boson: The Higgs Boson.
  4. A vaccine and new treatments to fight Ebola: 'Make Ebola a thing of the past': first vaccine against deadly virus approved.

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5. New human relatives: A new species of Homo from the Late Pleistocene of the Philippines.
6. Climate change: The last five years were the hottest ever recorded
7. New space missions: Underground Lake of Liquid Water Detected on Mars.
8. Fossilized pigments reveal the colours of dinosaurs: The Colours of Dinosaurs Open a New Window to Study the Past.
9. 40,000-year-old cave art may be the world's oldest animal drawing.
10. Lock the Planck: the kilogram has a new definition.

On another level, **case studies of research projects' impacts** reveal significant and concrete influences on current research projects.

- **REF (Research Excellence Framework)** is the system for assessing the quality of research in **UK higher education institutions**; it provides a list of **2,200 impact case studies** that students can select according to their research subject area: https://impact.ref.ac.uk/casestudies/Results.aspx?Type=S&Tag=770
    - Fast Track Impact R&I company developed a study analysing 7 of these case studies and recognized **best practices and common errors**.
      Results and insights are available in the blog post 10 lessons from grant proposals that led to the most significant and far-reaching impacts and in the *Nature* article Writing impact case studies: a comparative study of high-scoring and low-scoring case studies from REF2014

Societal impact: the case of the UN Sustainable Development Goals

Society faces tough challenges such as **global inequality** and **climate crisis**, and the research community is especially called upon to collaborate and take action to overcome these global challenges. The **social responsibility of research** is thus paramount, with R&I institutions regarding **societal impact** as the core goal of their action in 4 areas: research, teaching, outreach, and operational level.

Adopted in 2015 as part of the **2030 agenda for sustainable development,** the United Nations defined **17 Sustainable Development Goals (SDGs)** and **169 associated targets** to identify areas considered of **critical importance for humanity** to achieve three very ambitious goals: end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.

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The UN Sustainable Development Goals 2030

- **Goal 1** - **End poverty** in all its forms everywhere.
- **Goal 2** - End hunger, achieve **food security** and improved nutrition and promote **sustainable agriculture**.
- **Goal 3** - Ensure healthy lives and promote **well-being** for all at all ages.
- **Goal 4** - Ensure inclusive and equitable **quality education** and promote **lifelong learning** opportunities for all.
- **Goal 5** - Achieve **gender equality** and empower all women and girls.
- **Goal 6** - Ensure availability and sustainable management of **water** and sanitation for all.
- **Goal 7** - Ensure access to affordable, reliable, sustainable, and modern **energy** for all
- **Goal 8** - Promote sustained, inclusive, and **sustainable economic growth**, full and productive **employment,** and decent work for all.
- **Goal 9** - Build resilient infrastructure, promote inclusive and sustainable industrialization and **foster innovation.**
- **Goal 10** - **Reduce inequality** within and among Countries.
- **Goal 11** - Make **cities** and human settlements inclusive, safe, resilient, and sustainable.
- **Goal 12** - Ensure **sustainable consumption** and production patterns.
- **Goal 13** - Take urgent action to combat **climate change** and its impacts.
- **Goal 14** - Preserve oceans, seas, and marine resources for sustainable development.
- **Goal 15** - Protect, restore, and promote sustainable use of **terrestrial ecosystems** (manage forests, combat desertification, halt and reverse land degradation and stop biodiversity loss).
- **Goal 16** - Promote **peaceful and inclusive societies** for sustainable development, provide access to **justice for all** and build effective, accountable, and inclusive institutions at all levels.
- **Goal 17** - Strengthen the means of implementation and **revitalize the global partnership** for sustainable development

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Figure 45 - UN Sustainable Development Goals 2030

Academia is clearly mentioned in the list of stakeholders present in target 52:

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*'We the peoples' are the celebrated opening words of the Charter of the United Nations. It is 'we the peoples' who are embarking today on the **road to 2030**. Our journey will involve Governments as well as Parliaments, the United Nations system and other international institutions, local authorities, indigenous peoples, civil society, business and the private sector, the **scientific and academic community** and all people. Millions have already engaged with and will own this Agenda. It is an Agenda of the people, by the people and for the people and this, we believe, will ensure its success.*

Following this clear **global call for action**, the **2030 UN Agenda** is currently an important **driver of public policy, including research policy**. As such, research funding at the national and international levels has aligned with this agenda. The R&I framework programme **Horizon Europe** has the SDGs as the backdrop for its **funding mission** to address a set of global challenges.

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Recognition of institutions/projects linking their achievements to the UN SDGs is promoted. As such, several impact measurements were developed to **rank institutions** regarding their contribution to SDGs, such as the Times Higher Education (THE) Impact Rankings involving universities. Here, the **impact on society** is based on the institutions' success in **delivering the United Nations' Sustainable Development Goals**. While impact rankings can provide interesting insights, impact assessment results may also incur bias. This aspect is tackled in the 2018 MIT Sloan article The Right Way to Support the Sustainable Development Goals - A company's support of the SDGs is not necessarily a proxy for doing good, which acknowledges how challenges and concerns related to the use of SDGs by companies can easily apply to R&I institutions as well.

Impact assessment

As impact implies change, to assess the impact we must be able to understand, identify and **assess the change** that has occurred. When we analyse a research activity, such as a research project, we can identify changes occurring at different levels and stages. As such, it is important to distinguish what has changed within the project's timeframe (outputs) and the impact this change has generated.

LERU (League of European Research Universities) provided the following list of **impact-related concepts** in its Impact and the next Framework Programme for Research and Innovation (FP9) study:

- **Input**: the **resources** a researcher, a research funder, or an institution spends in the research process (e.g.: people, infrastructure, money, etc.)
- **Research activities**: the research **work performed**, or the actions taken, as a result of research inputs (e.g., teams established, research undertaken, networking with stakeholders, etc.)
- **Output**: the **results of the research** activities (e.g., **publications**, conferences, new research lines, new interdisciplinary collaborations, new products to end-users, etc.)
- **Outcome:** the **changes that occur** as a result of a project/programme implementation, viewed in a more immediate term than the assessment of impact (e.g., contribution to **policy debates** or documents, strategy development, creation of **start-ups,** and spinoffs).
- **Impact**: ***Effect on, change or benefit to*** *the economy, society, culture, public policy or services, health, the environment, or quality of life, beyond academia* (HEFCE's definition used in REF).

Outcome vs. Impact

The LSE blog article What is the difference between an impact and an outcome? Impact is the longer-term effect of an outcome, and provides a concrete example of **the distinction**

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between outcome and impact. Below is an **output analysis** of an information and advice intervention programme on healthy eating, nutrition, and weight loss.

- **Example of outcome**: changes in body weight or body fat - *This is a direct, measurable, **objective change** brought about by engagements with nutritional information and advice*.
- **Example of impact**: increased sense of happiness and/or decreased sense of insecurity - *This is the effect nutritional information and advice had on the ability to make an informed choice, bringing **empowerment** or wider life experiences*.

In conclusion, to be able to achieve impact, **outputs must be converted into outcomes and, subsequently, into impact(s)**.

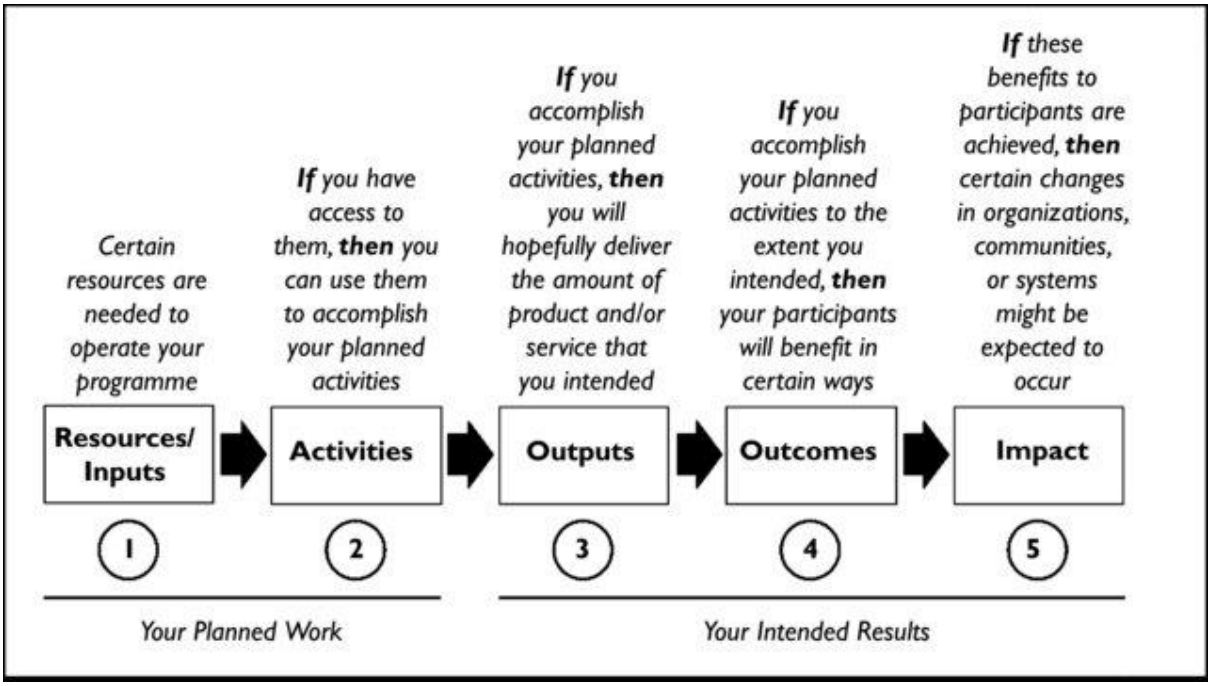

Figure 46 - A simple logic model ((W. K. Kellogg Foundation, 2004)

When to assess the impact (and why)?

