foRMAtion curriculum

IO2: foRMAtion international curriculum for future Research Managers and Administrators

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Table 1 – Document Control Sheet

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Table 2 – Versioning and Contribution History

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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 for 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 & 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 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 the 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. In fact, 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 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 the university students, developing the skills and competences needed for the understanding of the EU R&I funding system.

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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 formation project:

1) it targets bachelor students without any experience in the field of RMA;

2) it will be tested at 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 main tasks and roles; and

4) it acknowledges the wide range of roles and tasks Research Managers and Administrators 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 attract students for the RMA professions. More broadly, it will be openly available at the website of the project, in 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 is to be developed to assure that the curriculum content and structure was in line with the up-to-date challenges of the Higher Education Institutions and also the new skills needed for the future job markets.

Preparatory Task 2 - Identification of UNL, Sapientia and Corvinus Accreditation rules & procedures: a 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's 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 of 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 trainings, 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, autonomy/responsibility. This mapping of the different approaches of 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

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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.

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

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

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

- 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 by 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): which collaboration will be key to i) making sure all necessary content is provided for the teachers and students and also to ii) finalize the curriculum with the development of the evaluation system and requirements of the curriculum;
- IO6 (online textbook): that will showcase online the curriculum content and make available blended learning
- C2 Short-Term Joint Staff Training: where curriculum will be explored and tested by the teachers that will deliver the module at the 3 universities;

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- 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 in order to be used afterwards at any university.

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4. foRMAtion Curriculum: the framework

The curriculum is divided in 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 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 you a quick start into 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 in order to describe the skills, competences 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 conduct research activity and the professions linked to research.

Core learning outcomes:

Knowledge

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

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3. The student should understand the research project lifecycle and the role of RMAs within it.
4. The student is able to identify the differences between a research design/plan and a research proposal

Skills

5. The student can creatively elaborate and design a research plan adapted to a different research discipline (social sciences, economic sciences, 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 role of a researcher, and of 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 Advisory, 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, ethical dilemmas that can emerge in the course of a research work project.

Attitudes

11. The student is committed to find a balance between assertiveness and cooperation in the course of teamwork in research as a leader and as team member.
12. The student is open to perceive and accept the diversity of cultural and social context of research systems and practices.
13. The student is open for 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 is 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.

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- 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 research institutions level.
- The student can differentiate external from internal drivers of research policy.
- The student is familiar with the general process and principles of evaluation and assessment criteria of research proposals: what do 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

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, and expected outcomes and impact).
- The student is able to recognize the main components of a funding proposal and link them to the evaluation criteria of a given call for funding.
- The student is able to 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 the mission of the institution.
- The student demonstrates curiosity and interest for systemic approaches and for the organization of the research ecosystem.
- The student is able to accept others' views, and work together to provide the necessary support for the proposal's preparation.

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- The student is critical regarding his own work and that of others taking on a constructive attitude.
- The student takes responsibility for its own 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:

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 in negotiation theories and conflict management models, as well as 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 for 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 their 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 its effects in achieving the project's' goals.
11. The student will apply methodologies and tools for effective project management, including time, people and tasks 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).

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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 interest for detail
18. The student is critical regarding own 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 about own work

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 of 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 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 pertaining to 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 its roles at different stages of the research project

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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 is able to select the engagement strategies, platforms and communication style 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 sustainable development goals into the research project).
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 for 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 is ready to consider along the research process.
20. The student is able to accept others views and is able to compromise and work together.
21. The student takes responsibility about own 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 lesson as followed:

- **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 research matters?
  - 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. 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 perceive and accept the diversity of cultural and social context of research systems and practices.

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

What is this thing called science?

There is an abundance of evidence from everyday life that science is held in high regard, despite some disenchantment with science because of consequences for which some hold it responsible. It is due to science that humankind went to the moon, that human health longevity increased unprecedentedly in the last centuries, and from science that the solution to the Covid19 pandemics is expected to arise. However, science also generated 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 about what is science:

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'.

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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 result from the social interaction of human beings, based on social phenomena and human 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 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, 3. ed." (Chalmers, 2013) addressees extensively this question 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. Man and women have been trying to understand for centuries the distinctiveness of scientific knowledge in comparison to other types of knowledge, and there is a whole discipline of Philosophy of Science devoted to understanding science and its boundaries.

The **Philosophy of Science** inquires about 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 practiced - 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 long centuries.

Exploring the main ideas that have helped science philosophers to formulate theories to attempt to explain what distinguishes scientific knowledge from other forms of knowledge is important. Alan Chalmers 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. The facts are presumed to be directly established by a careful, unprejudiced use of the senses. Science is to be based on what we see, hear and touch rather than on personal opinions or speculative imaginings. If 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. The 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 concerns 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, so what appears to be an observable fact for one need not be for another example: a drawing in 3D may not be perceived as such from a tribe/community that was never exposed to or interpreted optical illusions).

Our perceptions depend to some extent on our prior knowledge, and hence on our state of preparedness, and 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? There are facts that are more relevant than others to formulate theories, thus our search for relevant facts needs to be guided by our current state of knowledge (for example: in order 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 as traditionally supposed.

Consider the nature of observation, especially as it is employed in science. 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. The challenge, in science, is to arrange the observable situation in such a way that the reliance on such judgments is minimised if not eliminated. (for example: 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 part of the basis for science if it is such that it can be straightforwardly tested by the senses and withstands those tests. The emphasis on tests brings out the active, public character of the vindication of observational statements.

Nevertheless, observable facts are to some degree fallible and subject to revision: If a statement qualifies as an observable fact because it has passed all the tests that can be levelled at it hitherto,

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this does not mean that it will necessarily survive new kinds of tests that become possible in the light of advance in knowledge and technology.

Relevant facts

One point that should be noted is that what is needed in science is not just facts but relevant facts. Most facts that can be established by observation. Which facts are relevant, and which are not relevant to science will be relative to the current state of development of that science? 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, and they are all superimposed on, and interact with, each other in complicated ways. A falling leaf is subject to gravity, air resistance and the force of winds and will also rot to some small degree as it falls. It is not possible to arrive at an understanding of these various processes by careful observation of events as they naturally occur. In general, it is necessary to intervene to try to isolate the process under investigation and eliminate the effects of others. In short, it is necessary to do experiments.

Experiments are adequate, and interpretable as displaying or measuring what they are intended to display or measure, if the experimental set-up is appropriate and disturbing factors have been eliminated.

Deriving theories from the facts: inductive versus deductive inference

No matter which comes first, the facts or the theory, the question to be addressed is the extent to which the theory is borne out by the facts. The strongest possible claim would be that the theory can be logically derived from the facts. That is, given the facts, the theory can be proven as a consequence of them.

Inductive reasoning departs from specific events to test a general theory. Inductive reasoning represents generalized conclusions based on many observations - looking for a pattern. (for example: Premises: 1. Metal Xl expanded when heated on occasion t l .2. Metal X2 expanded when heated on occasion t2. n. Metal Xn expanded 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 straightforward point 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. After this experience had been repeated daily for several weeks the turkey felt safe in drawing the conclusion "I am 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.

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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 the 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 in the sense of being logically deduced from that evidence.

What are the characteristics of a good inductive argument? The question is of fundamental importance because it is clear that not all generalisations from the 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 roll 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*'.

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 generalized 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:

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

2. My car 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 the way in which he saw Freudians and Marxists supporting their theories by interpreting a wide range of instances, of human behaviour or historical change respectively, in terms of their theory and claiming them to be supported on this account. It seemed to Popper that 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 in fact 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 theory 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 it 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 with the aim of accurately describing or accounting 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 by 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 is able to recognise and integrate the motivations, expectations and role of a researcher.

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

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

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

LO#13- The student is open to perceive and accept the diversity of cultural and social context 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 the specialized methods for research that are used one in some sciences?

There is a difference between specialized methods and general principles. Precisely because specialized techniques are specialized, and each scientific discipline has its own set of specific techniques. Simultaneously, the entire scientific community has a set of shared principles, which guide the way research is carried out.

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In the previous lesson we have seen some of the basic ideas defining what is research itself. In doing so, we addressed, despite superficially what is the scientific method, by introducing the ideas of controlled observation, inductive and deductive reasoning, formulation of hypotheses and experimentation.

Let's focus on this lesson on the general principles that guide researchers from different fields into designing their research projects.

Research design

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

The design of the research will depend on the type and purpose of the research work. 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 a solution for those problems.

i) Identifying a research question

A clearly formulated 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 the researcher can have to hopefully solving that problem.

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, in which we narrow to a topic, and from there to a question that we can address. They come from theory, our own observations, and a variety of other sources.

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

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 needs oil to function);
- It can operate as a guide to a process of discovery (exploratory research)' (Halperin & Heath, 2012), to collect evidence and make inductive inferences from the evidence collected.

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

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

a. Observation and description of a natural or human phenomenon
b. Desk research (or literature review) about the topic pertaining to the research question
c. Ask a question and formulate a hypothesis to explain the phenomenon
d. Make a prediction for the hypothesis
e. Test/Experimenting the hypothesis
f. Drawing conclusions
g. Making recommendation for further research areas

ii) Theory: function of the literature review

Fink (2005) defines 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. To conduct a literature review is a mandatory exercise when conducting research due to the following reasons:

1. Allows the researcher to contextualize and argue his/her research idea within the existing theories and evidence on the topic;
2. Allows the researcher to place his/her research question in literature and defend the need for research in the topic by identifying areas of knowledge that are still unexplored (called gaps in the literature).

iv) 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. 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.

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The most adequate scientific method to address a given research question, needs to take into consideration during its implementation 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 some 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 of 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 survey, run on a regular basis but to different individuals, and longitudinal survey, 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 archival material, the analysis of social or traditional media, advertisements, films, political speeches, or policy documents.
3. **Mixed-methods** (MM) research. It combines different scientific methods to create a framework of analysis of both quantitative and qualitative data.

The most used scientific methods 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 greater extent possible, only one factor can vary. In a laboratory, all conditions such as lightning, temperature, 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 cancel out of the analysis. Experiments are not always possible, the object of study can be too big, a mountain for example, or too complex, an ecosystem for example.

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

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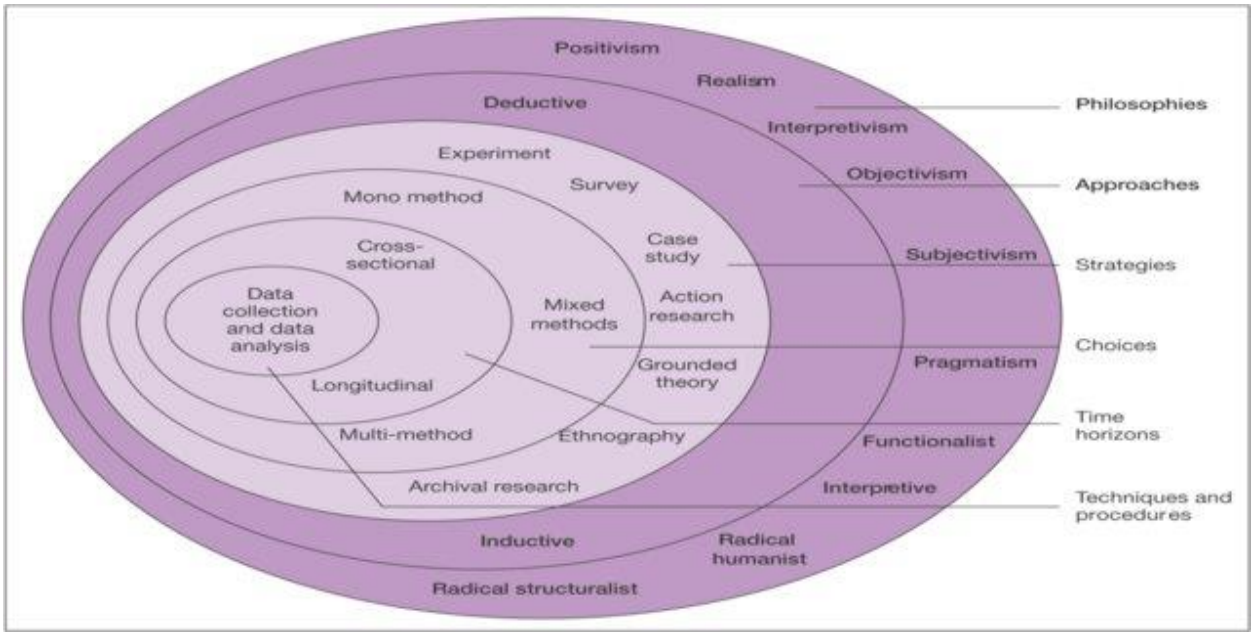

Source: https://thesismind.com/analysis-of-saunders-research-onion/

iv) The use of data

The outputs of the research work 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 carefully chosen.

The most common 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 subject to a **peer-review** process (a review and validations by other researchers, independent of the ones that have conducted the research work) that communicates to the public domain the results of a given research work.

An important part of the time of the researcher is devoted to the publication of the results. Planning and scheduling publication help organising and strategizing research outputs. When publishing, it is important to consider in which **scientific journal** to publish This requires to compare journals/other publications and to 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** (made public at no cost to the reader).

The scientific publications are generally read by other scientists who can understand the specificity of that piece of research. However, the research results can be of interest to many other stakeholders of research and to serve other purposes than merely to inform 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:

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

Research Lifecycle

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

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

For the researchers, doing research involves several periods of planning and writing, besides the periods when a researcher is collecting evidence and analysis data. Most researchers will have to write at least two different types of written work at different stages of the research lifecycle:

i) The **research proposal**. Whatever a researcher proposes to conduct research on, 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, So, applying for funding means entering a competition, often with other projects from anywhere in 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 work will be made public in different formats such as a research essay, publication, communication or patent.

The structure of these two types of written pieces, despite addressing the same research question, it is a bit different with many similarities, as the proposal envisions the future while the research paper 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, ethical dilemmas that can emerge in the course of a research work project.

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

Researchers are part of the society and as knowledge generated by research contributes to solve major societal problems, scientific integrity and ethics become a key aspect 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.*
>
> (National Research Council (US) and Institute of Medicine (US) Committee on Assessing Integrity in Research Environments, 2002).

Ethics and Compliance

A major part of research is ethics and compliance. Ethics is the act of critically reflecting on the norms, conventions and the 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 times challenges and dilemmas especially when the research work involves human or sentient beings. Therefore, it represents a horizontal activity within the research lifecycle, since the compliance with ethical guidelines in the phase of development of the project idea and data collection to compliance with specific regulations of funding agencies

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

- students and researchers should be provided with training and access to ethics guidance;
- RMAs staff working with research directly
- Supervisors and coordinators of research groups
- Deans, Directors and decision-making boards members.

Ethics through the research lifecycle

1. Planning research: research begins with developing the research problem and questions. At this stage ethical issues may arise, for example, conflict of interest and judging the value of research:

a. *Conflict of interest* - any interest that undermines research involving financial gains; personal relationships or other relationships that can influence the research design, interpretation of data or dissemination research (Briggle and Mitcham, 2012).
b. *Judging the value of research:* when analysing the value of the research ideia, the researchers need to consider if the research they are proposing follows the values of research integrity. Is the research really worth doing? Whose interests will it serve? Are there possible negative side effects? What are the justifications: making money, gaining notoriety, advancing theoretical understanding, developing applications, for military purposes, etc.? (Briggle and Mitcham, 2012).

2. Implementation: at the moment of conducting research 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 the data collected. It is important to maintain objectivity and ethical norms such as honesty; carefulness; accuracy and open-mindness.
b. *Bias and self-deception* - the 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 of maintaining objectivity and accuracy to avoid deceptive assumptions.
c. *Trust* - the research work is based on mutual trust between researchers and participants; stakeholders; funders and, public audiences. Researchers must ensure and build trust by conducting research following transparent norms and values, present in 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 the a) *peer review* and b) *authorship*.

a. Peer review - is an important process that must be undertaken by the research 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 represent a key element of the ethics conduct.

The National Research Council (US) and Institute of Medicine (US) proposes as integrity practices in research:

- *Intellectual honesty in proposing, performing, and reporting research;*
- *Accuracy in representing contributions to research proposals and reports;*
- *fairness in peer review;*
- *collegiality in scientific interactions, including communications and sharing of resources;*
- *transparency in conflicts of interest or potential conflicts of interest;*
- *protection of human subjects in the conduct of research;*
- *humane care of animals in the conduct of research; and*
- *adherence to the mutual responsibilities between investigators and their research teams.*

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

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

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

Scientific misconduct: Falsification, fraud or plagiarism in conducting, reviewing, disseminating and reporting research

1. Fabrication - Making up data or results and recording or reporting them as factual results.
2. Falsification - Manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.
3. Plagiarism - The appropriation of another person's ideas, processes, results, or words without giving appropriate credit, including those obtained through confidential review of others' research proposals and manuscripts.

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Responsible Research and Innovation (RRI)

RRI is an initiative of the European Commission to promote the engagement and mutual responsibility of societal actors in research to correspond to the values, needs, and expectations of society. It includes 'cross-cutting issues' to reinforce the openness, transparency and societal engagement in research such as public engagement, open access, gender, ethics, science education in the Framework Programme for Research and Innovation of the European Commission, Horizon 2020. National funding agencies and research performing organizations have been implementing the RRI principles through research agendas.

Examples of RRI projects: https://rri-tools.eu, http://res-agora.eu/rri-resources/ and http://morri-project.eu/

Case studies of RRI:

- Case Study 'Fracking in Austria' developed by the project ResAGORA
- Training Showcase: The Portuguese Sea and Atmosphere Institute: A case of stakeholder engagement in marine research developed by the project ResAgora

RMAs 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, e.g. collect information from lead researcher, create and maintain electronic and/or paper files, assist researchers in completing consent forms and information sheets, collate applications and disseminate for review, disseminate, review and record committee/panel decisions, ensure 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 the ethical resources for the researchers.

Contract negotiation:

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

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Reporting:

- Reporting and checking regulatory/governance and ethics issues.

At the institutional/governance level:

- Support the development of institutional strategies in relation to research ethics and governance;
- Maintain oversight of institutional research ethics and governance processes and systems;
- Producing FAQs for key areas (e.g. IP, ethics, liability, legislation, governance) and making them available to 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 is able to recognise and integrate the motivations, expectations and role of a researcher, and of 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 find a balance between assertiveness and cooperation in the course of teamwork in research as a leader and as team member.

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, in what we can call a Research and Innovation (R&I) ecosystem.

There is not an official and unique definition of R&I ecosystem, as they are complex systems which need various elements to perform optimally. Nevertheless, 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, in order to do science, we need highly trained individuals, state of the art infrastructures, competent institutions and informational resources, as well as on funding systems that provide and on agile ethical and legal frameworks. To make all this to work, and to be able to produce scientific discovery, we need more than researchers - there is a whole group of other professionals that work and contribute to maintain the R&I ecosystem working.

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) 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 (ERI) 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

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increasingly complex research ecosystem. In fact, 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 the **Research Managers and Administrators (RMAs)**.

Research Managers and Administrators: diversity and definition

Collinson (2006) highlighted the several common features of the professionals working in research management in British Higher-Education Institutions (HEIs), such as: the i) the wide range of roles; ii) the cross-boundary interaction with academics, and iii) "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 individuals that perform managing roles, with a diversified background and a non-academic contract, that undertake activities between the professional and academic spheres. A second type of space is defined by Shelly (2010) as the "shifting area", *highlighting* the shared space where the research management field crosses into the academic domain. Santiago et al (2006) had previously defined the increasingly specialized 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) propose the term "Professionals at the Interface of Science" (PIoS) as an umbrella identity that encompasses all these roles and profiles of professionals.

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

- *upstream of research* – to attract/advocate for/ define 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

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research and innovation, gender, ethics and several broader areas of researcher development.

Research Managers and Administrators: 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 related to the daily activities of these Professionals. Relevant activities include the definition of Professional Development Framework created by several associations that identify the knowledge and skills needed per functional area by the Professionals in their activities. Two main Professional Development Framework must be acknowledged:

1. ARMA Professional Development Framework: it comprises 21 different functions undertaken by RMAs that are 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 seven broad functions are described from three different perspectives – Operational, Management and Leadership.

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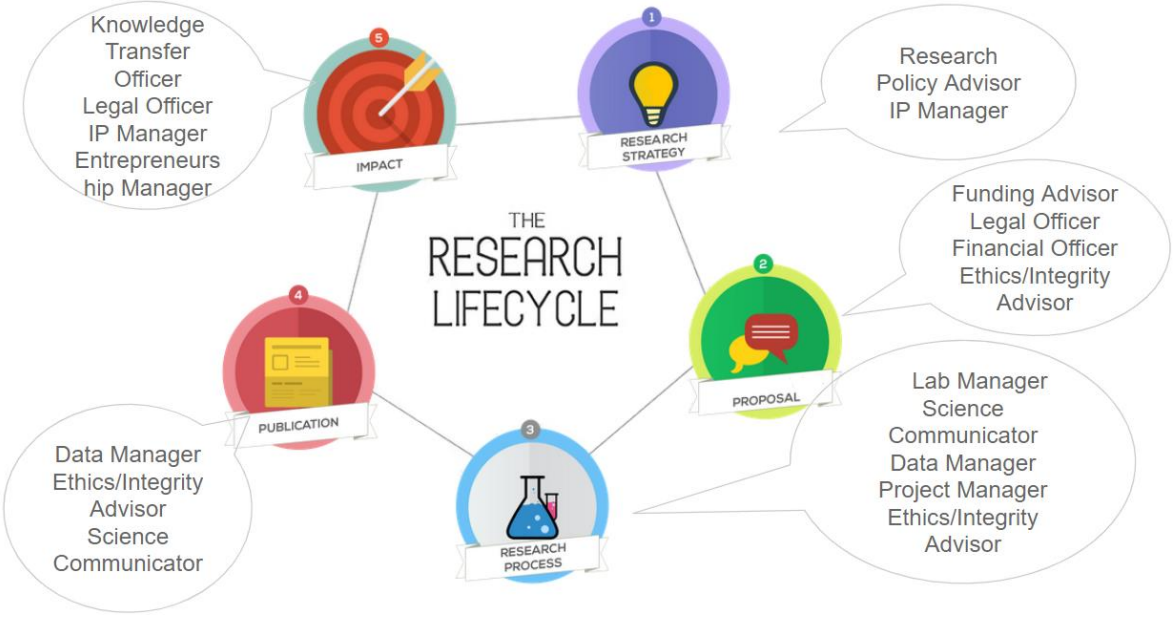
2. BESTPRAC's Research Support Staff (RSS) - Framework: identifies the various roles, tasks and skills performed by an RMA in the frame of the project lifecycle. It considers four stages as i) before the proposal; ii) proposal; iii) grant preparation and, iv) project. In this professional framework three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

The RMA's within the research lifecycle

Both frameworks above acknowledge that the RMAs play an important role in the development of research. If we look at the overall Research Lifecycle (RL), we can see that RMAs are called to participate in since the development of the research idea, to its implementation, from facilitating the broad impact of research to acting as brokers in the stakeholders involvement. If we associate the Research Lifecycle with the RMAs main roles, we have the follow figure:



Source: Adapted from Bournemouth University

To look closely to the different tasks involved in the research lifecycle, we can explore the four stages proposed in the BESTPRAC RSS Framework:

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Research lifecycle stage	RMA tasks and roles
Before the proposal	- Identifying funding opportunities (finding) - Disseminating funding - Advising - Training - Gathering non-public information - Quantitative and qualitative analysis of EU funding and organisational participation
Proposal	- Providing general information and support regarding proposal submission - Facilitating and setting up of internal approval and signature process - Providing budget notes and explaining + enforcing internal budget rules - Advise on the execution of the writing process and consortium formation and management - Advise on the content to be written (vs writing process) - General advising on legal aspects and providing organisational legal documents - Linking to information or advising on IP, ethics, open access and open data - Statistics and analysis
Grant preparation	- Facilitating the signature of the grant agreement - Facilitating the internal setup of the project - 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 project success (internal and external)
Project	- Supporting financial and technical reporting - Consortium management - Communicating internal procedures - Functioning as a helpdesk and providing administrative support - Contracts management and archiving - Support for amendments of the Grant Agreement and Consortium Agreement - Project Management - Project Communication and Dissemination - Liaison between the coordinator and the European Commission and the consortium (when RMA institution is the coordinating institution)

The RMA's beyond the project

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

Beyond the research lifecycle	RMA tasks and roles
Postgraduate Researchers	- Support and provide direction to Postgraduate Researchers (with close relation with the support for research career development)
Policy and Governance	- Contribute to Research Policy and Strategy - Contributing to the exercises 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

Skills and competences

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) categorises 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.

More currently, Susi Poli (2020) NARMA 2020 presentation identify the following ones:

- Networking; navigating complex, multiple relationships; social capital (or men and or women)
- Cross-cultural capability and team building in multicultural/sectoral groups
- Creativity and super-creativity
- Coaching, emotional intelligence and positive psychology

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- Happiness at work, 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 not to be let out

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

Testimonials of RMAs and their entrance in 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 RMA plays are intrinsically linked with the characteristics and maturity of R&I ecosystem they are integrated. As such, differences in R&I development, national R&I policies and funding schemes, as well as R&I governance can define the roles, tasks as well as professional recognition of the RMAs. Within institutions, its levels of commitment to R&I as well as scientific area, are also important variables to the definition of the RMAs organizational structures, tasks and responsibilities. These different aspects have been translated into research studies in the area we can call RMAs studies. Relevant contributions to the profession in terms of training and mapping the roles have been mainly conducted by the existing formal associations and groups of individual RMAs (either within the framework of large projects or individual projects). The Research Administration as a Profession (RAAAP) is a project aiming at finding out the key skills, attitudes and behaviours of successful research administration leaders, by making use of a longitudinal survey.

Another relevant debate is regarding the RMAs lack of recognition, since several challenges were identified by past authors: 1) there is thin boundary between research but not research itself, so a delimitation of RMA tasks is an ongoing debate; 2) the diverse contexts of national R&D

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ecosystems are linked with the RMA performance and recognition, so this interdependence needs further research; 3) the uniqueness profile some of these RMAs represent (with PhD, former researchers…) place RMA studies into an emergent research area developed to RMAs by 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 find a balance between assertiveness and cooperation in the course of teamwork in research as a leader and as team member.

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

LO#13 - The student is open for 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 the lessons in Module 1, the students will be asked to develop their own ideas about a research question or to work with an already funded research project (the teacher will define it according to the level and interest of the students). Depending on that, the project to be developed and presented in Module 1 and Module 2 can have the following frame:

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

OPTION 2: Action project - The students act as research managers and use their own ideas to plan a research management activity they would like to perform (example: to find a group of suitable funding calls for researchers to apply in a particular area, to set system to regularly inform researchers about funding opportunities, to analyse policy on open science and propose a strategy for action, other)

OPTION 3: Career project - The students act as potential applicants for job in RMA areas and use their own ideas to build a portfolio and present themselves in the job market

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Communicate your research findings to different audiences

When communicating your research results it is important to consider varied audiences, both academics and non-academics. Writing in a comprehensible way to readers with different levels of expertise is keen to reach more audiences and improve the impact of your research findings.

1. Consider the broad spectrum of audiences:
    a. Scientific community (researchers, reviewers for a grant proposal or article);
    b. Policy stakeholders (legislators, professionals working in government institutions);
    c. Civil society (general Public; members of non-profit organizations).

2. Tailor your writing and presentation to the audience:
    a. Before writing look for the requirements of your purpose, 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 organization's proposal guidelines)
2. Talk to previous grant holders of the programme/call you are applying to learn more about the process and successful tips (Vieira, 2020)
3. Think about your audience:
    a. learn more about who will be the reviewers of your proposal (scientific reviewers, staff from the funding agency, programme professors...)
    b. align your proposal with programme's/agency's mission
4. Examine sample proposals from your department, peers, and/or the organization.

"Common elements of Grant Proposals" by Katy Vieira (2020)

Short Overview (i.e. "abstract" or "executive summary")	Here you present the most important elements of your proposal in as few sentences as possible. 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 to just one paragraph. Either way, make sure that you answer: • What is the purpose or goal of your project, the need you're addressing, or the problem you're 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?

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	• Why is your project important? • Briefly, who are you?
Tips:	The first sentences are key to catch the interest of your audience. You can use different techniques: i. Bold sentences ii. A question or quote Include the 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 really needs to be filled. In order 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 that you establish the context of this problem (i.e., the background). If this problem affects a particular population, describe that group of people. Include data if appropriate. Particularly for academic grants, this examination may take the form of a short literature review clarifying that you've read extensively on this topic and understand your project's scholarly context and significance. But even for academic grants it's important to clarify why this 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, and methodology"; or "strategies and tactics")	Now that you've established a need for your project, you have to describe your project. Make sure you answer these questions: • What are the goals of your project or your research questions? • What are the goals of your project? • What will your project's outcomes be? [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 of these questions focus on the impact your project will have. Delineating the impact is important because funders want to see that you've clearly established the realistic benefits of your work along with how you plan to verify and assess your achievements.