Planning and assessing research impact are therefore a complex and multi-faceted phenomenon that requires a non-linear understanding and network-oriented processes of engagement with stakeholders beyond the academic community. Although researchers are requested to **plan and maximize their projects' impact**, doing this at the proposal stage is a very difficult task due to the level of **uncertainty and risk** which is inherent to research and its interaction with target audiences and stakeholders. At the same time, as **impact represents a long-term effect**, assessing it shortly after the research project's conclusion is an impossible task since only outputs and outcomes are available for assessment at that time.

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Looking at the implementation phase, ***delivering impact*** is also not an easy task. For this reason, tasks involved in this process are often planned in a very linear way, using **default activities (workshops, seminars)** and assuming **dissemination/communication leads** to impact; although, when foreseen impacts are too broad, these are not easily transferable to the realities of implementation.

Why, then, do we evaluate research impact? Impact assessment is a useful exercise since it helps researchers and institutions achieve (and learn to achieve) different goals. In Assessment, evaluations, and definitions of research impact: A review, Teresa Penfield et.al summarizes the usefulness of such an evaluation into four main concepts:

1. **overview performance**,
2. **inform funding decisions**,
3. understand the **pathways to maximize research impact**,
4. demonstrate to governments, stakeholders, and the wider public the **value of research**.

Another way to look at the topic is proposed by Paula Adam et al. in ISRIA statement: Ten-point guidelines for an effective process of research impact assessment, where the authors propose ***'Four As'* of research impact assessment** as the main reasons to assess impact:

- **analysis,**
- **allocation,**
- **advocacy,**
- **accountability.**

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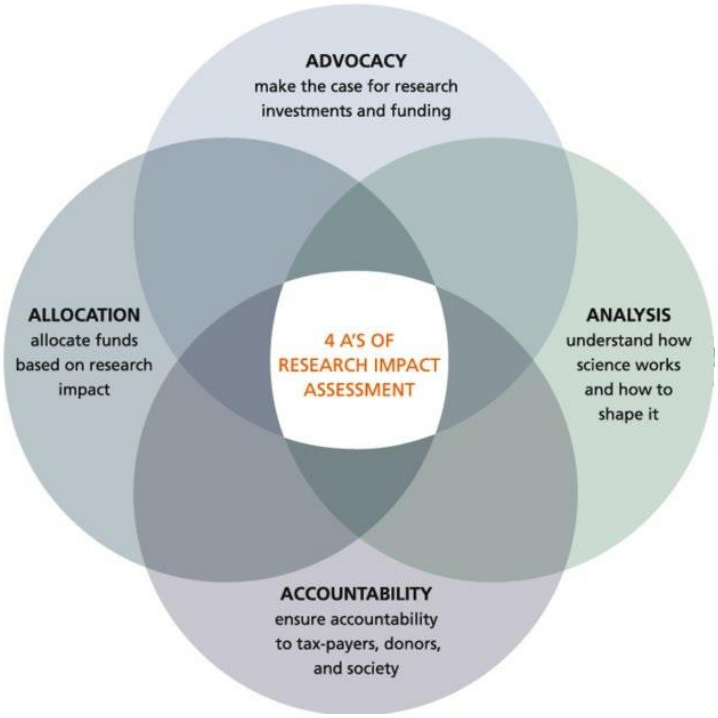

Figure 47 - The 4 A's of research impact assessment
(Source: https://www.researchgate.net/figure/The-Four-As-of-research-impact-assessment-advocacy-analysis-accountability-and_fig2_323024747)

The role of RMAs in promoting research impact

RMAs play an important role in all of these 'reasons' behind the use of impact assessment. For example:

- RMAs working in pre-award stages encourage researchers to think about and **identify potential areas of impact** and which **stakeholders to engage**, as well as provide support in the articulation of such elements in the writing of the research proposal.
- RMAs also act as **facilitators** and are involved in many **public engagement activities** (the focus of the next lesson).
- RMAs working in post-award stages also play an important role in monitoring and reporting the **Key Performance Indicators (KPIs)** of research impact.
- RMAs working in research strategy and policy provide important inputs to support the definition, monitorization, and assessment of impact at the institution and policy level, supporting the development of **strategic impact plans**.
- Transversely, as part of the research community, RMAs are big players in **advocating and lobbying for science.**

This lesson looks closely at the **RMAs' role in supporting researchers during the design of pathways/routes for impact**. For example, in the early stages, an RMA can help the researcher brainstorm and identify possible impacts (at varying levels and of different

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natures) and also map the activities required to achieve those impacts. Researchers often do not reflect on the **non-intended impacts** of their research activity/project, so it is important to promote the identification of possible negative impacts but also those non-intended.

A useful tool to map this potential impact, but also to explain how research plans will enable the anticipated impacts, is the **Theory of Change (TOC)**. TOC is a comprehensive description and illustration of how and why a certain change is expected to happen in a particular context. It starts by identifying the desired long-term goals and then looks back to select the activities that must be put in place for those long-term goals to be achieved. By identifying the link between activities and the major goal, this **mapping strategy** leads to a better overview of how change happens and, in turn, to better planning. It is important to stress the need to **think beyond the activities themselves**, to capture what those activities achieved: what difference they made for those participating and what did they provoke within their areas of operation.

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Lesson 2: Responsible Research and Innovation approach: the EU drivers for Impact

Learning outcomes:

LO#3 - The student can explain Responsible Research and Innovation (RRI) principles and practices in its main thematic elements: public engagement, open access, gender, ethics, science education, science communication and engagement, and impact.

LO#4 - The student can identify cross-cutting issues in a given project (e.g., ethical and gender issues) and identify different strategies to address them in different research projects.

LO#10 - The student can argue about the reasons for promoting accountability, responsibility, ethics, and integrity in research.

LO#11 - The student can contribute to the design of activities and instruments fitted to each of the RRI principles

While planning their research impacts, researchers and R&I institutions must consider the EU focus areas of impact defined in the **Responsible Research and Innovation Policy**. At the same time, addressing Responsible Research and Innovation (RRI) also means approaching impact by looking at how R&I meets the current social, ethical, and political demands.
This lesson explores RRI and the different aspects it involves.

Responsible Research and Innovation approach: a vision for research impact

Research and Innovation (R&I) have improved our world and our lives, and all evidence suggests they will continue to transform our future. Nevertheless, although research and innovation bring about positive impacts on societal development, R&I is **socially, ethically, and politically entangled** and, as such, it may have potentially widespread, uncertain and **unpredictable social effects**. Since R&I developments can generate a certain level of **new risks and ethical dilemmas**, with an impact on citizens, several policy meetings, research groups, projects, and networks around the world have highlighted the need to **conceptualize and implement responsible R&I**.

The term **responsible development** was first used back in 2003, in the US Act about nanotechnology development, and, in 2009, in Europe, by the Netherlands Organization for Scientific Research (NWO). Since then, many efforts have been put in place worldwide, leading to the EU Programme for Research and Innovation 2014-2020 (*Horizon 2020*) approach called *Responsible Research and Innovation (RRI)*. EU definition: cf:

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Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations concerning research and innovation, intending to foster the design of inclusive and sustainable research and innovation.

The RRI approach aims at diminishing the **gap between science and society** which implies that societal actors (such as researchers, citizens, policymakers, companies, and civil society organisations) work together in the whole research and innovation process to better align both the process and its outcomes with the values, needs, and expectations of society. RRI aims to promote the development of **ethically acceptable, sustainable, and socially desirable research and innovation outcomes**. This has become, from Horizon 2020 onwards, a guiding principle for the European Research Area.

Although the RRI concept is recently gaining momentum, general agreement on its definition, contents, and details is still missing. On this aspect, it is important to reference the EU-funded project MoRRI: Monitoring the Evolution and Benefits of Responsible Research and Innovation, having the main objective of providing scientific evidence, data, analysis, and policy intelligence to directly support the Directorate General for Research and Innovation's (DG-RTD) research funding and policy-making activities concerning Responsible Research and Innovation (RRI).

To tackle this policy approach, RRI acts on different aspects of the **relationship between R&I and society**:

- **public engagement,**
- **open access,**
- **ethics,**
- **gender,**
- **science education,**
- **science governance.**

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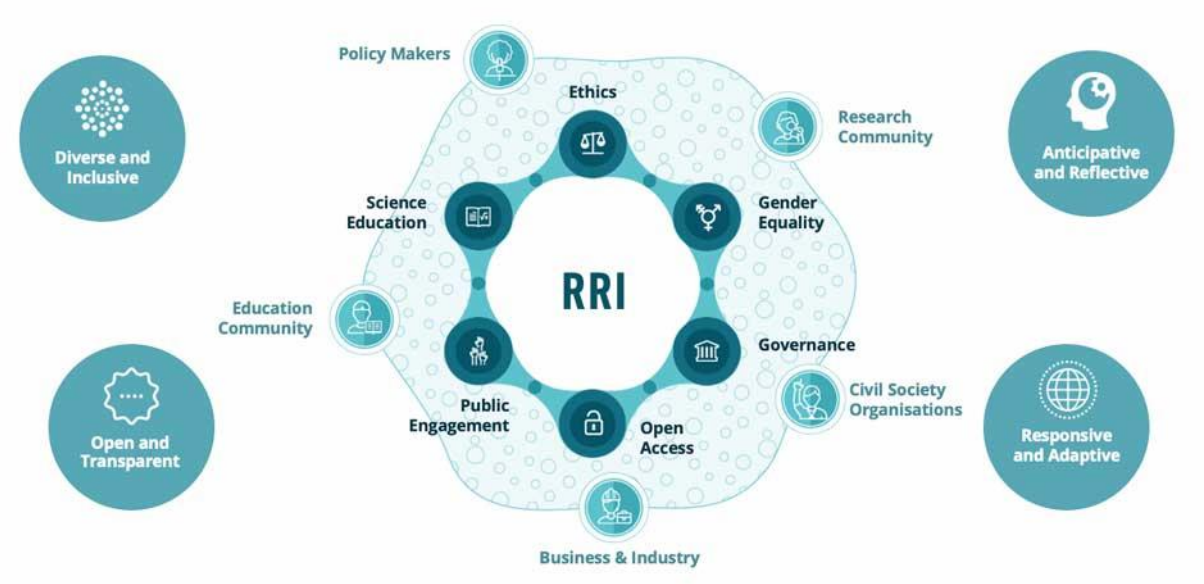

Figure 48 - EU RRI Tools project
(Source: rri-tools.eu)

Each aspect is described below, along with a selection of case studies representing the best practices that aim to provide a concrete vision of each RRI element.