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Tips:	Use introductory sentences to guide the reader and maintain a logical flow of ideas (Miller, 2007)
Budget (i.e. "resources")	For grant proposals you are asking for funding or other support, you need to clarify just what you're asking for and 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 why each cost, material, and equipment is valid, reasonable, and important for your project.
Conclusions	Write separate or sections paragraphs per research questions (Miller, 2007) Suggest future research

Final Revisions:

- Ask for a peer you trust and people from different scientific areas to revise your proposal.
- Re-read to avoid repetition,
- Double-check the Bibliographic references properly citation, reference requirements

Bibliographic references:

- Kate Vieira. (n.d.). *Planning and Writing a Grant Proposal: The Basics*. The Writing Center. Retrieved 11 January 2021, from https://writing.wisc.edu/handbook/assignments/grants-2/
- Locke, L. F., Spirduso, W. W., & Silverman, S. J. (2007). *Proposals that work: a guide for planning dissertations and grant proposals* (5th ed). Sage Publications.
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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 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 for systemic approaches and for the organization of the research ecosystem.

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

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

LO#20 - The student takes responsibility for its own work.

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

The European Union is an economic and political union of 28 Member States. The European Union is a major collective enterprise that entails a vision for the future based on promoting peace and the wellbeing of its citizens. It aims to offer freedom, security and justice without internal borders, while promoting sustainable development based on balanced economic growth and a highly competitive market economy with full employment and social progress, and environmental protection. It wants to achieve this by combating social exclusion and discrimination, promoting territorial cohesion and solidarity amongst EU countries and by respecting cultural and linguistic diversity. This vision of the European Union demands for scientific and technological progress; thus, Research and Innovation is central in the building of the European Union, now and for the future. One of the major driving forces behind the launching of the R&D policy was to boost the competitiveness of the European integration vis-á-vis the economic rivals. (The EU in brief: https://europa.eu/european-union/about-eu/)

This is illustrated on a citation from a representative of the European Commission at a leader meeting in 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."*
>
> (European Commission's contribution to the Informal leaders' meeting 23 February 2018)

Such a statement sets the stage for **policy making**. If Research and Innovation are central for the European Union, then policies and strategies will have to be put in place to define action within the Research and Innovation field. **Policies** are "guidelines for organisational action and implementation of goals and objectives" that any governing structure needs in order to justify their action. Policies are frames to action. (https://keydifferences.com/difference-between-strategy-and-policy.html#Definition). **Strategy** is about the set of actions that allow to create a unique and valuable position of 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 — which you may have heard of, and there are others.

The main decision-making european institutions can be simply described as:

The European Parliament: the voice of the people

European Council: setting the strategy;

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The Council: the voice of the Member States

The European Commission: promoting the common interest

Indeed, the European Parliament, represents the EU's citizens and is directly elected by them; the European Council consists of the Heads of State or Government of the EU Member States; and the Council represents the governments of the EU Member States; 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 it 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.

The Member States and the Commission then implement them.

At the core of the EU are the Member States — the 28 states that belong 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' in order to gain strength and the benefits 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 European level. The EU thus sits 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 founded on treaties that have been approved voluntarily and democratically by all EU countries. The treaties are negotiated and agreed by all the EU Member States and then ratified by their parliaments or by referendum. The treaties lay down the objectives of the European Union, the rules for EU institutions, how decisions are made and the relationship between the EU and its Member States.

The treaties list the policy areas in which the EU can take decisions. In some policy areas, the EU has exclusive competence, which means that decisions are taken at 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 the conservation of fish. In other policy areas, the decision-making competences are shared between the Union and the Member States. This means that if legislation is passed at EU level, then these laws have priority. However, if no legislation is adopted at EU level, then the individual Member States may legislate at national level. Shared competence applies in many policy areas, such as the internal market, agriculture, the environment, consumer protection and transport. In all other policy areas the decisions remain with 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 Union can support Member States' efforts. And in others,

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such as overseas aid and scientific research, the EU can carry out parallel activities, such as humanitarian aid programmes.

Decision-making at EU level involves various several types of legal acts which are applied in different ways.

A regulation is a law that is applicable and binding in all Member States directly. It does not need to be passed into national law by the Member States although national laws may need to be changed to avoid conflicting 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. Significantly, a directive specifies the result to be achieved: it is up to the Member States individually to decide how this is done.

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 on proposed mergers between companies.

Recommendations and opinions have no binding force.

See more at [The European Union explained: How the EU works]

External drivers of European R&I policy

There are different sorts of **drivers of R&I policy**, that is, 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 that is 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 at 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 drivers**, because they are external to a given institution, they relate to the 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. Read the text trying to identify different **drivers of R&I policy**.

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

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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.

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 clearly identifies several current external policy drivers that create demand for clear and wide scope R&I policy in Europe. Some examples these drives are: improve daily lives of people, provide lasting prosperity, maintain European way of life, maintain a leading competitive position of Europe in Key industrial sectors, take advantage of Europeans potential (in R&D, in collaborative and partnership spirit, strong industrial basis), protect European's citizens data and privacy….).

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The vision and the principles defended by the European Union project provide a master frame for action, but the European Union project must be built day by day, responding to the 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 built 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 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."*

There are factors that suddenly become very important and influence policy very strongly diverting the course of action. One very recent example is the 2020 pandemics of Covid-19 that 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, could help fighting the Covid-19 pandemics. The corona virus acted as the major policy driver in the whole world, and it was to a very 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 the months of April, May and June 2020 provide clear examples about 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 know how that overarching goal of becoming a knowledge-based economy will be achieved. While policy frames action, strategy defines action. Strategy is what will be used for Europe to *"develop its own distinct model of innovation". It is thus important to distinguish* policy from strategy.

Despite the distinction between policy and strategy varies depending on the context, in this module we use the definitions in the literature often employed by institutions, including companies and research performing organizations, which are not identical from 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) from the specific plan for action (called strategy in this module).

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Several definitions available in the literature support the distinction adopted at this Module. Examples follow:

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 competences"
"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 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/

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- 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
- 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 how the existing R&I policy and strategy affect the proposed plan. If funds will be demanded to support a research project, the funder often requests for specific elements to be included in the project to meet policy or strategy requirements. For example, a funder may ask for the researcher to design a research proposal to meet one of the UN Sustainable Goals, or it may ask the researchers to publish the project results in Open Access, or to follow specific ethical guidelines applicable to research involving human beings.

It is thus 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 in the links presented next:

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/

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- 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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- Skrodzka, I. (2016). *Knowledge-Based Economy In The European Union – Cross-Country Analysis*. Undefined. https://www.semanticscholar.org/paper/Knowledge-Based-Economy-In-The-European-Union-%E2%80%93-Skrodzka/09df619142554720cb7c4f9bc94af816c9ef36eb

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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, and 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 for systemic approaches and for the organization of the research ecosystem.

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

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

LO#20 - The student takes responsibility for its own 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 became increasingly a major priority, which should be addressed in all European funding frameworks for R&I. Other priorities that encompass many European funding programmes relate with addressing global challenges, attaining territorial cohesion and reducing regional disparities, or strengthening the European Research Area. Together, these policies help define a research funding framework that then is transformed into preconditions ruling the major European funding programmes.

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There are several large-scale European funding programmes that address different policy goals.

This short video helps to understand how policies help define a research funding framework that then is transformed into European funding programmes: EU Funding for your project?

Some of the ideas transmitted in this short video are:

European funding is the tax payers money from all European countries.

There are five main European funds debated and decided 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 perceived as a means to attain growth, job creation and sustainability of the planet.

There are other Funds that are managed directly by the European Commission, such as the Horizon Europe, the Erasmus Plus and others, that also support the area of Research and innovation. The latter are attributed to beneficiaries in a competitive manner, using a Call for Proposals.

The main features of the European funds managed directly by the EU can be consulted in 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 (LIFE), Creative Europe (CREA), and the Horizon 2020 Framework Programme (H2020), the latter being the EU programme by excellence to fund research activities. The Horizon 2020 Framework Programme (H2020) ran from 2014 to 2020.

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

The European Commission's proposal for Horizon Europe is an ambitious research and innovation programme to succeed Horizon 2020.

This short video helps understanding The Horizon Europe (2021-2027) and its predecessor the Horizon 2020 (2014-2020): Horizon Europe - the next R&I programme

*"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*

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*these areas, a limited number of research **missions and 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. The structure of its predecessor, the Horizon 2020, is also presented.

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References: Council of the EU Press release 27 March 2019. EU agreement on future research and innovation programme, at https://www.consilium.europa.eu/en/press/press-releases/2019/03/27/eu-agreement-on-future-research-and-innovation-programme/

See also infographics about the Horizon Europe programme at https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

Some insights into specific funding programmes

*"The **Marie Skłodowska-Curie actions** support 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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The **European Research Council's grants** *"encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research across all fields, on the basis of 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/

The *"**Widening actions** under the Spreading Excellence and Widening Participation programme of Horizon 2020 address the causes of 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, i.e. 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

Some basic vocabulary regarding European funding instruments

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 most capacity to carry out that project for the best price will be the ones that win the Tender. A funding proposal is a request for money to complete a project that is proposed to the response to a Call for proposals open by a funding agency or donor organization. Such projects are usually humanitarian or community-minded in nature. 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 donor every necessary detail about the proposed project.

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**?

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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 a new or improved technology, product, process, service or solution.This includes: basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment, closely connected but limited demonstration or pilot activities aiming to show 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 and arrangements or designs for new, altered or improved products, processes or services, including: prototyping, testing, demonstrating, piloting, large-scale product validation, market replication.

Coordination and support actions (CSA) - Type of action under the H2020 Programme yhat 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.

What is a **single stage deadline model** versus a **two-stage** deadline model?

Call 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 to the second round, they present the full proposal before the second deadline for submission.

When is a project **mono-beneficiary** versus **multi-beneficiary**?

Mono-beneficiary actions - Actions that fund projects with one beneficiary only. Beneficiaries can be many types of organizations, such as **Research performing institutions.**

Research performing institutions - Research is performed at institutions that hire researchers and other staff and that provide conditions for the research work 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 (NGOs, hospitals, patient association, regional authorities, public administration entities, museums…)

Multi-beneficiary actions - Actions that fund projects by a group of beneficiaries (normally from different EU and associated countries). In the latter, a group of beneficiaries' organizations form a **Consortium**.

What categories of countries exist within the European framework programmes? **Member States (MS)** versus **Associated Countries (AC)** versus **Third Countries**

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EU member states - 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) - 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 other formal relationship with the EU (EEA member, EU accession country, neighbouring country, etc) – unless the basic act specifically provides for it (with or without funding; e.g. for the H2020 programme: the work programme lists countries that are automatically eligible for participation and funding).

Third country - Depending on the context, it means either: a country that is not an EU member state or a country that is neither an EU Member State nor an associated country.

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. These are: 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): 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 in p. 5 (Excellence in S&T 2010) of the "Research and Innovation Performance in 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

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 world. The Missions are an integral part of the Horizon Europe framework programme beginning 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

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The Call for Proposals and RMA roles

Often, a funding agency regularly opens calls for funding. A **call for funding** is a public competition for funding within a funding programme. Often, they focus on specific R&I topics, or groups of topics. At the opening of the call, a group of guiding documents is generally made public that specifies the particular set of rules applicable to the call, defining many 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 to read to understand the funding call are:

- the call text
- the work programme
- the guide for applicants
- the guide for evaluators
- ethical guidelines

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

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 about amount of funding available and expected duration for the project
5) Expected Impact

The idea of this lesson is to explore in groups different funding calls and look at different aspects of the call in order to get prepared to easily extract the important information for the applicants from, while understanding what is the underlying policy that applicants to a given call will have to respond to.

Examples of Calls:

- Twining call
- Societal Challenge call (thematic)
- ERC call

An example for the full text for the Twining call is presented below:

Twinning Call

Type of action: CSA Coordination and support action

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Deadline Model: single stage

Opening: **24 July 2019**

Deadline: **14 November 2019 17:00:00 Brussels time** Closed

Work programme: Spreading Excellence and Widening Participation

Work programme year: H2020-2018-2020

Call ID: H2020-WIDESPREAD-2018-2020

Topic Description

Specific Challenge: The specific challenge is to enhance networking activities between the research institutions of the Widening countries and internationally leading counterparts at EU level. Driven by the quest for excellence, research intensive institutions tend to collaborate increasingly in closed groups, producing a crowding-out effect for a large number of promising institutions. This is the challenge that a specific Twinning action will try to address.

Scope: Twinning aims at significantly strengthening a defined field of research in a university or research organisation from a Widening country by linking it with at least two internationally leading research institutions from two different Member States or Associated Countries. Twinning will:

1. Enhance the scientific and technological capacity of the linked institutions with a principal focus on the university or research organisation from the Widening Country;

2. Help raise the research profile of the institution from the Widening country as well as the research profile of its staff.

Successful Twinning proposals will have to clearly outline the scientific strategy for stepping up and stimulating scientific excellence and innovation capacity in a defined area of research as well as the scientific quality of the partners involved in the twinning exercise. This scientific strategy should include arrangements for formulating new (or ongoing) joint research project(s) in the scientific area of choice and describe how Twinning will take this research to a new stage, by enlarging its scope and/or the research partnership. If relevant, any links with sustainable development objectives are to be outlined.

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Such a strategy should include a comprehensive set of activities to be supported. These should include at least a number of the following: short term staff exchanges; expert visits and short-term on-site or virtual training; workshops; conference attendance; organisation of joint summer school type activities; dissemination and outreach activities.

A dedicated focus towards promoting the involvement of early stage researchers (as per the MSCA definition[1]) in the coordinating institution from the Widening country is expected. This should take the form of a dedicated work package or task in the proposal describing activities dedicated to early stage researchers from the coordinating institution that could include training, mentoring and networking measures within the Twinning exercise, with a special focus on the promotion of gender equality among early stage researchers.

One of the lessons learned from previous calls and from the interim evaluation of Horizon 2020, is the lack of experience about research management and administration in widening countries. That is why proposals should also focus on strengthening the research management and administration skills of the coordinating institution from the Widening country. This should take the form of a dedicated work package or task, placing emphasis on specific activities, in view of helping the staff of the coordinating institution to improve their proposal preparation and project management/administration skills. If not yet in place, setting up/upgrading a research management/administration unit within the coordinating institution would be beneficial. This will be achieved by fully utilising the experience and best practices of the internationally leading partners and is expected to be a concrete deliverable of the Twinning exercise.

In general, costs relating to administration, networking, coordination, training, management, travel costs are acceptable under a Twinning project. While the action does not focus on equipment and research costs, these could be accepted if they constitute only a minor part (up to 10%) of the total Horizon 2020 funding requested and are deemed necessary to fulfil the action's specific scope and objective.

Therefore, for grants awarded under this topic and type of action the following cost categories will be ineligible costs:

- infrastructure costs;

The respective option of Article 6.5.C of the Model Grant Agreement will be applied.

The duration of a Twinning project can be up to 3 years.

If the coordinating entity has already been funded (as a coordinator) under other Horizon 2020 Twinning calls, these projects need to be described in the proposal. Proposers need to clearly demonstrate the added value and impact of the proposal in achieving the Twinning programme objectives, in comparison to the already funded Twinning project within the coordinating entity.