The **role of RMAs** in the accomplishment of each of these **RRI elements** is also relevant, as they:

1. **provide technical support** for researchers and institutions in RRI,
2. **train the research community** to enrol in such activities,
3. **advocate, raise awareness** and contribute to developing such policies within the institutions,
4. **monitor** such practices and policies.

Public engagement (PE)

This RRI challenge involves bringing new voices and creative perspectives into R&I design and results, aiming specifically at:

- contributing to a **more scientifically literate society**, able to support democratic processes and R&I developments;
- fostering R&I outcomes that are more focused on **tackling societal challenges**.

In brief, RRI seeks the **democratization of science and research**.

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Approaches to engagement with the public have been evolving over the last two decades, from ***Promoting the Understanding of Science*** (**one-way communication** of research results to the audience) to the ambitious concept of ***Publicly Engaged Science and Innovation*** (where public engagement is the strategy that allows **inputs from the participants**). In the public engagement process, both citizens and scientists have a say on the discussed subjects.

While 'public engagement' is a commonly understood concept, it is still unclear how to engage the public, how to deal with contradictory positions between the different audiences (including researchers), and at what stages of R&I the public should be involved. Public Engagement in Responsible Research and Innovation: A Critical Reflection from the Practitioner's Point of View is a doctoral thesis that, besides providing a literature review on the matter, develops an empirical study of these topics in action, highlighting some of the challenges tied to practical implementation. It is also particularly relevant because it addresses the issue of **practitioners (RMAs who are responsible for public engagement activities)**.

Public Engagement case studies

- https://www.publicengagement.ac.uk/do-engagement/inspire-me/case-studies
- https://ec.europa.eu/research/swafs/index.cfm?pg=policy&lib=engagement

Role of RMAs

RMAs involved in public engagement activities have a dual role: they act as **moderators** between the different actors (e.g., civil society organisations, public representatives, and individual citizens) and are also responsible for the whole **engagement process**.
They must master **communication skills** as well as **conflict management** and creative **problem-solving**, while understanding the policy context, the political processes and the types of knowledge with which political actors and institutions engage, including their ability to communicate effectively (Powell & Colin, 2009). Open University's description of these RMA points to people *who can actively listen by connecting meaningfully with people from different academic disciplines and roles, and with multiple external stakeholders*. *This role also requires analytical and rhetorical skills to filter ideas and construct arguments that work in particular contexts. At times, this may require flexibility, adaptability, tact, and diplomacy; at other times, a progressive vision might be required* (Holliman et al., 2015, p.13).

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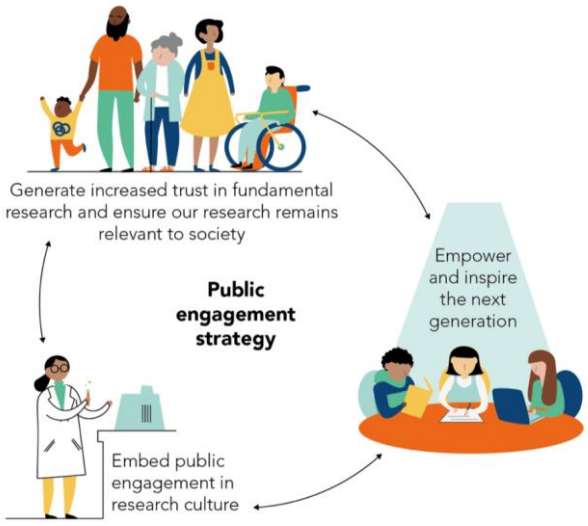

Figure 49 - Public Engagement strategy
(Source: https://www.gurdon.cam.ac.uk/public-engagement/public-engagement-strategy/)

Open Science (+ Open Access)

Open Science is based on the evidence that **making scientific results more accessible** will improve science's overall contribution and boost the development of **new products and services** in the public and private sectors. It is also based on the sociological argument that scientific knowledge is a **product of social collaboration,** and its ownership **belongs to the community** and on the economic argument that **scientific outputs** generated by public research are a **public good** that everyone should be able to use at no cost.

By openly sharing R&I knowledge among the whole scientific community, but also with society and companies, Open Science aims to increase the recognition of science and maximise its social and economic impact. In 2012, the **European Commission** issued a clear recommendation encouraging all EU Member States to **share public-funded research results with the public sphere** and, in 2016, published the book *Open Innovation, Open Science, Open to the World - A Vision for Europe*, developed under the leadership of Carlos Moedas, the EC Commissioner for Research, Science, and Innovation at the time. Here, the European Commission provides the following definition of Open Science:

A new approach to the scientific process is based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools.

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Other definitions of Open Science include the OECD definition: *to make the primary outputs of publicly funded research results – publications and research data – **publicly accessible in a digital format** with no or minimal restriction*. Nevertheless, while Open Science encompasses **open access to data and publications**, it also represents the openness of the scientific process, on the whole, reinforcing the concept of RRI. As the Open Science and Research Initiative highlights, Open Science integrates several ***open* movements** (such as open access to publications, open research data, open source software, open collaboration, open peer review, open notebooks, open educational resources, and open monographs), **citizen science** and **research crowdfunding**. The **openness** to the scrutiny of science and scientific practices by the citizens, who may access data and take part in R&I discussions, intends to stimulate **public trust in science**, a major goal of RRI.

Open Science concepts can be extended to the whole project lifecycle, as exemplified in Figure 50.

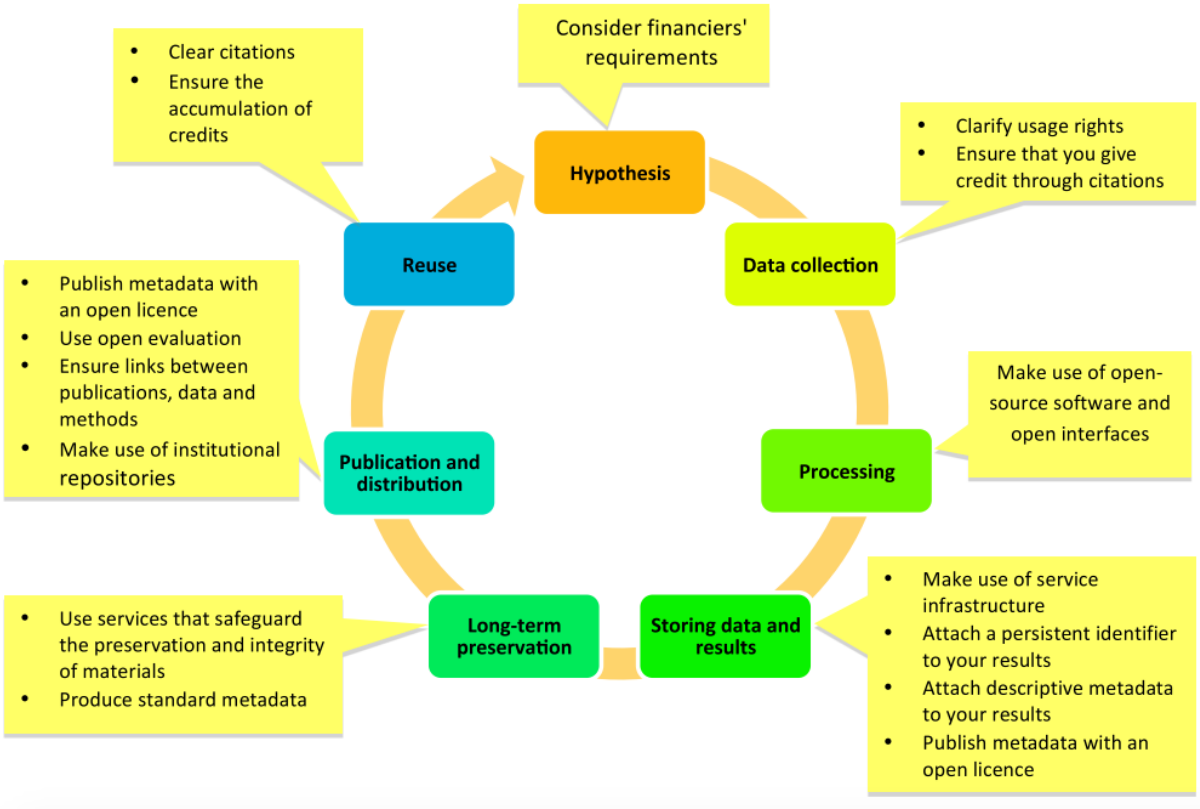

Figure 50 - Open science throughout the project lifecycle
(Source: Open Science and Research Initiative, 2014)

In all R&I projects funded by the European Commission, as set out in the European Code of Conduct for Research Integrity, providing sound and **FAIR data** (**Findable, Accessible,**

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Interoperable and Reusable) is an essential part of good research practice and **research integrity**. For more information, see the section below on Data Management.

Open Science case studies

- Facts and Figures for open research data and case studies related to accessing and reusing data generated during scientific production
- UK Open Research Data Task Force: case-studies
- Case studies on Open Science in the context of ERC projects - 5 sets of case-studies

Role of RMAs

Research and Innovation institutions have the responsibility to create an **enabling environment for open data**, with RMAs playing an important role in:

- effectively **training and supporting** the evolving information needs of researchers,
- providing **support to the infrastructures** to share publications, articles or data,
- **advocating, raising awareness and contributing** to developing open-access policies within the institutions,
- **carrying out and monitoring Open Access policies**.

As such, the EU-funded project Foster Plus (Fostering the practical implementation of Open Science in Horizon 2020 and beyond) highlights the following RMA-powered tasks on this matter:

- advise on **preserving research outputs** (e.g., publications) and **project records** (e.g., correspondence);
- contribute to the development and governance of **repositories** of publications and data, regarding an appraisal, selection, description and metadata application, curation and preservation; information retrieval; monitoring data reuse, citation and impact, etc.
- support researchers in complying with the various mandates of funders, including **open access requirements**;
- assist researchers in the **identification of potential funders** for Open Science activities;
- provide **advice and training in data management, preservation and analysis** to assist researchers in **opening and sharing their research workflows** and reusing research outputs produced by others.

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Ethics (+ Data Management)

Ethics in the RRI approach includes all ethical issues which may arise from the beginning to the end of the research lifecycle. It represents the **commitment to ethical research conduct**, which implies the application of fundamental ethical principles and legislation to scientific research in all possible domains.

All R&I activities are obliged to **comply with ethical norms and principles**. The US National Institute of Environmental Health Sciences (NIEHS) highlights the relevance of such norms since they:

- **promote the nature of the research purpose:** search for knowledge, truth, and avoidance of error;
- **promote the essential values for collaborative work**, such as trust, accountability, mutual respect, and fairness, which are especially relevant for cross-discipline and cross-institutional cooperation and coordination;
- **make researchers accountable** for their research practices, boosting public support for research;
- **integrate a set of important moral and social values**, such as social responsibility, human rights, animal welfare, compliance with the law, and fulfilment of public health and safety, which are especially relevant as some research activities may potentially harm human and/or animal subjects, students, and the public.

Research integrity

Related to ethical principles is the concept of **research integrity,** which refers to developing research in such a way that allows others to have **trust and confidence** in the methods, findings, and publications that result from this research. According to the European Code of Conduct for Research Integrity, this means complying with the **4 main principles** below.

1. **Reliability** in ensuring the quality of research is reflected in the design, methodology, analysis, and t use of resources;
2. **Honesty** in developing, undertaking, reviewing, reporting, and communicating research in a transparent, fair, full, and unbiased way;
3. **Respect** for colleagues, research participants, society, ecosystems, cultural heritage, and the environment;
4. **Accountability** for the research, from idea to publication, including its wider impacts; accountability for research management and organisation, including training, supervision, and mentoring aspects.

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Figure 51 - 4 fundamental principles of research integrity
(Source: http://www.eurodoc.net/news/2021/integrity-transparency-openness-key-issues-for-european-research)

Besides the application of fundamental **ethical principles** by researchers and their institutions, **ethical research conduct** also involves compliance with ethical norms and principles **specifically related to the R&I activity** in question. Although this obligation is mostly linked to **medical research** - which has a longer ethical history, beginning in 1964 with the declaration on research ethics by the World Medical Association - research ethics principles are of crucial importance for any field of research.

12 golden rules to ethical research conduct

In the document Ethics for Researchers - Facilitating Research Excellence in FP7, the European Commission identified **12 Golden Rules for Ethical Research Conduct**. The researcher must ensure that his/her research:

1. Respects the integrity and **dignity of persons** (this intrinsic worth protects them from being used for greater perceived benefits).
2. Follows the ***Do no harm* principle**. Any risks must be communicated to the subjects involved.
3. Recognizes the **rights of individuals** to privacy, personal data protection, and freedom of movement.
4. Honours the requirement of **informed consent** and continuous dialogue with research subjects.
5. Treats animals with respect and works under **humane conditions** before, during, and after the research.

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6. Designs animal research following the **3 Rs**: Replacement, Reduction, and Refinement.
7. Respects the principle of **proportionality**: not imposing more than is necessary on the subjects or going beyond stated objectives (mission creep).
8. Treats **societal concerns** seriously - a researcher's first obligation is to listen to the public and engage with them in a constructive dialogue, transparently, honestly and with integrity.
9. Tries to prevent being openly available for **misuse or malignant dual use** by terrorists or military organisations.
10. Recognises the **wholeness of an individual** and that any modification (genetic or technological) does not interfere with this principle.
11. Respects **biodiversity** and do not impose irreversible change that threatens the environment or **ecological balance**.
12. Builds on the understanding that any benefits are for the **good of society**, and any widely shared **expressions of concern** about threats coming from his/her research must be considered (with the acceptance that, perhaps, certain research practices might have to be abandoned).

The above principles are legally converted and linked to specific domains of research both in EU and international legislation. Examples are the EU Clinical Trials Regulation, the Code of Ethics of the International Sociological Association, or, with a broader scope, the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights.

During the application to an R&I EU-funded programme, researchers are requested to identify any ethical issues related to the project and, if any ethical issues* arise, to **complete an ethics self-assessment**. *Ethical issues are categorised into 11 macro groups:

1. Human embryos & foetuses
2. Human beings
3. Human cells or tissues
4. Personal data
5. Animals
6. Non-EU countries
7. Environment, health & safety
8. Dual-use
9. Exclusive focus on civil applications
10. Potential misuse of research results
11. Other ethics issues

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The funding proposals that identify ethical issues are then submitted to an **ethics Review process**.

Ethics dumping

Another key concept related to ethics is **ethics dumping**, which is the exportation of non-compliance research practices **outside Europe**. This issue is particularly relevant in the current era of **globalization of research activities**, where EU organisations develop their work outside the EU and where **international science collaboration and diplomacy** are needed.

Ethics and Data management

During the implementation of most Research and Innovation (R&I) projects, it is necessary to collect, preserve and disseminate data. **Managing data ethically** is critical for maintaining participants' confidentiality and privacy. In R&I projects funded by the European Commission, the researcher must submit a **Data Management Plan (DMP)** within the first 6 months of the project. A DMP details the procedures for the collection, storage, use, re-use, access, retention and destruction of research data. The Commission provides a DMP template that can be used for this purpose.

Regarding ethics, it is in this DMP that the researcher must answer the following questions:

- *Are there any **ethical or legal issues** that can have an impact on data sharing?*
  These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and the ethics chapter in the Description of the Action (DoA).
- *Is **informed consent** for data sharing and long-term data preservation included in questionnaires dealing with personal data?*

Data management according to FAIR principles (Findable, Accessible, Interoperable and Reusable) is closely linked to the concept of Open Data and, in the end, to Open Science.

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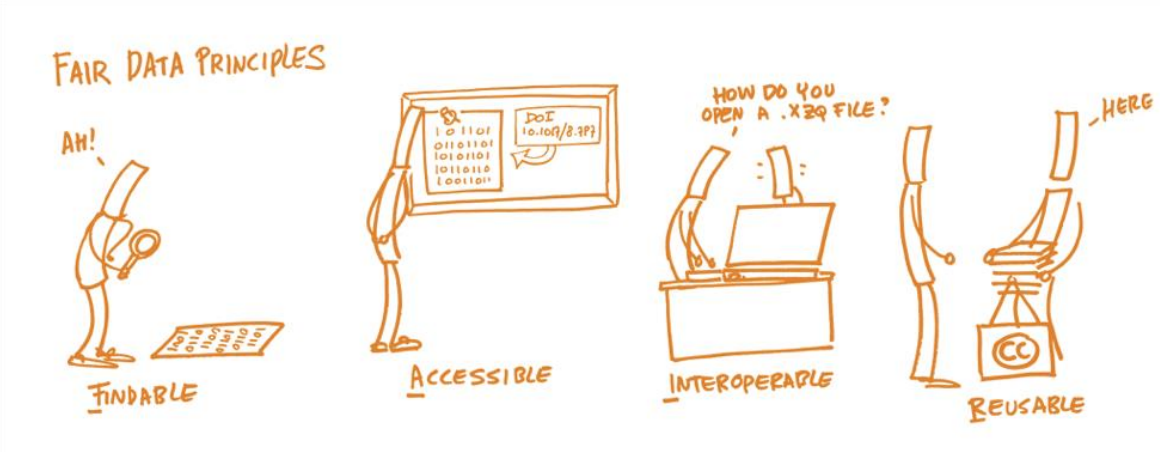

Figure 172 - FAIR principles
(Source: https://www.openaire.eu/how-to-make-your-data-fair)

Ethics case studies

- The European Commission provides other important guidelines in Ethics for researchers: Facilitating Research Excellence in FP7
- 3 case studies on ethical dilemmas and research misconduct (in the USA)
- TRUST report on ethics dumping

Role of RMAs

Even if not directly involved in the actual research process, RMAs have an important role in promoting RRI in their institutions by:

- working in compliance with a **core of ethical principles** (for example see the National Council of University Research Administrators (NCURA) Statement of Principles;
- **identifying real and potential ethical issues** related to research activities (at the level of planning and implementation of a research project, but also in daily research activities at the institution).

Related to this, Boston College has developed the online program called Administrators and the Responsible Conduct of Research with 5 modules devoted to specific case studies of ethical issues for a series of RMA tasks related to:

- Conflict of Interest
- Financial Management
- Mentor-Trainee Responsibilities
- Collaborative Research
- Data Management

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Gender

The target of promoting **gender equality** in the EU was laid out in the 2012 European Commission's Communication for a Reinforced European Research Area (2012). Specifically, regarding R&I, it encloses 3 objectives:

1. Integrating the **gender dimension in the R&I context** (i.e., analysing and taking into consideration the possible differences between men and women, boys and girls, or males and females, in the **R&I subject analyses**);
2. Promoting **equality in scientific careers** (i.e., aim for a 50/50 participation in project scientific teams and management structures);
3. Fostering **gender balance in decision-making** (for example, closing the gap in the participation of women in panels or advisory groups).

In 2015, the Council Conclusions on Advancing gender equality in the European Research Area highlighted the need to **promote institutional change on this matter** namely at the R&I and Higher Education institutions. This recommendation stems from strong evidence pointing to how R&I institutions, as in many other areas of society, reproduce social values leading to **gender bias and discrimination**. In this respect, the European Institute of Gender Equality identified various institutional challenges regarding the promotion of **Gender Equality in Academia and Research** that justify the need for this cross-cutting issue.