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The Commission considers that proposals requesting a contribution from the EU of EUR 0.9 million, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting lower amounts.

Expected Impact:

- Increased research excellence of the coordinating institution in the field of research as a result of the twinning exercise.

- Enhancing the reputation, attractiveness and networking channels of the coordinating institution.

- Improved capability to compete successfully for national, EU and internationally competitive research funding.

- Illustrate quantitatively and qualitatively the expected potential impact of the twinning exercise within the coordinating institution (and possibly at regional/national level) based on indicators like expected future publications in peer reviewed journals, collaboration agreements with businesses, intellectual property, new innovative products or services.

- It should be explained how the leading scientific institutions in the partnership will contribute in terms of provision of access to new research avenues, creativity and the development of new approaches, as well as acting as a source for increased mobility (inwards and outwards) of qualified scientists.

- The benefits for the internationally leading scientific institutions and the way they would materialise through the partnership should be substantiated.

[1]Early stage researchers shall, at the time of recruitment by the host organisation, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when the researcher obtained the degree entitling him or her to embark on a doctorate, (either in the country in which the degree was obtained or in the country in which the researcher is recruited) even if a doctorate was never started or envisaged. Part-time research experience will be counted pro-rata.

It is important to analyse a Call for Proposals from different perspectives.

First, one can analyse it from the perspective of the policy need giving rise to the topic. There are Research Managers and Administrators (RMAs) whose job is focused on contributing to the design of funding programmes and calls. As examples of this category of RMAs, we have the

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European Officers for specific Horizon 2020/Horizon Europe programmes, or policy officers at the European Commission that are actively engaged into the writing of the call itself and accompanying documentation. But you do not need to work for the European Commission to do this sort of work: at universities, NGOs, research institutes, companies, etc., that perform R&I can exist dedicated policy advisers that can have important roles in advocating for the interests of their own institution or research field. The policy advisers are often consulted during the preparatory work leading to the creation of funding programmes and calls for proposals.

The vocabulary used in the text of a Call for proposals has been widely scrutinised by many different stakeholders, as there is a process of extensive public and internal consultations prior to the design of a call or funding programme. The opening of a Call for Proposals is a lengthy and highly political process, requiring extensive preparatory work. Hence, the vocabulary used in a call for proposals can tell you much about the genesis and the policy purposes of a given call.

Secondly, a Call for Proposals can be analysed from the perspective of supporting the applicants. Here, it is important to transmit crucial information to the candidate, who will subsequently prepare the project proposal. There is a category of Research Managers and Administrators (RMAs) that is specialised into providing support to applicants into the assembly of funding proposals. This is the area of Pre-award, because it relates to the project cycle before the funding is obtained and the funding contract (or award) is established. Pre-award RMAs often work at research performing institutions in direct contact with the applicants, which are often researchers.

In summary, in this lesson the aim is to analyse the following aspects of a Call for Proposals.

- the policy that gave rise to the need of that topic, and the format in which it was conceived. Analyse the vocabulary used (linked to policy action).
- the objectives of the call
- the activities it funds
- the expected outcomes and impact
- the financial aspects
- the effort that is needed to be put into building partnerships.

And to understand the role that RMAs can have in the design of the Call for Proposal and in the support to applicants in designing a suitable project for the given call.

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The following example illustrates the identification of the policy aspects, the objectives, the activities, the expected outcomes and impact, the budget, and the partnership requested in a Twining Call:

Policy/need	…Strengthen one field of research in a university or research institution from the Widening country … Reduce the crowding-out effect for a large number of promising institutions that exists when, driven by the quest for excellence, research intensive institutions tend to collaborate increasingly in closed groups …Links with sustainable development goals
Objectives	…Address network gap and deficiencies of your institution …Twin with international partners in high performing countries
Activities	… Enhance S&T capacity of the linked institutions with a particular focus on the Widening institution … Raise the research profile of the Widening institution and staff … Involve early stage researchers (specific work package) …Strengthen the research management and administration skills of the coordinating institution (dedicated work package or task) …Short term staff exchanges, expert visits and short-term on-site or virtual training, workshops, conference attendance, organization of joint summer school type activities, dissemination and outreach activities …Within 3 years of project
Outcomes & Impact	…Increase research excellence of the coordinating institution in a particular field …Enhance the reputation, attractiveness and networking channels of the coordinating institution

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	… Improve capability to compete successfully for national, EU and international competitive research funding …Quantitative and qualitative indicators …For the coordinating institution and at regional and national level …Benefits for the more-intensive research performers
Funding	... EUR 0.9 million; does not preclude submission and selection of proposals requesting lower amounts
Partnerships	… a university or research organisation from a Widening country and at least two internationally leading research institutions from two different Member States or Associated Countries

RMA Roles

Several professionals in Research Management intervene from the drawing of a call to 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, others work directly with the research teams that will be carrying out the approved projects. The figure below illustrates some of these roles. Even if the context affecting these professions and the nature of their daily activities change substantially over time, students can look for more information about each of the examples presented, or examples of people working in these areas can be brought to the class to provide their testimony and answer questions form the students.

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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 do 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 is able to 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 is able to accept others' views, and work together to provide the necessary support for the proposal's preparation.

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

LO#20 -The student takes responsibility for its own work.

Introduction - what does a European funding proposal look like?

A **funding proposa**l is the result of often months of preparation to gather the right team and the right project that meets the demands of a specific **Call for Proposal**s and can be funded. When you prepare a funding proposal, you want 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 falls below 20%, meaning that at best 20 proposals out of 100 submitted will receive funding. So, applying to funding by submitting a **grant** (or funding proposal) is like playing a game: you play according to the rules, which imply that you design a project that meets the **evaluation criteria** the best you can, and the best proposal submitted in the same round of competition wins. Sometimes luck also plays a role. When several of the submitted proposals are of a very high

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quality but there are no funds available to fund them all, then the luck factor may be a bonus - but only if your proposal is already excellent and very well written!

There are different types of funding proposals. Those that are presented by a single organization **(single beneficiary**). In these we find the **individual fellowships**, for example to apply for a **fellowship**, a **travel grant** or those that contain **project proposals** to be carried out by a single team of researchers at a single institution. Often European proposals demand for the participation in the same project of different organizations, located in different countries. These organizations form a **consortium** in which one beneficiary is the **Coordinator** and the other are the participants. The proposals that involve consortia require substantial time of **networking** activities in order to contact potential partners and negotiate their participation in the proposal and subsequently in the approved project.

The **pre-award RMAs** can play a very important role in assuring that the proposals submitted are of high quality by addressing the evaluation criteria and complying with the admission conditions for the given call. Of course, the applicant should be expert in the topic of the Call for Proposals and should contribute to the scientific/technical sections of the proposal. But often, proposals require much more information than just the technical and scientific aspects of the proposed project. RMAs can specialise in supporting applicants in the non-scientific parts of the proposal. In doing so they can provide a valuable input into the proposal, and actively contribute to the likelihood of success of the proposal!

A full proposal must contain a lot of information in order to be funded, as it needs to meet compliance requirements and address all evaluation criteria. What does a European proposal really look like?

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

Generally, the proposal is divided into two components: **Part A**, containing the administrative details of the proposals and partners and **Part B** contains the technical description of the proposed action. (Annex 1 to the Grant Agreement (Description of the Action: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/gap/doa/h2020-doa-ria-ia-csa_en.pdf)

In Part A you will find:

- General information on proposal (including an Abstract for the project)
- Declarations
- Administrative data of all partners
- Budget
- Ethics (and Security) issues

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- Call specific questions (if any)

Part B is divided into two documents, one containing sections 1, 2 and 3, and the other sections 4 and 5.

The first three sections are the key core sections describing the action, structured according to the selection criteria. These three key sections are:

Section 1. Excellence

Section 2. Impact

Section 3. Implementation

Then, there are two more sections, corresponding to:

Section 4. Members of the consortium

and Section 5. Ethics and security.

In **Section 1 Excellence** language understandable by non-specialists should be used to explain the need for the project. Jargon should be avoided. Several aspects will be assessed here, such as the novelty, the relevance and the timing of the proposed idea and the challenge that the approach represents. 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 in the following headings:

1.1 Objectives

1.2 Relation to the work programme

1.3 Concept and methodology

1.4 Ambition

The **Section 2 Impac**t describes the sum of the influences and effects that the project has on all its potential target groups (**stakeholders**) and on the field, after the project ends.

Generally, Section 2 is divided in the following headings:

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

2.2 Measures to maximise impact. Here it is important to describe three key types of measures:

Communication = How the project impacts will be shared to society

Dissemination = how the project results will be shared with others

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Exploitation = how the project results will be used

In **Section 3 Implementation** of the research proposal, the work plan must be very clearly detailed in accordance to the project objectives.

This Section is generally divided into the following headings:

3.1 Work plan

The proposed work is generally divided into **Work Packages**, which are the set of tasks that are necessary to be performed to address each of the project's **goals**. Each Work package is expected to produce several **Deliverables**.

Deliverables - outputs (*e.g. information, special report, a technical diagram brochure, list, a software milestone or other building block of the project*) that must be produced at a given moment during the action.

The work should be organized in time in a **Gantt Chart** or timeline for the project proposal.

3.2 Management structure, milestones and procedures

The **Management Structure** describes the governing bodies of the project, the decision-making rules and the frequency of project meetings and internal communication within the partners of the consortium. This is only relevant for large projects that involve several organizations.

Milestones should be defined. Milestones are steps in the project that help to assess the project's progress. They can correspond to the moments when a key deliverable will be completed, for example.

3.3 Consortium as a whole. Here the composition of the team/partners of the consortium is described emphasizing the added value of performing the work together.

3.4 Resources to be committed. Here the budget necessary to do the project is detailed.

In Section 4. Members of the consortium each partner of the consortium is described. It includes a brief description of the institution and of the individuals contributing to the project. This section does generally not have a page number limit.

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In Section 5. Ethics and Security all ethical and security issues that the project proposal raises must be identified and an explanation about how they will be addressed should be included. This section does not generally have a page number limit.

Above it is described the structure of a European proposal. Other funding agencies, national or international, use other structures, which can be much simpler. In any case, there are common elements in all proposals, and once one is familiar with one type of funding proposal, it is easier to identify the similarities and particularities in other types of proposals. There are parts that generally appear in any type of proposal. A typical proposal structure can be:

- Title
- Summary or abstract
- 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

The European funding documentation is full of specific vocabulary. Some of the **vocabulary describes the underlying policies** that gave rise to 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 vocabulary means and to **"recycle" the funders wording** to some extent to help the evaluators to easily match the information that is asked for by the evaluation criteria and the proposal text.

Other "European" terms used come from the **vocabulary linked to European funding** itself, such as "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 learn and this takes time and might seem discouraging when one is attempting to assemble a funding proposal for the first time. Also, when one applies to other funding agencies, the vocabulary for describing the same actions can be completely different. For example, in the American NIH vocabulary: a "call for proposals" is an "announcement" and the deadline is "due date" (https://grants.nih.gov/grants/grants_process.htm).

The **style of writing** a grant grant is also very important and can be a factor influencing the success in obtaining funds. When writing about research, it is important to explain simply concepts that can be often complex. Thus, one should use an **effective writing** style in which one writes to be understood using the simple phrase structures, familiar and short common words, short sentences and paragraphs.

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The aim of writing a grant is primarily to get funds, thus the grant text needs also to be convincing. A **persuasive writing** style is also needed. This consists of using subtle techniques to make the text stand out from the others, often inspired by techniques used in publicity and marketing. Examples consist of using present and future tense verbal forms instead of passive voices to show action; using "I" or "we" to show responsibility of the main candidate or his/her team in performing the work; to repeat key ideas throughout the text; to bring to the front the benefits; to make the proposal visual by using simple infographics, separating the text into clear headings, using short paragraphs, using moderately tools to highlight text such as "bold" or "underline", etc.

Analysis of funding proposals

From a given group of selected European **funding proposals** (Part B only, can be approved and/or not approved):

- Identify main sections of the proposal
- What guiding policy may be underlying the call that gave rise to the given proposal (see sections 1.1 Objectives and 1.2 Relation to the work programme)?
- What are the specific evaluation criteria for this call? (call text (or /work programme or guide for applicants)
- Are the proposals organized by the selection criteria?
- Can you identify examples of persuasive writing? Or examples of effective writing?
- Can you identify specific wording recycled from the call or Work Programme text?

Evaluation of funding proposals

Given the specific **Evaluation Criteria** (in the work programme or guide for applicants for the specific Call for Proposals) and the **Self Evaluation form** (https://ec.europa.eu/research/participants/data/ref/h2020/call_ptef/ef/2018-2020/h2020-call-ef-ria-ia-csa-2018-20_en.pdf) containing the **scoring scale** and description of each score for each proposal:

- How does the given proposal address the specific evaluation criteria? Groups can evaluate the proposal according to all or just some criteria; give scores; some groups can comment on the evaluation performed by the other groups

Pages with examples of proposals, to check: https://www.researchgate.net/publication/279923828_Successful_Marie_Curie_Research_Proposal_Example

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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 do 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, and 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 is able to accept others' views, and work together to provide the necessary support for the proposal's preparation.

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

LO#20 - The student takes responsibility for its own work.

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

1. Plan the project

The student will divide their work plan into coherent work packages, deliverables, milestones and including a timetable that is appropriate for what the student wants to do. This can be done in groups or individually.

First, the goal and expected impact of the research proposed should be clearly established. It is important to describe the **State of the art**, by briefly telling about the '**big idea**' for the project and what previous data (published or unpublished) led to propose it, and how it could significantly add to your field. It is extremely important that the **need** for the project is clearly described, and that it is **timely**.

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A short statement of the **specific hypothesis** or the **specific goals** attempted to reach within the project period that can directly support or refute the 'big idea'.

This reflection cannot be separated from the thinking about the **expected impact** of the project. What results will be expected and what **change** will they produce? What wider impacts will your project have?

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

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

2. Partnership building

A crucial aspect of the success of any proposal is to ensure that the "best team possible" is available to perform it. In a research project, the "best team possible" of a given project is the team that has the necessary technical know-how to implement the planned action, but also a team that has access to equipment, facilities, services or know-how that will be necessary. In other types of projects, the best team possible may be the team that has the best contacts or access to a wide range of people, institutions, services, etc. Also, the team must be suited to ensure that the project results will be known for the project to be able to accomplish its expected impact.

Many European calls for proposals demand the establishment of international teams, in particular those that require partners from at least three Member States. Moreover, the reasoning to assemble such large transnational teams is to generate added value from that transnational character, such as impact at European or global level. As these proposals are highly demanding in terms of impact, they can gather a wide list of entities directly or indirectly participating in the action. Many stakeholders can participate. Examples are companies, universities, research centres, Non-governmental organizations such as consumer associations, patient associations or other, public authorities, hospitals, policy makers, 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 a geographical balance of partners location important? Which partners should be core to develop the activities proposed and should be part of the consortium versus those that should be involved in achieving the impact of the project (target audiences for dissemination, communication and exploitation activities? Build the ideal consortium, if this is what the project requires.