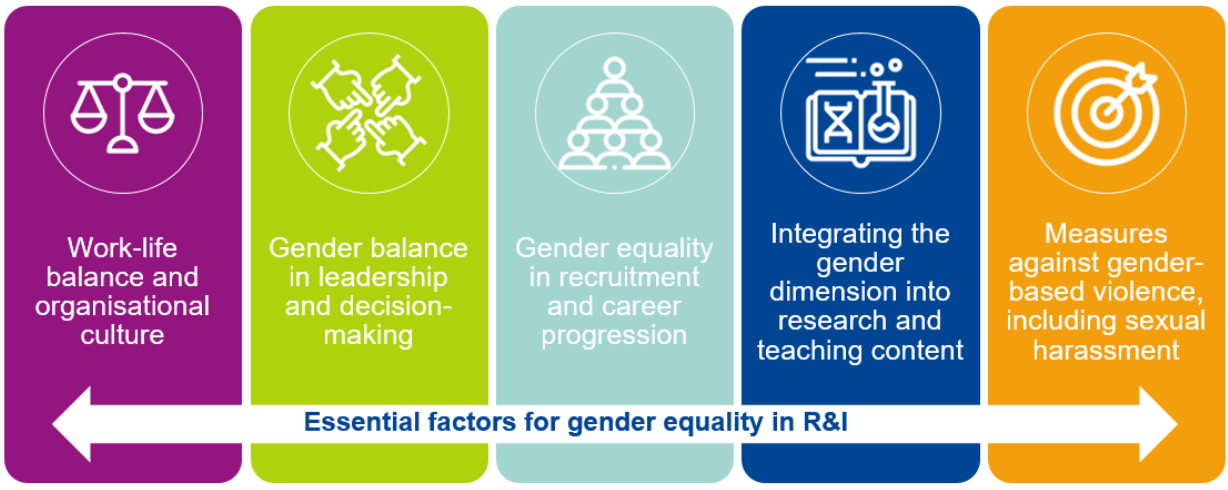

Figure 53 – Gender equality in academia and research
(Source: https://eige.europa.eu/gender-mainstreaming/toolkits/gear/what-gender-equality-plan-gep)

Gender case studies

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The Gendered Innovations project, from Stanford University, provides case studies as concrete illustrations of how sex and gender analysis leads to innovation: http://genderedinnovations.stanford.edu/fix-the-knowledge.html

Role of RMAs

RMAs can play an important role in supporting researchers in **the integration of the gender dimension** in their ongoing research activities/projects and in **applying a gender-sensible approach** when conceiving new activities/projects.

- GARCIA project (*Gendering the Academia and Research: combating career instability and asymmetries)* developed a Toolkit for Integrating a Gender-Sensitive Approach into Research and Teaching targeting researchers, teachers, and RMAs. It provides a thought-provoking checklist that RMAs can use to promote a reflection on the level of gender sensitivity within the research team and to **guide gender-sensible planning** of new research projects. This checklist intends to support researchers through 3 main steps:
    - Step 1: How to design gender-sensitive research/course content.
    - Step 2: How to apply a gender-sensitive theoretical/methodological structure.
    - Step 3: How to produce gender-sensitive outcomes.

Science Education

In the 2014 report, *The future of Europe is Science*, the European Commission highlights how **science is a powerful tool for shaping the future of Europe** and showcases how science education has an important role in breeding future scientists. With a decreasing number of young people interested in scientific topics and careers, science education has been on the EU agenda, and that of national science and education authorities, for some years and it is a top priority in the current R&I Framework Programme.

Science education's priority within the RRI scenario is thus related to the need for an **improvement of science and technology literacy** in society, including the urgency of promoting audiences receptive to **STEM disciplines** (Science, Technology, Engineering and Mathematics). To make science more attractive to young people, who could potentially pursue STEM careers, innovation in several areas and involvement of different actors in science education (from formal to informal education, from curriculum to teaching methods), is paramount. To this purpose, the European Commission highlights the need to increase the involvement of the following areas and actors:

- different levels of the education system,

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- universities and other higher education establishments,
- research and innovation funding and performing organizations,
- civil society organizations and NGOs,
- industry,
- policymakers,
- professors,
- teachers,
- students and pupils,
- science museums and science centres.

Science education plays an important role not only in shaping future scientists but also in developing the **science literacy tools** for all social actors to participate in the R&I process.

Figure 54 - Infographics: Increasing achievement and motivation in mathematics and science learning in school (Source: https://eurydice.eacea.ec.europa.eu/publications/mathematics-and-science-learning-schools-2022)

Science Education case studies

The 2015 EU report SCIENCE EDUCATION for Responsible Citizenship (Chapter 7) provides a list of interesting practices promoting responsible science education.

Science Governance

Governance is an **umbrella term** for activities, from the individual to the institutional level, aimed at **fostering sustainable change toward Responsible Research and Innovation**, both within institutions and towards other stakeholders. The main goal is to **'open up' policy-**

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making and institutional practices to make them more inclusive, transparent and accountable.

The 2001 European Commission White Paper on European Governance identifies **five requirements of good governance**:

1) openness,
2) participation,
3) accountability,
4) effectiveness
5) coherence.

In the context of RRI, the EU Project RRI Tools provide the following insights for governance:

- **Collective responsibility** for the impact of R&I,
- **Participatory governance** to cope with new and unexpected challenges,
- **Transparent** and reflective procedures,
- **Accountability** and responsiveness towards society,
- **Anticipation** of unintended consequences from R&I.

Governance case studies

- RRI Tools provide a list of 'inspiring practices' of RRI governance initiatives and projects: https://www.rri-tools.eu/governance
- Regarding Open Science governance, the EU project FIT4RRI produced a set of useful Guidelines on governance settings for responsible and open science targeted to different audiences, including RMAs.

Role of RMAs

Bringing RRI inside institutional practices will also require the involvement of RMAs, as they actively participate in the development, application and evaluation of such practices and policies within their institutions. Often RMAs are involved in the process of decision-making or, indirectly, in providing information to support such decisions.

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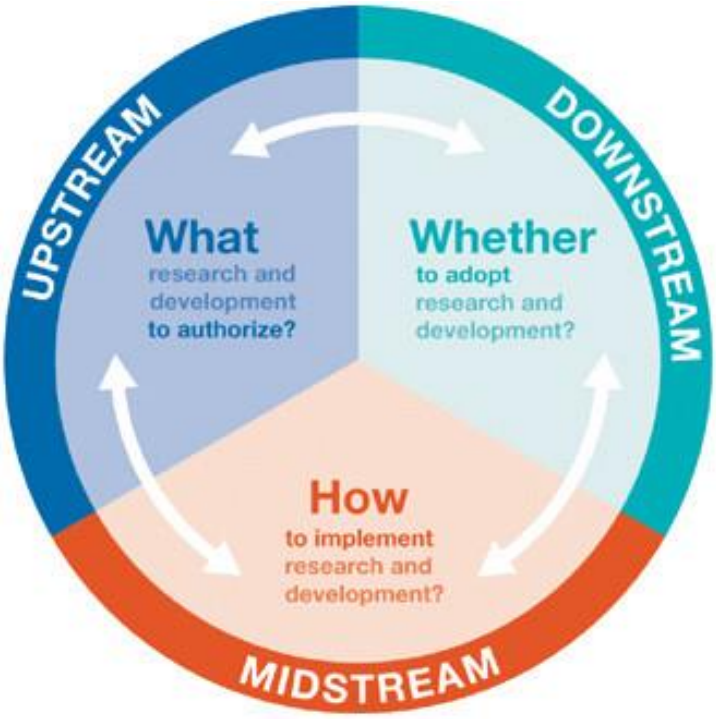

Figure 55 - Stages in the governance of science and technology (Source: https://www.researchgate.net/publication/24401386_Lab-scale_intervention_Science_Society_Series_on_Convergence_Research/figures?lo=1)

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Lesson 3: Pathways to impact: planning a strategy for public engagement

Learning outcomes:

LO#5 - The student will become familiar with and differentiate several RMA facilitation roles that add value to research (such as science communication, societal engagement, technology, and knowledge exchange).

LO#7 - The student is aware of the major elements and characteristic features of a research engagement plan and the key performance indicators.

LO#8 - The student will be able to map the different target stakeholders and their roles at different stages of the research project

LO#13 - The student can select the engagement strategies, platforms, and communication styles suited for each target audience.

For a research activity/project to have an **impact beyond academia** developing top research is not enough. Depending on its overarching goals, the potential beneficiaries and stakeholders should be engaged throughout the whole project lifecycle to maximize its impact. Thus, defining the **pathways to impact** means shaping a **public engagement strategy** for the design, implementation, and dissemination of research**.**

Empowering citizens through multiple engagement activities

Public engagement is a fundamental factor to multiply research impact as it focuses on **co-creating the future** with citizens and civil society organisations, bringing together actors who would not normally interact with each other in research contexts. To do so, the promotion of continuous and **inclusive participatory dialogues** among a wider number of actors, throughout the research activities, is needed, along with a mutual understanding and shared co-creation of R&I outcomes and policy. Public engagement is, by definition, a **two-way process**, able of **empowering citizens** to perform evidence-based actions, influence research policy and decision-making, promote research impact, and also raise the visibility of the researcher, developing his/her transferable skills (such as communication, negotiation, cultural awareness, etc.).

Researchers are requested to demonstrate their expected research (project) impact early on, during the application stage, and define ways to maximize it. As such, shaping and designing a **public engagement strategy,** that includes **multiple engagement activities** feeding into one another, is essential to power the greatest possible impact.

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To design a solid path, leading to impact, researchers must answer the following questions:

1. **PURPOSE**: **Why** engage the public?
2. **STAKEHOLDERS**: **Who** might benefit from this research?
3. **PROCESS**: How to engage and **when**?
4. **EVALUATION**: **How** to assess the success of public engagement strategies/activities?

In this lesson, we will take a closer look at these four necessary steps to draw up an effective research impact plan.

1. PURPOSE: Why engage the public?

Public engagement is multi-faceted, involving a variety of strategies, such as outreach, patient involvement, collaborative research, citizen science, participatory arts, lifelong learning, community engagement, and engagement with partners. To define what strategy fits the project, the researcher must clearly define the purpose of such engagement: **what do I want to achieve?**

The UK National co-ordinating centre for Public Engagement identifies six main categories of purpose for public engagement:

- **Sharing** what we do (inspiring, informing)
- **Responding** (to societal needs/requests)
- **Creating knowledge** together/Doing research together (collaborating, innovating)
- **Applying knowledge** together (collaborating, innovating)
- **Learning** from others (consulting)
- **Changing** attitudes/behaviour

Another approach is proposed by **Engage2020**, a project funded by the European Commission (DG Research) looking at research, innovation, and related activities to explore how members of society are involved today and how they could be in the future. In its Deliverable 3.2 Public Engagement Methods and Tools, Engage2020 proposes the following **levels of public involvement** (based on the purpose of the action):

1. **Dialogue**: aims to improve the **'three-way' communication** between scientists, policymakers, and citizens to ensure a regular exchange of views.
2. **Consulting**: aims to obtain **public feedback** for decision-makers on analysis, alternatives, and/or decisions.
3. **Involving**: aims to work directly with the public throughout the engagement process to ensure that **public concerns and aspirations** are consistently understood and considered in decision-making processes.

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4. **Collaborating**: implies **partnering with the public** in each aspect of the decision, including the development of alternatives and the identification of the preferred solution.
5. **Empowering**: this happens when the involved **participants acquire certain skills/knowledge** in the process of engagement.

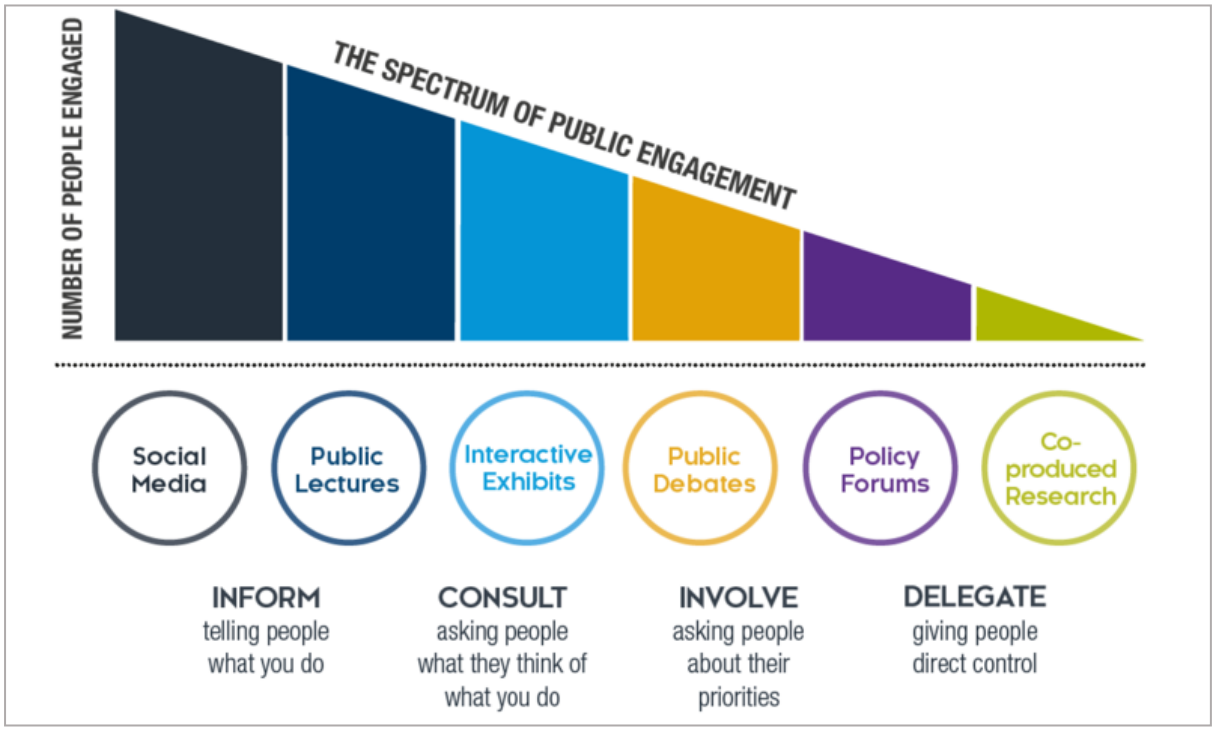

Figure 56 - Different purposes for public engagement
(Source: https://www.hw.ac.uk/uk/research/engage/engaged-research.htm)

Before selecting the adequate audience (step 2- Stakeholders) and activity (step 3- Process), the researcher needs to have a **broader picture of the research subject** beyond academia (= where they want to act). NHS Public engagement: a practical guide identifies an important task to address. At this stage, the researcher and/or RMA must **scan what is being said about the project subject** in news media, public statements, websites, social media, blogs, and forums and, if relevant, in advertising, policy documents or reports. This review is instrumental to draw a more concrete picture of where people are starting from when they engage with the issue, and also to locate the actors you need to engage.

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2. STAKEHOLDERS: Who might benefit from this research? How would they benefit from this research?

After defining the purpose of the public engagement plan, the next step is to identify who are the stakeholders to engage and why. Understanding the different **audiences' needs** is essential to promote the quality and effectiveness of the public engagement plan.

Although it is tempting to target the audience as the "general public', this generalization does not help develop **quality targeted engagement activities**. As such, it is necessary to identify the **particular interest groups** or **specific segments of society** to which the research is relevant or likely to appeal. Taking a step back, to **understand the potential impact of the research activity/project** in question will help focus on the people to reach and involve.

1. What could be the change spurred **beyond academia** (even if on a small scale)?
2. What **new insights** will potential beneficiaries gain and how can they use them?
3. What current or **emerging debates** does the research contribute to?

Breaking the public down into **different categories** such as age, gender, ethnicity, location or interests may help narrow down the target audiences. Examples of audience types include:

- **Adults**
- **Minority groups**
- **Community groups**
- **Family groups**
- **Older people**
- **Young people**
- **Employees**
- **Students**
- **Service users/Consumers/Patients**
- **Affected citizens**

If the target audience is wider or difficult to access, it may be useful to work with an **intermediary organization** (for example, a teachers' association if the target audience is teachers at large).

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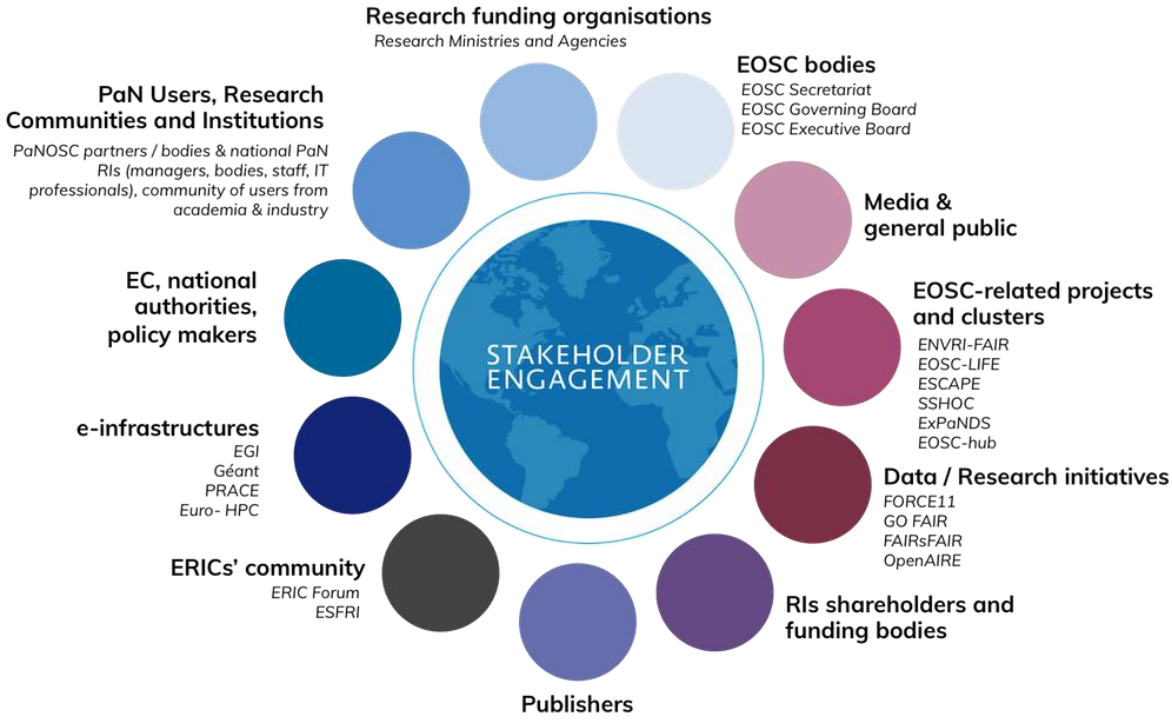

Figure 57 - Example of a stakeholder mapping for the PANOSC initiative (Source: https://www.panosc.eu/stakeholders/)

3. PROCESS: How to engage and when?

It is very important to stress that public engagement must be integrated at different stages of the research process: during design, implementation, and dissemination. As such, different levels of engagement activities, responding to different purposes (informing, collaborating, consulting, etc.), should be planned and developed throughout the activity/project, avoiding leaving engagement with potential beneficiaries to the end of the research process. This interlinkage between purpose (step 1) and process (step 3) can be easily understood by looking at the **Public Engagement Onion** developed by the Wellcome Trust.