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With a clear idea of how the project could be implemented and the partners it requires, and some knowledge about the types of funding available, it would be challenging to look for a suitable funding agency, programme or call to apply to with the student's own research project proposal. This could be a challenge to take home and perform outside the class time. Basically, it will be necessary to 1) Screen work programmes, 2) shortlist and prioritise topics, checking deadlines, 3) try 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 200 000 Euros for one year to be spent at a single host institution and not requiring co-funding. No subcontracting will be necessary. Template provided:

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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			

To guide into the setup of a budget the following should be considered:

- Generally, a proposal project requires people (called **Human Resources)** to do the work, so this must be considered in the budget. If the person doing the work already works at a given institution, it is common to estimate the time it will dedicate to the project as a **percentage of their work time** during the project's length, and to estimate what this time represents in terms of salary cost.

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Sometimes projects imply the **recruitment** of new people to do the work, thus the budget should contain the full cost of the salary of the people to hire.

- Common research costs can be of many different types. Examples are publication costs in Open Access, purchasing consumables, materials, services, software licences, the cost of preparing and submitting patents, the costs of travelling and accommodation to attend conferences, to collaborate with international partners, to participate in events, to do field expeditions to collect data, etc.
- Some types of research often require purchasing of specific equipment. The cost of the equipment can be included in the project costs, but only to the extent it is used by the team of the project within the project's length. In accounting standards a given equipment had a prefixed lifetime. Hence, if the project is shorter than the equipment's lifetime, it is only possible to include as a project cost only a part of the equipment full cost.
- Other types of projects may have many sorts of costs, depending on the nature of the activities planned
- All the costs mentioned above are the **Direct Costs** because they directly contribute to the implementation of the project.
- However, all costs also require **Indirect Costs**, that is, costs that are linked to the maintenance of research facilities and services of the institutions which are necessary for institutions to work but that are not directly linked to the project. They are also called **Overhead Costs**. Many research institutions rely on overheads for their normal functioning.
- In some specific call, the funder will only support part of the project costs. In these cases, there is a **co-funding rate**, for example of 40%, meaning that the project must be supported partially by own funds of the host institution of the project. In the example, 40% of all costs of the project will have to be co-funded by the host institution.
- **Subcontracting** is when a significant part of the activities is performed by a third party that does not belong to the consortia. Subcontracting costs can be included in the budget, but they are not considered for calculating the overheads.
- Also, if the proposal involves a team involving members in different host institutions (**consortium**), the budget, if approved, will have to be distributed by the partner host institutions in order that the partner part of the work can be carried as planned.

At the proposal phase, a realistic budget that complies with international, national and institutional rules is important to be established. The more realistic a budget is, the easier it will be to spend it according to the project plan, and the less problems will arise 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 potential problematic situations identified, it will become

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clear the role that a **Pre-award RMA** may have in avoiding potential problems by providing the necessary support during the phase of budget preparation for the research proposal. Sometimes, certain institutions install a process of **Budget Validation** by pre-award RMAs or administrative services to prevent proposals with “bad budgets” to be submitted.

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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 is able to 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 for systemic approaches and for the organization of the research ecosystem.

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

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

LO#20 - The student takes responsibility for its own work.

This lesson explores the institutional funding proposals that research performing institutions have to prepare in order to get funds to develop their own funding and impact strategies , or simply their strategy to assess research productivity and enhance the ranking of the institution. To prepare this type of funding proposals one requires to get knowledgeable about institutional research organization, infrastructure that exists to support research, and how the work carried out at research performed 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 for searching and mapping the scientific institutional ecosystem, based on the existent knowledge of the student and that obtained by internet searching.

Examples of research performing institutions: 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 centers, NGOs, etc. In many countries the public system is divided into a panoply of different types of institutions, thus national contexts can provide good material to do this mapping. In Portugal, for example, there are Research Units, Associate Labs, Collaborative Labs, State Labs, etc. Each type has their own specific institutional funding programme.

Research performing institutions need funding to function and to provide good conditions for research and innovation to flourish. There are many very different ways on how research performing institutions can be funded. Some institutions receive core funds that are **non-competitive**, which for public institutions is generally from the State budget centred. Other institutions rely heavily on open competitions - there is an «institutional research project». To get it, it is necessary to prepare and submit a grant proposal, and of having it approved afterwards. 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 institution, but institutions generally rely substantially on national assessment and evaluation schemes to reward national research institutions.

Any funds distribution to research performing institutions, independently of using competitive calls or not, should be based on a system to assess the quality of the research being produced by a given institution.

Institutional research assessment

There is a wide diversity of quality assessment systems affecting research performing institutions across Europe. Any assessment system exists due to existing competition. Given that the resources are scarce, research performing institutions compete to be able to attract the best talent (researchers, the students, RMAs), to offer the best conditions (infrastructure, equipment, services, environment) to be able to produce the most relevant discoveries, with greatest impact in science, society or the economy. Hence, there are external drivers guiding the strategy of research performing institutions, such as the funding pressure, but also internal drivers, such as those that render an institution competitive in its specific action environment.

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Which types of institutional research assessment exist assessing the quality of research producing institutions?

This question could be the motto for a group brainstorming on

- ranking systems
- institutional bibliometric indicators
- research assessment frameworks

Some references for ranking systems:

- Scimago institutions ranking https://www.scimagoir.com/
- QS World University Rankings https://www.topuniversities.com/university-rankings
- U-Multirank https://www.umultirank.org/
- Leiden Ranking https://www.leidenranking.com/
- Times Higher Education Rankings https://www.timeshighereducation.com/
- Shanghai Academic Ranking http://www.shanghairanking.com/

Some references for institutional bibliometric indicators:

- 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)

Some references for research assessment frameworks:

- UK REF https://www.ref.ac.uk/
- Assessing Europe's University-Based Research Expert Group on Assessment of University-Based Research
- Performance-based research funding in EU Member States—a comparative assessment

Explore a specific research assessment framework in some detail.

According to the next institutional evaluation exercise planned in the UK's REF, what will be the assessment criteria? How are they linked to policy?

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The institutional proposal

The research assessment evaluation exercises that determine how much funding an institution will get for several years demand considerable efforts in time and resources in assembling an institutional proposal and in coordinating their submission.

During the assembly of the institutional proposal, a concrete plan for action for a given period has to be set. Hence, a strategic action plan has to be envisaged, discussed and produced. RMAs can have key roles in supporting institutional evaluation exercises, which are often very demanding and important periods in the life of research performing institutions. RMAs can intervene in different ways: from the preparatory phases of evidence collecting, providing the policy review, and proposal planning, to the assembly of the proposal and to the support to all evaluation steps, which can involve site visits of the external expert evaluators.

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

Also, RMAs working on pre-award can have a role in assembling institutional strategic proposals. 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 institutions.

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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 policy makers 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 for systemic approaches and for the organization of the research ecosystem.

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

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

LO#20 - The student takes responsibility for its own work.

This lesson is dedicated to exploring conflict of interest between research policies and funding frameworks (policy makers) and research (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*

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

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The aim is to explore the role and perspectives of different stakeholders (policy makers; researcher 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 that the changes in the funding research scenario leads to changes in the behaviour of researchers and on academic values. EDWARDS & ROY argues that those changes tend to lead to unethical behaviours and lead to scientific error or fraud.

Point to cover over the discussion:

1. Which funding changes have occurred in the last decades?
2. What other factors have changed in the last decades that seem to affect the way research is conducted?
3. What are the micro mechanisms by which researchers adapt to the current pressures of the research environment?
4. Which behaviours related to the way researchers conduct their research have been observed?
5. Which ethical dilemmas are raised in the articles?
6. If you were a Researcher/Funding Agency/Policy maker/ RMA, you abide by which values? Consider the values of the citizen, the researcher and those of the institution.
7. What course of action would you consider for the future?

In this lesson time can be allocated to assess the progress of the students in the development of their project proposal tasks.

Bibliographic references:

- Edwards, M. A., & Roy, S. (2017). Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition. *Environmental Engineering Science*, *34*(1), 51–61. https://doi.org/10.1089/ees.2016.0223
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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 do 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, and expected outcomes and impact).

LO#8 - The student is able to 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 is able to 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).

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 policy makers for programme bodies, senior management of research institutions, research managers, and researchers.

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

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

LO#20 - The student takes responsibility for its own work.

In this lesson the student (or group of students) represents the Principal Investigator of a research proposal, or the main proposer of the other types of projects, to present his/her proposal to a given target entity (Stakeholder) in order to convince them to join the project as member of the team, as a partner of the consortium, or as a funder/sponsor of the project, or any other goal that is suitable for the specific project that must be defined beforehand.

The presentation should explain the goals of the project in simple, clear and engaging terms, stressing the benefits and features of the project but also explaining potential limitations. Each presentation should last 5 minutes maximum. Students can use any presentations tools available (e.g., power point, videos, pools, etc) in order to do the presentation.

Stakeholders can be one of the following options:

- Company working in the field of the project
- Non-Governmental organization 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 to the project presented,

The presentations will be evaluated according to predefined criteria, specific for the type of project:

OPTION 1: Research project - The students act as researchers and use their own research ideas to set a research project proposal

<u>Evaluation guidelines:</u>
Is the need for the project expressed clearly?
Is the main goal clear?
Will the idea for the project be impactful?
Is the state of the art broad enough to present the research area but foccused enought to lead convincingly to the research question?

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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 clearly play the role of a researcher?
Would you fund this project?
Would you accept becoming part of the team of this project?

OPTION 2: Action project - The students act as research managers and use their own ideas to plan a research management activity they would like to perform (example: to find a group of suitable funding calls for researchers to apply in a particular area, to set system to regularly inform researchers about funding opportunities, to analyse policy on open science and propose a strategy for action, other)

Evaluation guidelines:
Is the need for the project expressed clearly?
Is the main goal clear and addressing a research management activity?
Will the idea for the project 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 clearly play the role of a RMA?
Would you provide to this project what it requests?
Would you support this project?

OPTION 3: Career project - The students act as potential applicants for job in RMA areas and use their own ideas to build a portfolio and present themselves in the job market

Evaluation guidelines:
Is the need for the project expressed clearly?
Is the main goal clear and addressing a potential entry into a RMA career?
Will the idea for the project 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 clearly play the of a RMA-to-be?
Would you employ this person as RMA?

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A group of students may score each other's performance during the oral presentation. The performance of the pair Principal Investigator and Stakeholder should also be evaluated.

During the exercise, the teacher evaluates the appropriateness of the work of the evaluators.

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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) 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. In fact, Research & Innovation (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)**.

Research Managers and Administrators: diversity and definition

Collinson (2006) highlighted the several common features of the professionals working in research management in British Higher-Education Institutions (HEIs), such as: the i) the wide range of roles; ii) the cross-boundary interaction with academics, and iii) "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 individuals that perform managing roles, with a diversified background and a

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non-academic contract, that undertake activities between the professional and academic spheres. A second type of space is defined by Shelley (2010) as the "shifting area", highlighting the shared space where the research management field crosses into the academic domain. Santiago et al (2006) had previously defined the increasingly specialized 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) propose the term "Professionals at the Interface of Science" (PIoS) as an umbrella identity that encompasses all these roles and profiles of professionals.

Despite the different terminology and conceptual framework proposed to define these professionals, all authors acknowledge that research managers and administrators (RMAs) operate at these different levels/ stages of research development:

- *upstream of research* – to attract/advocate for/ define 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).

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This Module focuses on the Project life cycle and on the RMAs that perform project management tasks, often called R&I Project Managers.

R&I projects 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 to these type of projects, so the management of R&I is of a utmost relevance to the success of a R&I project (Mikulskiené, B. 2014; Dinsmore, P. & Cabanis-Brewin, J. 2011). Management processes allow us to deal and control the activities and team members in order to successfully develop a project. R&I management's most important matter is the ability to control the tasks development and effectiveness and efficiency with which the R&D activities are undertaken and how uncertainties are addressed.

In order to understand what implies R&I management and how to better use its techniques, we must understand the meaning of R&I effectiveness (how can we evaluate it) and what are the benefits that can result from R&I management addressed (Szakonyi, R. 1994; Mikulskiené, B. 2014).

Szakonyi (1994) identified 10 R&I activities that allows us to measure the R&I effectiveness:

1. Selecting R&I – without recognising and identifying the R&I projects that better suits our organization perspectives and specializations, any concerns about the project management process are unwarranted;

2. Planning and managing project – a R&I project needs to have a good and organized plan and a suitable management process, otherwise the successful outcome of the project will be in risk;

3. Generating new products ideas - new product ideas with a relevant impact to society are important to present a strong project idea that is interesting to the stakeholders;

4. Maintaining the quality of R&I processes and methods – in a R&I project we must assure that not only we reach the objectives proposed, but also that they are met with quality. Assuring the quality of R&ID processes and methods will allows us to work efficiently and produce good outcomes;

5. Motivating technical people;

6. Establishing cross-disciplinary teams – even though this paper was written more than 20 years ago it already stressed about issues that are even more notorious nowadays. To have a project approved the European Commission (EC) demands a project plan that addresses strategic challenges of our society. And to address these strategic challenges cross-disciplinary teams are fundamental to their development;

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7. Coordinating R&I and marketing - apart from a good R&D project plan and the production of the research results with quality, a successful project must also have a plan on how we intend to use the knowledge developed and how the 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 know how we are going to transfer the technology to society. As Dr. Eugene Sweeney referred 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 where we describe 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 consideration to take in account in EC research projects. A project-specific dissemination and exploitation plan is often required and evaluated at proposal stage;

9. Fostering collaboration between R&I and finance - the author only identifies that the R&ID staff should have a good communication with the finances department, but in fact it should establish a communication with a diverse number of departments inside the organisation, namely 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) organised the project management field is organized in ten knowledge areas, that take part on a research project life cycle:

1. *Project Integration Management* - essentially is the integration and coordination of all elements of the project, namely the project activities, resources, stakeholders, and any other project elements. It is in this knowledge area that falls the responsibility to manage the conflicts that may arise in the project development, the need to make trade-offs that allows to make a diverse number of processes, developed by different teams and/or departments, align and work together in a coordinated way. It's considered crucial on the success of a R&I project;

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2. *Project Scope Management* - involves the characterisation of the product or result, namely its functions and features. The scope management includes also the activities to be developed in order to achieve what is defined in the functions and features of the results of the project;

3. *Project Time Management* - involves six processes: 1) definition of the activities; 2) organisation the execution sequence of the activities; 3) estimation of the activities resources; 4) estimation of the activities duration; 5) definition of a schedule for the activities execution; 6) controlling and revising the schedule of the activities execution;

4. *Project Cost Management* - involves establishing the project budget, ensuring that the funds available cover the extent of the project, and the definition of a monitoring system and tools through which the costs can be measured and managed;

5. *Project Quality Management* - involves the definition of a plan where it's detailed how the quality assurance and control will be executed and allows to perceive the quality standards are achieved. It also should detail what techniques or tools can be applied for quality improvement;

6. *Project Human Resource Management* - involves the establishment of a plan where is identified the roles and positions needed for the project development and the formation needs. It also requires a track system that allows to evaluate the team performance and ensuring that the activities are being executed as planned;

7. *Project Communications Management* - involves a communication plan where it's defined how and when the communications to the team, partners and stakeholders will take place. It should also be accounted on the plan the control of the communications to ensure that their efficiency is frequently evaluated and adjusted when needed;

8. *Project Risk Management* - involves a plan where is defined how the risks will be itemized, categorized and prioritized. It should be also established the risks responses, who will be responsible for the risk identification and handling and how the regularity with which the risk register should be reviewed;

9. *Project Procurement Management* - involves a plan where is identified the acquisitions of services and/or products needed for the project development and how the suppliers/contractors will be engaged in the project;

10. *Project Stakeholder Management* - involves listing the stakeholders and prioritizing their concerns and how they could impact the project. The control of the stakeholder's engagement should be made throughout the project, namely by identifying if their needs are being addressed and what adjustments may be needed to achieve their expectations.

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These project management areas are vertical oriented, meaning that these ten areas coincide with the different project management process groups, whereas the project management process groups are horizontally oriented and will occur sequentially on the project life cycle.

Project Management and project life cycle

Project management accompanies a project through its life cycle and in some cases, it might be extended after the closing of the project. On Figure 1 is demonstrated a project life cycle and it's diverse sequential stages (project management process groups): 1) project initiation; 2) project planning; 3) project execution, 4) project monitoring and controlling; 5) project closing (Kourounakis, N., & Maraslis, A., 2016).

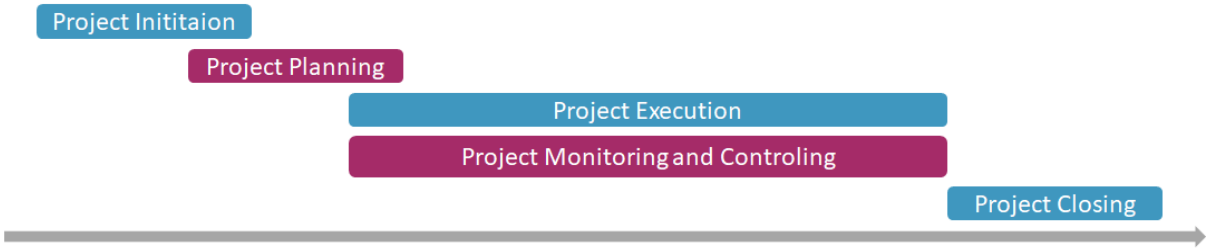

Figure 1 – R&D Project life cycle

The first phase of a R&I project is the project initiation phase and it's at this stage that the project purpose and objectives are defined, and some initial part of the project planning takes place. The purpose of the project must be aligned with the organisation's strategic objectives. In this phase occurs the following activities (Kourounakis, N., & Maraslis, A., 2016):

1) Project planification, where is identified the research idea, the expected R&I project outcomes and the challenges that the project will address;
2) Preparation of the grant proposal, where is provided the: a) project scope; b) detailed objectives and methodologies to be implemented in the project 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) possible risks, identifying the possible problems that may arise and alternative solutions.

After these activities, 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, where some contractualisation procedures are made with the funding agency and the partners (e.g.: grant agreement and consortium agreement signature, project work plan, project management plan).

The second phase is the project planning phase, at this stage the objective of the R&I project is verified and the initial plan revised, making adjustments if needed (e.g.: dates of the activities development and the resources should be adjusted to the timeframe and budget defined on the grant agreement). It is in this phase that the project work and project management plans are

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structured, and the kick-off meeting with all partners of the project is prepared (Kourounakis, N., & Maraslis, A., 2016).

The project implementation phase sets the beginning of the project activities and the kick-off meeting is promoted by the coordinator. In this stage all the plans prepared previously start to be implemented until the closing phase (Kourounakis, N., & Maraslis, A., 2016).

Simultaneously with the project execution phase we have the project monitoring and controlling phase. During this phase the R&D project execution activities are regularly reviewed and monitored to make sure that everything is being developed according to the project work plan and to promptly address any deviations and risks. Also, it's in this phase that happens all the communications with the funding agency, namely adjustments requests - when the deviations on the project might not be handled without altering the initial plan; interim scientific and financial reports (Kourounakis, N., & Maraslis, A., 2016).

The project closing phase signals the official end of the project and it's when all the project documents, reports and deliverables are prepared to be sent to the funding agency. At this stage is important to not only acknowledge the team involved in the R&D project, but also to discuss the overall experience and document the know-how learned and the best practices implemented that might be useful in 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: 1) identifying the funding schemes; 2) aiding on the proposal writing procedure; 3) schedule the R&I activities and plan the resources needed to develop the project; 4) manage the scientific and financial development of the project – the RMA should keep track of the tasks being developed, the costs associated with each task and proceed with adjustments and corrections when needed, present reports to the funding agency; 5) promote the dissemination and communication of the projects development; 6) manage the finalisation of the project – the RMA aids the principal investigator gathering all the project information, so it can be made an evaluation of the project indicators, access if they were met and to prepare the final report; 7) management of the knowledge produced by the project, focusing on its use and impact to society (Mikulskiené, B., 2014; Kourounakis, N., & Maraslis, A., 2016).

Due to the large spectre of RMAs actions, in a Research Performance Organisation (RPO) we can observe different types of managers with different and specialized competencies (e.g.: pre-award manager and post-award manager, team manager, laboratory manager, communication manager, intellectual property manager).

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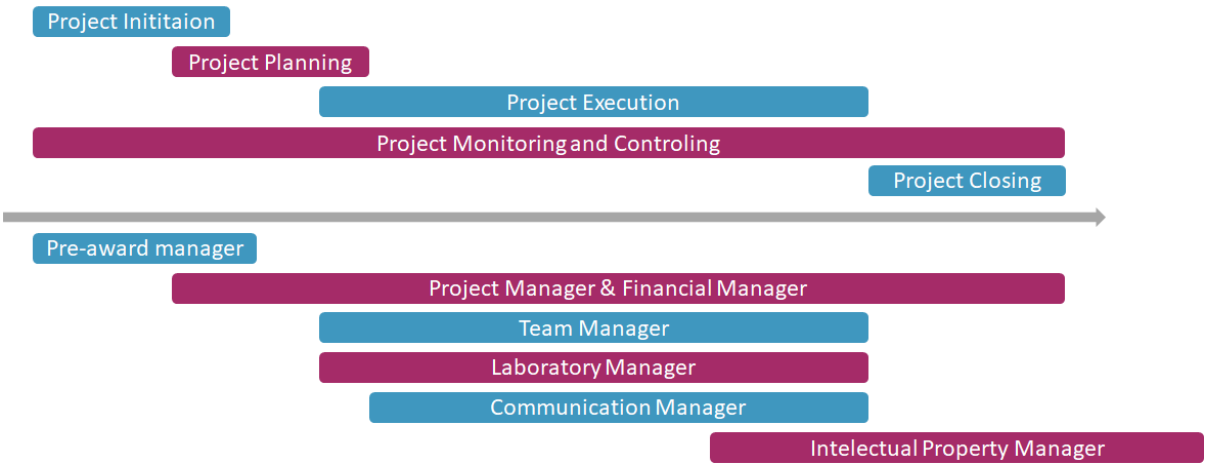

Figure 2 – RMAs in a project life cycle

Each type of managers mentioned above, since they have specific competencies, can participate in a R&I project in different phases of the project life cycle, as shown on figure 2.

The pre-award manager is responsible for identifying the best funding scheme for a specific idea or research plan that a researcher wants to develop and aids on the proposal writing procedure. The pre-award manager advises the researcher on the specificities of the call and must guide on how to address successfully all topics of the application form.

The post-award manager is responsible for the financial compliance monitoring, verifying if the financial execution of the project occurs according to the funding agency financial rules and applicable national laws. The post-award manager also has a significant participation in aiding the principal investigator with the articulation with the funding agency and helping in some project modification processes, like budget revision due to project deviations. Throughout the project execution the post-award manager is responsible for the preparation and organisation of report documents and financial reports submission, and for the project closing procedure and audit preparation. The post-award manager can also have a narrow collaboration with the pre-award manager, specifically on the establishment of the budget and resources plan on the application preparation.

The 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 of the project needs. The team manager is responsible for managing the team of the project, accessing the team's performance and deals 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 at the laboratory, and for the requesting of material necessary for the project activities.

The intellectual property manager is responsible for aiding in the writing of the IP protection requests to be submitted to IP offices, preparation and revision of non-disclosure agreements and for the revision of the IP clause present on the consortium agreements. The role of the IP

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manager can be extended after the closing of the project, since he accompanies the IP concession procedure - that may take up to 2 years - and he is involved in the licensing agreements and technology transference activities.

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 RMAs

The pre and post-award RMAs act separately in separate units and offices.

> advantages: being exclusively dedicated to the pre-award research management the RMA can develop a high level of specialization and become knowledgeable in very specific niche area;
>
> disadvantages: a strict separation between pre and post-award management can lead to a inefficient communication and contribute to some difficulty, for both pre and post-award RMAs, gaining perspective on the whole process of research administration;

Hybrid pre and post-award RMAs

The pre and post-award RMAs act separately in the same unit or office.

> advantages: the RMAs specialize in specific niche areas and develop a closer communicating between pre and post-award management procedures, that ultimately will benefit and increase the convenience of the principal investigator;
>
> disadvantages: it may lead to the need of additional staff leaders (e.g.: pre-award coordinator and post-award coordinator) and the RMAs must lead with the existence of different roles and responsibilities in 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 the RMAs generalists (working as pre and post-award managers) it can contribute to a flexibility in adjusting to high work loads periods both on the pre or post-award procedures; also the project monitoring is more streamlined since the same RMA has managed the project from the beginning and aiding as well in the communication development with the principal investigator;

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disadvantages: the training of a RMA that works as a pre and post-award manager is extensive and leads to a large volume of information to master.

Project Management Offices (PMO)

Often project managers are integrated into a wider research support team, such as in a Research Support Office or in the Research and Innovation department. Nevertheless, the composition and diversity of such teams/ offices vary from the type of RPO institution (University, private research institution, technological/ interface institution, etc.) but also from its level of professional maturity and development (connected with great discrepancies of R&I performance between countries even within Europe). There are different frameworks that define the roles and governance of a Project Management Office which can provide us an overview of possible organizational distributions. The most recognized ones are:

1. Project Management Body of Knowledge (PMBOK): Developed by the Project Management Institute (PMI) in the United States, it divides the management of projects into five process groups and ten knowledge areas. The process groups run roughly in chronological order (project phases) and the knowledge areas are utilized whenever the expertise on that topic is required. The process groups are horizontal, and the knowledge areas are vertical.
2. PRINCE2: Developed by the UK government PRINCE2 is a system of project organization that defines a specific project organizational structure, roles and responsibilities which must be filled for the project to be considered a PRINCE2 project.
3. Individual Competence Baseline (ICB4): Developed by the International Project Management Association (IPMA), this is a standard methodology of project manager competence. This guide is divided into 24 competence elements each of which contain key competence indicators which can be used to judge a project manager.

Looking at such frameworks can help us understand the dynamics of the Project Management Offices, its roles and governance. Since each framework focuses on different aspects, we can take them into account in different analyses.

Depending on the organization and also on the level of professional maturity / development, there are different possible configurations of teamwork for project managers, from a wide and very specialized RMA team (that supports the project management as a team effort addressing its different aspects - financial, communication, open science, etc.) to a small and generalized team (where the project manager has an overview about all issues relevant). In this regard, several authors have been analysing 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 the PMO based on their 1) influence and 2) position within the organization as such:

1) based on the level of influence we can have:

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a) **Supportive PMO**: provide a consultative role to 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.
b) **Controlling PMO**: provide support and require compliance through various means. Compliance may involve adopting project management frameworks or methodologies, using specific templates, forms, and tools, or conformance to governance. Moderate degree of control.
c) **Directive PMO**: take control of projects by directly managing them. High degree of control

2) based on the position they have within the organization we can have:
   a) **Individual PMO** or "Project Management Office": typically provide functional support (e.g., infrastructure, document management, training, etc.) to a single complex project or program. They set basic standards and oversee planning and control activities for a single project.
   b) **Departmental PMO** or "Business Unit PMO": Departmental PMOs provide support for multiple projects at a department or business unit level. Their primary challenge is to integrate projects of different sizes within a division (e.g., IT, Finance) from small, short term initiatives to multi-year programs with multiple resources and complex integration of technologies.
   c) **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.

Team development and individual roles

A project management team consists of people working together in a committed way towards a common goal: manage the research project. But, as their organizations and offices, teams also mature, grow and develop. In this regard it is important to acknowledge the four-stage model of Bruce Tuckman where he proposes that such team development occurs in a fairly clearly defined growth cycle: **Forming, Storming, Norming, and Performing** (later he added a fifth stage, "**adjourning**").