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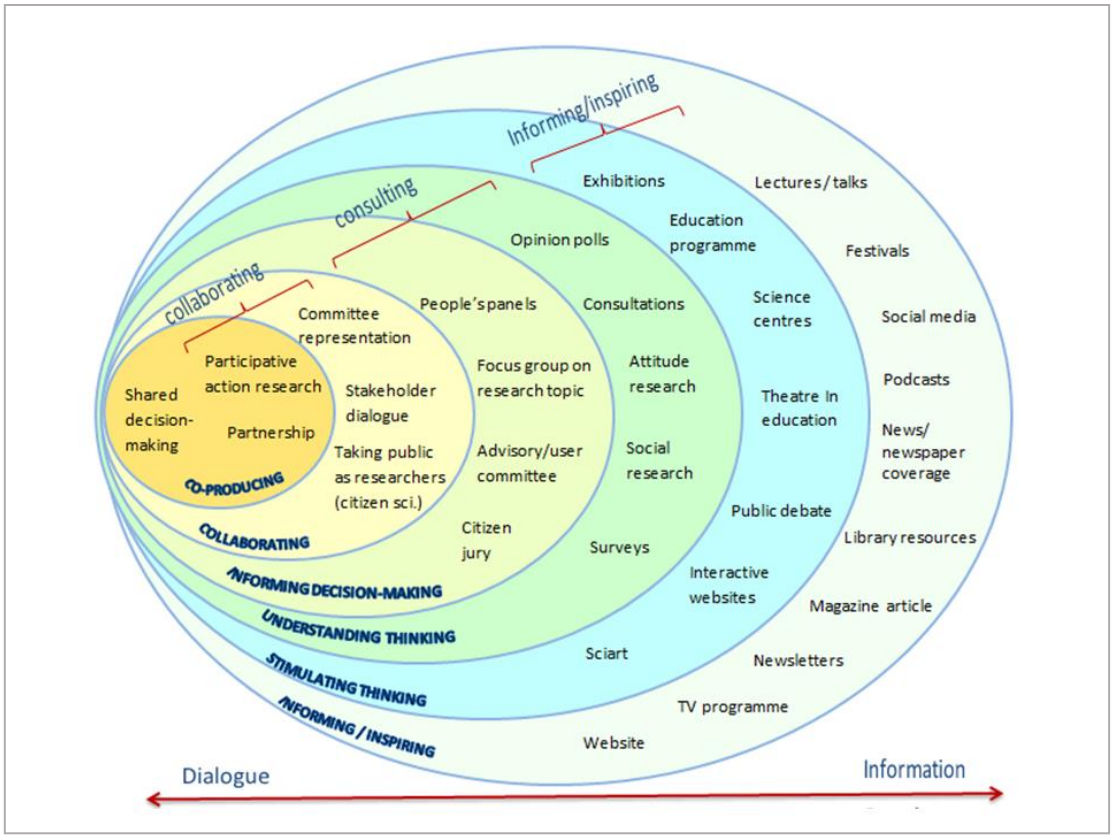

Figure 58 - The Public Engagement 'Onion', developed by the Wellcome Trust (Source: https://www.mpls.ox.ac.uk/public-engagement/what-is-public-engagement)

Several research associations and projects have described and categorized these different engagement activities and strategies.

The UK National co-ordinating centre for Public Engagement identified the following **categories of public engagement activities:**

- Lecture/Presentation
- Broadcast
- Event
- Writing
- Encounter
- Websites
- Performance
- Exhibition
- Exhibit
- Workshop
- Network
- Social media
- Collaboration
- Consultation
- Formal learning
- Citizen research
- Collaborative research
- Enquiry service

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The selection of such activities must always consider step 1 (purpose) and step 2 (previously identified stakeholders), as some activities are more suited than others. As such, students may find examples of how to choose appropriate activities at https://www.publicengagement.ac.uk/do-engagement/quality-engagement/process

- The **Engage2020** project lists **57 types of public engagement activities**, from citizen science to science weeks, from focus groups to participatory budgets. In its Deliverable 3.2 Public Engagement Methods and Tools students can find a factsheet template for each of these 57 activity types with very detailed information concerning the application of such methods, including examples of past experiences.

- Another tool developed by Engage2020 is the Action Catalogue, an **online decision support tool** intended to enable researchers, policy-makers, and other actors wanting to conduct inclusive research to find the most appropriate method for their specific project needs.
  Students may explore this tool to select one or more engagement methods suited for their research projects. To do so, they must select the objective of engagement and the level of involvement (step 1 - purpose), the participants (step 2 -stakeholders), the geographic scope of the application, and also the skills needed to carry out such activity (which can activate thinking about their skills but also about the relevance of developing management skills). When selecting a method, students can explore a detailed description, including examples of the use of the method worldwide.

- Other **examples of public engagement activities** can be found at:

  - UK National co-ordinating Centre for Public Engagement case studies: featuring a range of different purposes, methods, and audiences. Students can search by discipline, purpose, participants, and other criteria.

  - Examples of Public Engagement activities https://www.completecommunitiesde.org/public-engagement/charrette/: This video describes how a **charrette process** was used to involve and actively engage stakeholders in a corridor planning project in the town of Smyrna, Delaware.

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4. EVALUATION: How do we assess the success of such strategies/activities?

Evaluating the effectiveness of public engagement activities means **assessing the effect** of such activities, looking at whether the goals were achieved, and considering **to what extent the activity was effective**. The evaluation must be used strategically for it to provide useful information to concretely assess if the engagement goal was achieved but also to gather insights for **future pilot approaches/further exploration**. As such, the evaluation must also be part of the impact planning, right from the start.

Evaluation procedures may have different aims, approaches, and methods and may yield different types of data. **Summative evaluations** assess the outcomes of the engagement activity, while **formative evaluations** look closely at the process to ensure that the approach is as effective as possible.

The role of the RMA as a facilitator

As mentioned in Module 4 - Lesson 1, the implementation (and support to the implementation) of such strategies and activities is often in the hands of an RMA, known as a **facilitator or knowledge broker**. Julie Bayley et.al. developed a framework for knowledge mobilisation and impact competencies which lists a series of key skills required for such roles.

Figure 59 - Knowledge broker competencies across the institution
(Source: https://juliebayley.blog/2018/03/19/knowledge-broker-competencies-across-the-institution/)

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RMAs' top-rated competencies are:

1. **Internal communication skills**
2. **Developing and maintaining professional relationships**
3. **Working in teams, communities and networks**
4. **Managing multiple conversations**
5. **External communication skills**
6. **Active listening**
7. **Organizational link: acting as a connection point to your organisation**
8. **Facilitating sharing of knowledge**
9. **Partnership and relationship management skills and processes**
10. **Reporting and presenting knowledge**

Public engagement plans: beyond the research project

Besides the project's public engagement plan, **higher level plans** might exist, such as those of **Research Performing Organizations (RPOs)** or **Research Funding Organizations (RFOs).** At these levels, the public engagement plans establish the main aims, objectives and underpinning principles for community engagement with research.

R&I institutions engagement plans

Developing institutional public engagement plans (such as **University PE plans**) is often a task of specific departments/units that congregate different actors within and outside an RPO. The development of such strategies, their monitoring and evaluation, as well as the interface activities between the different stakeholders called to contribute to such plan/strategy include the participation of RMAs.

The examples below illustrate such **strategies and processes within the Universities**:

UCL Public Engagement Strategy (2017): this strategy, developed by UCL's public engagement unit, identifies four strategic aims and some indicators of success.

- Aim 1: Enable UCL to become a global leader in listening to communities and engaging with public groups
- Aim 2: Champion a culture of public engagement across UCL
- Aim 3: Enable the UCL community to be effective in public engagement activity
- Aim 4: Put UCL at the centre of London conversations, creating London-wide impact and being a good neighbour.

It provides the **vision of a public engagement journey**, in five phases:

1. **Find your voice**
2. **Learn to listen**
3. **Start a conversation**

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4. **Develop a dialogue**
5. **Embed a change**

Imperial College of London Public Engagement with research strategy (2017-2020): this strategy also identifies four areas for research engagement activities.

1. **School outreach and widening participation**
2. **Local community engagement**
3. **Patient engagement**
4. **Engagement with research**

It also lists a set of strategic initiatives divided into **one-way communication**, **interactive engagement,** and **two-way engagement**.

Public engagement plans of a funding body

The Research Councils UK Public engagement strategy focuses on:

- stimulating a reflexive and **responsive research community** that engages the public within the research process;
- **enabling public views to inform policies** and research strategies across Research Councils and the broader community;
- helping to **secure and sustain a supply of future researchers** and enabling the next generation to act as informed and involved citizens.

The Wellcome Trust's new Public Engagement strategy adopts an outcome-led approach with a vision of **researchers'-led engagement**. It includes a new funding scheme, supported projects and Fellowships.

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Lesson 4: Science communication and dissemination: framing the message

Learning outcomes:

LO#6 - The student can distinguish the aims and activities of science communication, dissemination, and broader impact.

LO#12 - The student can effectively communicate ideas and the main results of a given project to non-specialist audiences, applying different strategies to increase audience interest and understanding.

LO#14 - The student can implement science engagement tasks in simulated situations.

For any Public Engagement activity or strategy, defining the key message, how to deliver it, in what way, and to who is a crucial task that can make or break the success of the research impact plan.

For any public engagement activity or strategy, defining the **key message**, how to deliver it, in what ways and to who is a crucial task that can make or break the success of the research impact plan.

Framing the message

Looking at public engagement in a coherent and transversal way throughout the project's lifecycle, different stakeholders should be engaged with key messages at different stages: from research objective definitions to the outreach of project findings.
Framing these key messages correctly is paramount. In the Oxford Research Encyclopedia of Climate Science, framing is defined as *making certain considerations salient as a way to* ***simplify or shape how an audience understands*** *a particular problem and its potential solution*. In other words, framing involves emphasising certain elements of an issue over others, shaping the way the issue is understood. Different frames must be defined to reach distinct audiences and meet separate goals.

In all cases, some **key communication principles** should be followed:

- **Messages should be clear, simple, and easy to understand** - appropriate for the target audience and jargon free.
- **Messages should be tailored to the different audiences** - know your audiences, what drives them and what pre-concepts/underlying assumptions on the subject influence them.

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- **Messages should be correct** - using simple messages does not mean sacrificing content.

Defining engagement goals and directing knowledge

In a research project, the following plans must connect to **specific engagement goals**.

1. **Communication**: how to make a wider audience aware of the **project**.
2. **Dissemination:** how to reach target audiences with the **project's findings.**
3. **Exploitation:** how to empower potential users in **using the project's results.**

	COMMUNICATION	DISSEMINATION	EXPLOITATION
OBJECTIVE	**Reach out to society and show the impacts and benefits** of EU-funded R&I activities	**Transfer knowledge & results** with the aim to enable others to use and take up results	**Effectively use project results** through scientific, economic, political or societal exploitation routes → aim to **make a concrete value and impact for society**
FOCUS	**Inform** about and **promote** the project AND its results/success.	**Describe** and **ensure results available** for others to **USE** → focus on results only	Make **concrete use** of results (for scientific, societal or economic purposes)
TARGET AUDIENCE	Multiple audiences beyond the project's own community (incl. media and public)	Audiences that may take an interest in the potential **USE** of the results (e.g- scientific community, industrial partner, policy makers, etc.)	**Project partners** (individuals or organisations) and **groups outside the project** that make concrete use of the results

Figure 60 - Overview of communication, dissemination and exploitation activities (Source: European Commission)

Let us look closer at each of these plans.