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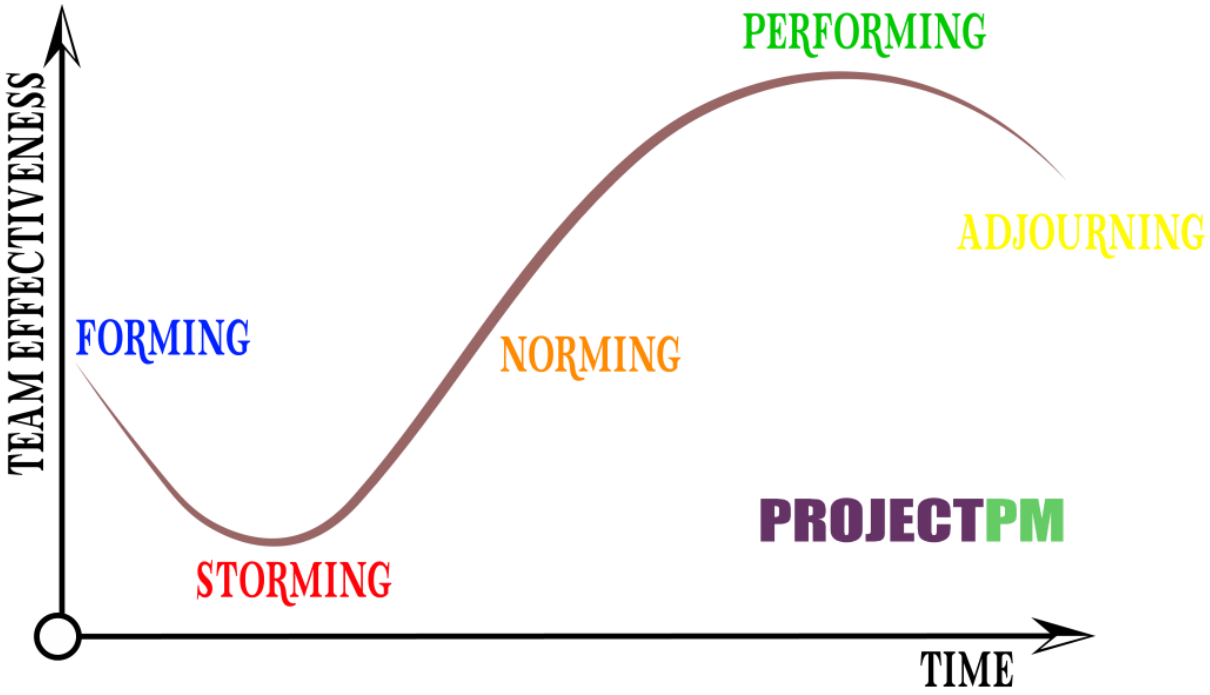

Source: https://project.pm/team-development-tuckman/

Different stages have different levels of effectiveness and, as project manager, managing all stages accordingly is key (specially the "storming"!). Let us look the definition of each stage:

1. **Forming:** this is when team members meet for the first time and, as such, most team members are positive and polite, others can be anxious or simply excited about the task ahead. The leader of the management team plays a dominant role at this stage, because team members' roles and responsibilities aren't clear. This stage can last for some time, as people start to work together, and as they try to get to know their new colleagues.
2. **Storming**: Next, the team moves into the storming phase, where people start to push against the boundaries established in the forming stage. This is the stage where many teams fail. Storming often starts where there is a conflict between team members' natural working styles. People may work in different ways for all sorts of reasons but, if different working styles cause unforeseen problems, they may become frustrated. Storming can also happen in other situations. For example, team members may challenge your authority, or jockey for position as their roles are clarified. Or, if you haven't defined clearly how the team will work, people may feel overwhelmed by their workload, or they could be uncomfortable with the approach you're using. Some may question the worth of the team's goal, and they may resist taking on tasks. Team members who stick with the task at hand may experience stress, particularly as they don't have the support of established processes or strong relationships with their colleagues.

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3. **Norming**: Gradually, the team moves into the norming stage. This is when people start to resolve their differences, appreciate colleagues' strengths, and respect your authority as a leader. Now that your team members know one another better, they may socialize together, and they are able to ask one another for help and provide constructive feedback. People develop a stronger commitment to the team goal, and you start to see good progress towards it. There is often a prolonged overlap between storming and norming, because, as new tasks come up, the team may lapse back into behaviour from the storming stage.
4. **Performing**: The team reaches the performing stage, when hard work leads, without friction, to the achievement of the team's goal. The structures and processes that you have set up support this well. As leader, you can delegate much of your work, and you can concentrate on developing team members. It feels easy to be part of the team at this stage, and people who join or leave won't disrupt performance.
5. **Adjourning**: Many teams will reach this stage eventually. For example, project teams exist for only a fixed period, and even permanent teams may be disbanded through organizational restructuring. Team members who like routine, or who have developed close working relationships with colleagues, may find this stage difficult, particularly if their future now looks uncertain

Diagnosing the stage of development of a management team can help selecting the appropriate intervention and the relevant management and leadership approaches to move the team forward. Looking at the preferred “team roles” of individual team members can also be important.

Team roles

There are different approaches to study **team roles**. One of the most recognized was developed in the 1970s by Meredith Belbin and colleagues at the Henley Management College. In here, based on long-term psychometric tests and studies of business teams, Belbin's team propose 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 their inquisitive nature to find ideas to bring back to the team.
    a. Strengths: Outgoing, enthusiastic. Explores opportunities and develops contacts.
    b. Allowable weaknesses: Might be over-optimistic and can lose interest once the initial enthusiasm has passed.

2. “Team Worker”: Helps the team to gel, using their versatility to identify the work required and complete it on behalf of the team.
    a. Strengths: Co-operative, perceptive and diplomatic. Listens and averts friction.

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   b. Allowable weaknesses: Can be indecisive in crunch situations and tends to avoid confrontation.

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

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

5. “Monitor Evaluator”: Provides a logical eye, making impartial judgements where required and weighs up the team's options in a dispassionate way.
   a. Strengths: Sober, strategic and discerning. Sees all options and judges accurately.
   b. 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.
   a. Strengths: Single-minded, self-starting and dedicated. They provide specialist knowledge and skills.
   b. Allowable weaknesses: Tends to contribute on a narrow front and can dwell on the technicalities.

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

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

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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.
    a. Strengths: Painstaking, conscientious, anxious. Searches out errors. Polishes and perfects.
    b. Allowable weaknesses: Can be inclined to worry unduly, and reluctant to delegate.

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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 for 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.

Project Management and Governance

In coherence with the project management office organization, a project management plan is designed in order to ensure the successful development of a project during its life cycle. On the project management plan, it is defined as the project management governance framework that should provide a logical and robust decision-making methodology that can be replicable in any project or future projects. The project management governance framework provides the project team the structure for making decisions, defines roles and responsibilities and provides tools for the project management, while it supports and controls the successful outcome of the project (PMI, 2013; Alie, S. 2015; Smits, F. 2018; Bernardo M. 2010).

According to the Association for Project Management it's the effective governance of project management that allows the alignment between the project's and the organization's objectives. It's also the project governance that ensures that the project development is sustainable and supports the means through which the board and stakeholders give relevant and reliable feedback on the project development on time (APM, 2011).

Project governance puts into definition to the RMA on how the project should be managed, providing comprehensive and consistent methodologies for the project controlling and ensures the project success by defining and documenting project practices. Project governance is relevant for any project and its management, but it's especially determinant for large and complex projects (PMI, 2013; Alie, S. 2015; Smits, F. 2018).

Even though project management governance is the framework on how the project team should develop the project, the RMA and remaining project team are still responsible for carrying out the project life cycle phases (planning, executing, controlling and closing phases) (PMI, 2013).

Key governance components and project management process groups (project life cycle phases)

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During the project life cycle, project management governance has eight major components that are mandatory and must be studied and analysed for the project success. These eight components are divided between the initiation phase and the monitoring phase. There is a need to know the project environment and make sure the project is aligned with the organization's governance structure. These alignments must be the focus 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 implementation during the project and should assess the effectiveness of the plan implementation. When doing this project governance monitoring the project manager should "ensure that there are adequate meetings [4], reporting [5], evaluate and control the risk [6] and issue management, assurance [7], and project management control processes [8]" (Alie, S. 2015). On figure 3 these eight components are mapped in the project management process groups (project life cycle phases).

Figure 3 – Project Governance eight components in a project life cycle

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

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2) Accountability and responsibilities - the definition of these components is one of the core tasks of RMAs. The non-definition of these components may result in negative consequences and lack of effectiveness of meetings, the control processes, the risk assessment and the communication plan. This definition isn't solely based on stating who's accountable of a certain aspect or activity of the project, but it's also stating who's responsible and who's should be consulted/informed for each of the project activities and deliverables;
3) Stakeholder engagement - definition of all the stakeholders, what are their interests and expectations and how the communication with them should occur. The stakeholder is anyone who can be 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 the relevant, concise and on time information to the pertinent stakeholders;
5) Meeting and reporting - definition of the right balance of meetings and reporting. The stakeholder must understand the content of the communication and its periodicity. The RMA should assure that the communication with the stakeholders is brief, concise and direct to the point;
6) Risk and issue management - definition of how the risks should be identified, classified and prioritized. The lack of definition of the risks that could arise in the project development may cause some adversities and delay the application of the due adjustments - how you handle the risk it's more important than the risk itself;
7) Assurance - definition of metrics that could give a view of the project performance and ensures that the risks are effectively managed. Some of the metrics are effectiveness of the change control and risk analysis process; the capability to monitor deviations in project scope, time, cost and schedule; and 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 balances. The monitoring and controlling process is based on all tasks and project related metrics and measures the project performance by comparison with the baseline scope, budget, time, and resources. This procedure must be done constantly by the RMA to ensure that corrective actions can be made on time.

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 adjusted to its objectives, culture and own governance model (Bernardo, M. 2010; PMI, 2013), aligned with the organization's own strategies and ethical principles (Bernardo, M. 2010), that cover the following core elements:

1) Roles and responsibilities;
2) Decision making process and levels;
3) Methodologies;

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4) Competences;
5) Communication process;
6) Controlling process.

Project management roles and responsibilities

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

- Principal Investigator (project coordinator) - is the intermediary of the between the project parties and the Funding Agency;
- General Assembly - assembly of all the partners, where it should be included one representative of each partner and is chaired by the principal investigator;
- Executive Board - directs and monitor the project development, normally is constituted by the principal investigator and other project members appointed by the General Assembly (e.g.: task leaders);
- Advisory Board - external stakeholders that have specific expertise regarding the project scope and 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, for the organisation of meetings, coordination of the reporting, serving as helpdesk for queries by the project partners.

This set of roles or governance bodies will have specific ways of interacting within the project and that it's normally detailed on the project management plan. Each project, depending on the needs and specificity, may define certain rules and mechanisms between the governance bodies that aid in the decision-making processes.

Depending on the needs of the project there might be other roles such as: communication manager - that is responsible to manage all the external communication and dissemination activities of the project, innovation manager - that is responsible to manage the project results and promoting their exploitation, laboratory manager - that is responsible to maintain the laboratory organised and with the appropriate conditions and needed material so the project scientific team can develop their activities, etc.

Essentially the project management and the project governance framework will set the pace with which the project should be developed and how all the project participants (research, management team and stakeholders) will intervene.
After the drafting of the project management plan and project governance framework is time to start preparing the legal documents that will bind the project team and the EC/Funding agency.

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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 concluded before the signature of the GA.

Grant agreement

The GA forms a contract between the EC and the project 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 and preparation project-results and the requirements for the use of the EC-emblem.

GA preparation

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

The EC funded projects must be implemented in accordance with the evaluated proposals, so the GAs mustn't differ from the proposal, with the exception to some needed corrections, namely:

- when, meanwhile the project evaluation to the grant approval, occurred an ethical review or security scrutiny;
- 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 grant preparation.

Like mentioned above, in this document there isn't a lot of information that can be changed, so the negotiation involved in this procedure is minimal, but you are still able to correct some shortcomings that the experts identified in the 'Evaluation Summary Report', if this situation doesn't delay the grant agreement preparation beyond the deadlines applicable.

The signature of the GA is made exclusively online through the Funding & Tenders Portal and this procedure must be completed until 3 months after the beginning of the grant agreement preparation.

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Aim of the GA preparation

Essentially the GA's preparation is needed to:

- gather legal, administrative and financial information from the beneficiaries (project participants - sign the GA) and any third parties linked to any of the beneficiaries;
- ensure the Description of the Action (Annex 1 to the GA) and the estimated budget/estimated lump sum breakdown (Annex 2) match the proposal;
- establish the key points of the GA, namely: project start date; reporting periods; amount of pre-funding payment; need for a consortium agreement (CA); ethical issues, third parties linked to any of the beneficiaries; in-kind contributions provided by third parties; subcontracting - the last four points are detailed only if applicable;
- verify the coordinator organisation financial capacity - verification made when the funded amount is equal or higher than 500 000 EUR, unless the coordinator 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; a private individual in receipt of a scholarship.

Consortium agreement

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

The European Commission (EC) advises on preparing the consortium agreement, or at least a draft version of this document, at the initiation phase, during the proposal preparation. This early draft preparation will enable the discussion and agreement of important project particularities and sensible information.

The EC states that the draft of the consortium agreement should give a first idea on:

1. project implementation and division of tasks between the beneficiaries (coordinator and partners);
2. internal organisation and management of the consortium and user rights on the Funding & Tenders Portal;
3. project budget and distribution of EU funding
4. additional rules on rights and obligations related to background and results;
5. liability, indemnification and confidentiality arrangements between the beneficiaries

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6. boilerplate provisions: duration, termination, communication, applicable law, settlement of internal disputes etc.

At the grant preparation phase, the consortium must have reached and agreed on a final version of the consortium agreement that should be concluded before the coordinator organisation signs the grant agreement. The consortium agreement allows the beneficiaries (coordinator and partners) to agree on any specific details that aren't detailed on the grant agreement and the consortium may see fit to have it in writing (e.g.: organisation of work, intellectual property management, liability, and future exploitation and dissemination of results).

As previously stated the EC, per rule, demands the preparation of a CA in almost every project and provides some information on how to draft this document, but doesn't specifically endorse a specific model of CA. Aiming to prepare a model CA specifically designed for H2020 projects a work group was formed between the French National Association for Research and Technology, European Association of Research and Technology Organisations, European Liaison Office of the German Research Organisations, League of European Research Universities, Applied Research Organisation in Finland, Centre for Innovation and Technology in North Rhine Westphalia, Applied Research Organisation in Germany and Helmholtz Association of German Research Centres. This work group, commonly known as Development of a Simplified Consortium Agreement (DESCA) core group developed an easy and detailed model CA - the DESCA model, with various options and clauses providing maximum flexibility so the CA could be adapted to the specific project needs. The DESCA model has also several elucidation notes that help the RMAs without legal training and first time participants, and is regularly updated being the last version from 2020 (DESCA, 2021).

The items you normally see on a consortium agreement are:

- **Preamble** - sets the scene and context for the consortium agreement and some agreements previously set between the consortium may be referred to;
- **Parties** - details the official name of each of the project beneficiaries and may be added interested parties that will carry out some tasks during the project (linked third parties);
- **Definitions** - sets a list of specific terms in order to avoid misunderstandings regarding the extent of a specific right or obligation;
- **Internal organisation** - sets how the consortium will be governed and managed, representing most of the content of the consortium agreement. A project consortium normally involves beneficiaries from different Member States with different languages and customs. Facing this diversity, the proper management of the consortium is of extreme importance in order to achieve the project results and efficiently disseminate and exploit them.

The provisions of project governance normally cover the following issues:

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- set-up and ways of working of coordination and management bodies (e.g.: project steering committee, project quality committee);
- the powers and responsibilities of these bodies;
- voting rules.

There are some additional provisions that can be detailed in this topic:

- how often project meetings will be held;
- how the parties should communicate and correspond with each other and the management bodies;
- how the project should be followed up and supervised - in this topic it could be proposed an internal scientific and financial report, so the RMA can actively monitor the project develop throughout all partners;
- what rules should be applied if a partner wants to leave the consortium or if a new party wants to join when the project has already started.