Communication

The **communication activities** of a project are a **transversal task** throughout all projects.

Figure 181 - Communication (Source: https://ec.europa.eu/info/sites/default/files/coordinators_day_communication_dissemination_exploitation.pdf)

The EC Research & Innovation Participant Portal Glossary/Reference Terms provides the following definition:

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Communication on projects is a strategically planned process that starts at the outset of the action and continues throughout its entire lifetime, aimed at promoting the action and its results. It requires strategic and targeted measures for communicating about (i) the action and (ii) its results to a multitude of audiences, including the media and the public and possibly engaging in a two-way exchange.

Since the targets are **multiple audiences**, reaching beyond the project's community, including the media and the general public, communication actors must choose **clear and simple language** to make goals and meanings of the project understandable for all.

Typical **communication activities** include:

- **Visual identity development** (logo, templates, brand guidelines, tone of voice, etc.)
- **Press & Media mapping**
- **Social media posts**
- **Website animation**
- **Blogs**
- **Newsletters**
- **Promotional materials** such as leaflets, posters, factsheets, etc.
- **Audio-visual products, etc.**

To design a communication plan, the researcher, supported by the RMA, must answer the following questions:

- What does the **public need** to know about?
- How can I describe the project (goals/key findings/expected impact) to a **non-specialist audience**?
- What **channels can be targeted**? Social media, blogs, press releases and news articles.

In a collaborative research project, the communication resources, channels and teams of each participating institution must be brought into this task. This and other **tips and guidelines** are described in the EC Communicating EU research and innovation guidance for project participants.

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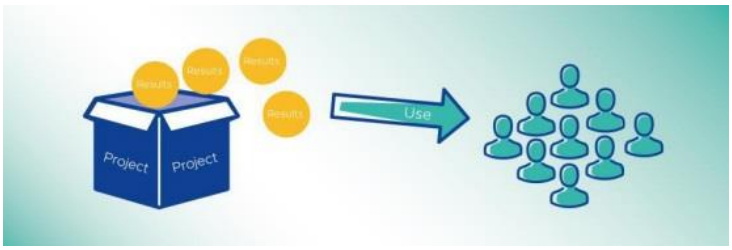
Dissemination



Dissemination is about **transferring knowledge and results**.

Figure 62 - Dissemination (Source: https://ec.europa.eu/info/sites/default/files/coordinators_day_communication_dissemination_exploitation.pdf)

The EC Research & Innovation Participant Portal Glossary/Reference Terms provides the following definition:

> *The public disclosure of the results by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium.*

The goal of dissemination is to **promote the effective use of project results**, turning them into concrete value and impact on society. Thus, the target audiences are stakeholders who may have an interest in the **potential use of the results** (e.g., the scientific community, industrial partners, policymakers, etc.).

Dissemination activities include:

- **publications**
- **media releases**
- **policy briefs**
- **training and workshops**
- **demonstrations**
- **online repositories**
- **events (exhibitions, demo days, cluster events, guided visits), etc.**

To design a dissemination plan, the researcher, supported by the RMA, must answer the following questions:

- What are the **main project findings**?
- Who are the **target audiences**?
- How can I communicate the project's main findings to each **specific audience**? What are the adjustments necessary?
- What **channels** and communication strategies are appropriate for each audience?

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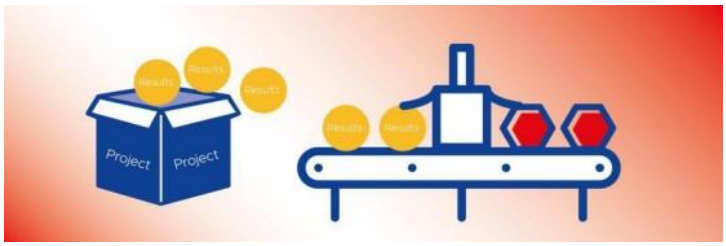
Exploitation



Exploitation is about **empowering potential users with tangible project results**.

Figure 6319 – Exploitation (Source: https://ec.europa.eu/info/sites/default/files/coordinators_day_communication_dissemination_exploitation.pdf)

The EC Research & Innovation Participant Portal Glossary/Reference Terms provides the following definition:

The utilisation of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardisation activities. Thus, the target audiences are people or organisations who make concrete use of the project results (not restricted to commercial use).

Exploitation activities include:

- **market identification**
- **business models**
- **product concept**
- **stakeholder mapping**
- **strategic grant planning**

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To design an exploitation plan, the researcher, supported by the RMA, must answer the following questions (from the European IPR Helpdesk):

- What are the (expected) **key exploitable results** of the project?
- How is the **value for further use** assessed?
- Which **IP protection** and **IP management** measures have been laid down for expected results?
- How will project partners address the issue of (joint) **ownership of results** and the **management of exploitation activities**, especially for jointly owned results?
- How are the results going to be used to a) address the call topic challenges and expected impacts, and b) for **further uses**?
- Who are the **main innovators,** within the consortium, to drive commercial exploitation?
- Which **(other) results** will be produced and could be exploited by people or organisations outside the project and under which terms and conditions?
- What are potential **additional application areas** (even outside the project's field of research) that could benefit from its developments?
- What impact do results have on **everyday life**? How would society benefit from this research? What would be the consequences for **future policymaking**?
- What are the **markets' needs and customers' expectations**?

Communication, dissemination and exploitation plans: some examples

Communication, dissemination and exploitation activities are developed to maximize the impact of the R&I activity or project and must be understood as **intertwined** since one activity drives and feeds the other, and vice versa. Often, the same type of activity, approach or product may be employed in more than one of these three actions; for example, a press release, or even a magazine article, can address multiple actors and goals. What is more useful to distinguish these three separate, but interconnected levels of action is to **differentiate the goal, the focus and the target groups addressed.**

Concrete examples are provided below:

- Open Data Incubator Europe Deliverable on Communication and Dissemination.
- 60-minute Comms Workout: video of **lessons learnt** from different EU research projects, with tips and Q&As.

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General tips an RMA can provide

- **Start from the beginning: study and plan** - know your project, set your goals and design your communication, dissemination and exploitation plans in a clear and simple way.
- **Design SMART activities**: Specific, Measurable, Attainable, Realistic and Time-Bound activities.
- **Set Key Performance Indicators (KPIs) for each activity** - build in some simple **evaluation measures** with clear KPIs to assess if you are succeeding with your objectives. A KPI is a measurable value that demonstrates how effectively an activity is achieving its key objectives (for example, number of followers on social media).
- **Set out your key messages in clear, accessible language** - frame your message, avoid jargon.
- **Test your messages in different media** - try out and select the most effective media for presenting certain types of messages.
- **Draw up an overall project plan** - including all the activities will make it easier to envision their **interconnections**, as well as to achieve a feasible plan with deadlines, responsibilities and costs.
- **Don't underestimate the time and money needed** - **budget it!** Including human resources, equipment, specialized services, materials, etc.
- **Make sure you fulfil the EC obligations** - Developing (at the pre-award stage) and implementing (at the post-award stage) a communication, dissemination and exploitation plan is a **contractual obligation** that comes with the EU R&I funding.

EU obligations and acknowledgment

Here are the most important **obligations to acknowledge**, most of them already included in the Annotated Model Grant Agreement (AGA):

1. Each beneficiary must – as soon as possible – **disseminate results** by appropriate means, including **scientific publications** (Art. 29.1, AGA).

2. All **peer-reviewed publications** must be accessible either by **green or gold open access** (Art. 29.2, Model Grant Agreement, see Guidelines to the Rules on Open Access to Scientific Publications and Open Access to Research Data in Horizon 2020).

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3. Each beneficiary must – up to four years after the end of the project – take measures to **ensure exploitation** of results (art. 28.1, AGA).

4. Each beneficiary must **promote the project,** and its results, by providing targeted information to multiple audiences in a strategic and effective manner (Art. 38.1, AGA).

5. All Communication, Dissemination and Exploitation activities, as well as all equipment, infrastructure and major results financed by the project, need to **acknowledge EU funding** by using the wording and criteria specified in the AGA (Articles 27, 28, 29, 38).

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Learning outcome:

LO#15 - The student can design a research engagement plan and identify suitable key performance indicators to assess stakeholder engagement.

My own PE plan

Students will be challenged to apply the knowledge and skills acquired in Module 4 - Lesson 1 by **presenting a public engagement plan** for their projects or a given project.

The proposed public engagement plan should follow the structure indicated in Module 4 - Lesson 2, identifying:

1. **Purpose -** what is the main goal of the engagement plan?
2. **Stakeholders** - who are the different target audiences/stakeholders?
3. **Process/strategies** - detailing a communication/dissemination/exploitation plan.
4. **Evaluation** - how to assess the success of an engagement plan for the project's goals.

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7. Conclusion and recommendations

Scientific systems in the globalised world became also more complex, with a multiplicity of available opportunities for research funding, transnational cooperation, networking, and mobility, altogether acting under a strong competitive environment. In this context, the demand for professionalized and specialized Research Managers and Administrators (RMAs) has increased extensively.

Although different training programmes exist already regarding RMA tasks, they mail target the development of skills for professionals in practice. Higher Education Institutes, which aim to improve and expand students learning, have an opportunity to fill the gap in training future RMAs, acknowledging RMA skills as important transferable skills and future job opportunities for their students.

The foRMAtion curriculum proposes a broad overview of the main RMA tasks, focusing on the development of knowledge, skills and attitudes. As such, it combines technical content with practical approaches to daily RMA tasks, translated into Problem-Based Learning teaching activities.

Although the foRMAtion curriculum was designed to be tested in the 3 partner universities – CUB, NOVA and Sapientia – it will be openly available to all universities and any other institution aiming to train RMA topics.

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