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

The consortium agreement should detail all the roles and Funding & Tenders Portal user rights for each of the beneficiaries for project information and project management tasks (e.g.: filling in forms, uploading documents, submitting information and signing documents). There should be also detailed provisions for when persons leave or change roles in the project or in the organisation, and what happens if applicants/beneficiaries end their involvement with the project.

- **Project implementation** - definition of the task's division per beneficiary:
  - the tasks assigned to each party;
  - the project schedule;
  - how changes can be made to the project;
  - the conditions under which other persons/organisations (e.g. linked third parties, seconded persons or subcontractors) are brought into the project.

- **Project budget**
  - distribution by the coordinator of the payments received by the Commission/Agency - in this topic it could be defined a strategy to distribute the funds to the partners, namely making them available upon delivery of reports or deliverables. If this method is applied, the CA must have a clear definition of what must be submitted or fulfilled by the partners in order to receive the funds and the percentage corresponding to the funds. Also, it's a good practice to define on the CA the bank account details to which the funds must be sent;

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- contributions - in the CA it should be set out in detail the contributions made by each beneficiary and whether these are made in cash or in kind;
- receipts - in the CA, it should also be considered the potential implications of contributions and income received, since, when these qualify as receipts, they will be considered at project-level. If receipts are expected, in the CA it should be set out how this will be managed, additionally a beneficiary's income may mean that the project grant is reduced because of the non-profit rule.

- **Intellectual property rights (IPR)** - dissemination and exploitation of project results

  In the CA it should be defined flexible and efficient rules to encourage and support cooperation between the beneficiaries as regards intellectual property (IP). Normally on this topic the following points are agreed on:

  - definition of the IP background - IP considered relevant to the project and that are already owned by the beneficiaries on the date of signature of the CA;
  - protection, dissemination and exploitation of results - in the CA it should be set out rules on how to identify, report, protect, disseminate and exploit the project results. Regarding this topic the GA already establishes the need of any beneficiary to notify the other beneficiaries before disseminating the project results, allowing the review of the content and, if appropriate, seek the protection of the results through IPR;
  - how joint ownership will be managed - If two or more beneficiaries jointly produce results in the project and it's not possible to identify each beneficiary's contribution nor it's possible 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 it's should be included in the CA as well;
  - transfers of ownership provisions;
  - any additional rules on access rights;
  - how third party involvement will be managed - 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 the beneficiaries may disclose or use confidential information. For this effect on the CA it should be detailed the following:
  - a definition of what constitutes confidential information;
  - the confidentiality obligations (including their scope and duration);
  - penalties for breach of confidentiality obligations (if necessary).

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- **Liability, warranties & penalties** - definition of each beneficiaries' liability for actions or omissions in the project. For this effect, the CA should cover the following:
    - the procedure to be followed (e.g. for serving the party with a warning, giving them the opportunity to object to the charge or to rectify the situation within a given period);
    - liability for damage caused and the related indemnification (and possible limitations of liability, including force majeure);
    - possible penalties for non-compliance (stipulating clearly the terms of the penalties, e.g. the amounts, the procedure for imposing a penalty and the interest due in cases of late payment).

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

The Commission/Agency may reject some of the costs declared by the consortium or even reduce the grant. In these situations, the GA defines the way the financial responsibility is normally shared between the beneficiaries. But the financial responsibilities to be shared in the consortium may differ from the ones defined on the GA, in this case, the financial responsibilities to be applicable should be clearly defined on the CA.

The same situation should be applied to the damages each beneficiary is liable to cause to the Commission/Agency.

- **Boilerplate provision** - standard contractual provisions included in agreements of all kinds, such as:
    - its start and duration (i.e. entry into force and end (including early termination);
    - methods for resolving disputes (in court, via arbitration or via mediation) ;
    - the procedure for amendments (and the types of changes that require one);
    - contact points for any correspondence;
    - the law applicable to the agreement.

Project management and Decision-making

Defining the project management plan or the governance structure with the research team, advising on the grant agreement or acting as facilitator in the consortium agreement, RMAs are involved (and a lot of the times are the key players) in decision-making processes crucial for the development of a research project. RMAs are then often called to choose (or help to choose) from a set of alternatives, resulting in an action, a recommendation, or an opinion. To do so, RMAs must follow a series of sequential steps, from understanding the alternatives to implementing the decision. In this regards, different authors propose different rationales, as for example:

1. GOFER (model developed by the psychologist Leon Mann and colleagues in 1980s):

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- 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

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

There are several theories and models about decision-making that we summarise in three main research perspectives:

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

According to that, we can also categorize different styles of decision making:

1. **Optimizing vs. Satisficing**

As Herbert A. Simon acknowledges, decision-making is limited to the finite amount of information an individual has access to and thus the decision-making is constrained by the limited available information, available time and the mind's information-processing ability. Two main styles were identified: the *satisfier* who recognizes this necessary imperfection, and prefers faster but less perfect decisions, and the *maximizer* who takes a longer 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 in management and decision making.

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2. **Intuitive vs. Rational**

Daniel Kahneman proposed that there are two separate minds that compete for influence within each of us: the *System 1* that is automatic and intuitive, rapidly consolidating data and producing a decision almost immediately and the *System 2* that requires more effort and input, utilizing logic and rationale to make an explicit choice.
An article published by the authors at MIT magazine can provide for insights about the this Approach to Strategic Decisions https://sloanreview.mit.edu/article/a-structured-approach-to-strategic-decisions/

3. **Combinatorial vs. Positional**

Proposed by Aron Katsenelinboigen based on how the game of chess is played, and an individual's relationship with uncertainty and defines two main styles: the *combinational* style is characterized by a very narrow, clearly defined, primarily material goal and the positional that performs semi-complete linkages between the initial step and final outcome (as opposed to pursuing a concrete object). Each move from this type of player would maximize options as opposed to pursue an outcome.
For more information see The concept of indeterminism and its applications: economics, social systems, ethics, artificial intelligence, and aesthetics

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

- In the 2004 article Decision-making: Theory and practice we can find a literature review of the main theoretical models of decision-making and specially applied to the way in which 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 personal styles, the agendas of decision-makers, as well as the presentation of results, may significantly improve the impact of a decision support project".
- In the 2012 article Becoming Aware of the Unknown: Decision Making During the Implementation of a Strategic Initiative discuss the relevance of become aware of the uncertainties for the performance of decision-making from managers
- In the 2019 PLOS article Ten simple rules for providing optimal administrative support to research teams emphasize 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 to 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, integrating 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, so in order to successfully develop a R&I until it's completion, it's needed a formal and thorough planning (Kerzner, H. 2003; Westland, 2020).

As mentioned on lesson one, the ten project management knowledge areas occur in any of the sequential phases of a R&I project (project management process groups). One of the most important of these areas is project integration management, since this is what holds a project together. Project integration management is based in management actions that allows the coordination of multiple activities of the project, making them work together in an organized way. The project management integration is present in all project process groups (project life cycle phases) and includes the following actions (Westland, 2020):

1) preparation of the project charter/application - planning phase;
   In the project charter it's justified the reasoning for the project initiation and serves as base for the scope definition. In the project charter are outlined the reasons to develop the project but are also discriminated against the following elements: objectives, deliverables, task list, resources, financial and quality plans. After the establishment of the project charter it means that the project boundaries are defined and all the following processes (planning, executing and controlling) can successfully take place.

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2) preparation of the project scope statement - initiation and planning phase;
In the scope statement it is defined what is part of the project and what isn't, it will list all work to be developed during the project life cycle, so it basically sets the project deliverables and defines criteria that can be measured and access the project successfulness.

3) preparation of the project management plan - planning phase;
The project management plan is a formal document that will guide orient the project execution and control and should be revised during the project life cycle. The RMA is responsible for the development of this plan, which will consolidate all the project management plans (scope management plan, cost management plan, quality management plan, process improvement plan, human resource plan, communication management plan, procurement management plan).

4) manage and control the project work/activities - execution phase;
In the execution phase the deliverables are already being developed and the RMA must manage technical and organisational parts of the project, in order to ensure that the goals are achieved with success.

5) monitoring of the project work/activities - monitoring and control phase;
Monitoring and controlling are crucial to the project, since it will allow us to promptly perceive if changes are needed in order to avoid negative impacts in the project.

6) project closing procedures - project closing phase;
In the end of each phase it should be registered and duly documented the experiences that the team learned - whether if they were successful or not, so that on the closing phase all this information can be aggregated and serve as support for future projects. This practice is also relevant to consolidate and increase the know-how of the team and/or organisation on how to address certain difficulties and what good practices can be applied in future R&D projects.

As stated above, project integration management is a set of management processes that are linked and will be carried out throughout the project life cycle. These management processes will allow the RMA to manage the project development, by integrating all management plans and all the stakeholders of the project.

To set the right tone for this new phase it's relevant to gather all project participants and make a revision of all the processes made and prepared until now and to review what is expected from each and every one of the project participants.

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Project management plan

The project management plan is a central document when it comes to the management process of a project and in some of the European Commission projects is demanded as a project deliverable to be presented until the 6th month of the project implementation. It is in the development of the project management plan that it's defined and coordinated all the plan components and integrated in a single plan - the project management plan. The project management plan is a formal and essential document for the project team, since it establishes the basis of all the project work and how it will be developed, defining how the project is to be executed, monitored, controlled and closed (PMI, 2017; EU, 2016).

In the project management plan are integrated all the project management plans, namely (PMI, 2017):

Scope management plan - plan where is described 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 that enables the creation of the activities division (e.g.: Work Breakdown Structure) from the detailed project scope statement; c) Process that establishes how the scope baseline will be approved and maintained; and e) Process that specifies how formal acceptance of the completed project deliverables will be obtained.

Requirements management plan - Plan where is described 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 they will be traced, tracked, and reported; as well as the authorization levels required to approve these changes; c) Requirements prioritization process; d) Metrics that will be used and the rationale for using them; and e) Traceability structure that reflects the requirement attributes captured on the traceability matrix;

Schedule management plan - plan where is defined the roadmap for how the project will be executed, the criteria and the activities for developing, monitoring, and controlling the project schedule;

Resources management plan - plan where is detailed the 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, providing guidance on 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 team and physical resources needed; b) Acquiring resources - Guidance on how to acquire team and physical resources for the project; c) Roles and responsibilities – The function assumed by, or designated to a team member; The rights to apply project resources, make decisions, sign approvals, accept deliverables; d) Project team resource management - Guidance on how project team resources should be defined, staffed, managed, and eventually released; e) Training -

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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 - plan where is defined how the project costs will be estimated, budgeted, managed, monitored, and controlled. It also stipulates the team member responsible for the controlling tasks. In this plan it can also be defined an internal strategy for the money transference between the partners that differs from what is stipulated in the GA, but that is essential to be established In the CA;

Communication management plan - plan where it is described how project communications will be planned, structured, implemented, and monitored to ensure their effectiveness. It could also define specific communications technologies that are required in the project.

Quality management plan - plan where is identified 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 - plan where is defined how to conduct risk management activities for a project, how they will be structured and performed. This plan can include the following components: a) Risk strategy - Describes the general approach on how the project risks will be managed; b) Methodology - Defines the specific approaches, tools, and data sources that will be used to perform risk management on the project; 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, in accordance with the project schedule.

Procurement management plan - plan where is defined the activities to be undertaken during the procurement (purchasing) process. Normally, each institution already has their procurement procedures clearly defined and according to the applicable national law, therefore it is normal that this plan might not be detailed or even included in the Project management plan.

Stakeholder management plan - plan where is defined and documented the approaches and actions that will increase support and minimize the negative impacts of stakeholders throughout the project development. In this plan it should also be identified the key stakeholders along with the level of power and influence they may have on the project.

The project management plan can be a resume of all actions to be taken in all the project management processes or be as detailed as possible. Each of the management plans integrated on the project management plan should be detailed according to the project specific needs. For instance, smaller projects might need less detailed plans as opposed to larger projects with a significant number of entities involved, that might need extended and more detailed plans. Apart from the details and specificities of each project, the project management plan must be robust

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and flexible enough to address the project that can change and suffer alterations during its development (PMI, 2017; EU, 2016).

Kick-off meeting

During the project life cycle several meetings should be held, but the kick-off meeting is vital because it will set the tone for the entire project, where its main its purpose is to communicate the objectives of the project, gain the commitment of the team for the project, and explain the roles and responsibilities of each stakeholder (PMI, 2017).
Normally this meeting is held with the project participants such as the project coordinator, project manager, team members from the coordinator organisation and from the partners organisation. The participation of the partners' organisation managers should be stimulated, since it will make communication easier regarding the more administrative and financial issues during the project (PMI, 2017; Usmani, 2020).
Even though the kick-off meeting is usually associated with the end of the planning phase and the beginning of the executing phase, it can happen in different times depending on the characteristics of the project (PMI, 2017). For example:

- small projects - normally there is only one team involved in the planning and the execution, so, in this case, the kick-off is held right after the project initiation, meaning that is held right after the planning phase starts because the team is involved in planning;
- large projects - the kick-off meeting is held in beginning of executing phase, since is the project management team that is involved in most of the planning, and the rest of the project team is only involved end the project execution starts;
- Multi-phase projects - one kick-off meeting is held in the beginning of each new phase.

<u>Good practices at kick-off meetings</u>
Take this opportunity to explain to all the partners (research and management team), to do a briefing on the scientific and financial obligations and how the articulation between the coordinator and the partners should be managed. It should be relevant to ask the project manager and the financial manager to prepare a presentation detailing the following topics:

1) financial rules stated by the EC/Funding agency so the costs can be eligible;
2) deliverables and/or financial reports presentation dates;
3) implementation of internal scientific and financial reports - why, how and when to submit them;
4) budget distribution presentation - how and when the instalments will be made to the partners;
5) contact points at the coordinator organisation - whom the partners should contact for certain types of issues (scientific or financial).

Interdisciplinary meeting

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Apart from the kick-off meeting, where you gather all project partners and other relevant stakeholders, it's also relevant to organise an organisation internal meeting to join all possible departments that will have some influence on the project, such as Human Resources and Acquisition and Procurement Departments.
At this meeting the RMA should moderate the articulation between the mentioned departments and the research team members and their needs for the project. For example, at this meeting the RMA should promote a share of the procedures and bureaucracy the Human Resources and the Acquisition and Procurement Departments will have to comply in order to contract new staff members for the project or simply to acquire some goods and services necessary for the project development. This sharing of information is intended to create awareness on the project team about the relevance to initiate a determined process of recruiting or acquisition on its due time, avoiding delays in the project execution.

Communication Management

Managing a R&I project combines managing the **work** to be developed, but also collaborating with the different **actors** involved (that can have different roles, levels and times of participation at different stages of the project implementation). Working closely with the research team, the RMA must provide advice and support to the **Principal Investigator (PI)** and its team to manage the planned research activities. But the RMA must also liaison with different actors such as the **funding agency** (and its contact points), the **consortium partners** (in case of collaborative projects we will have diverse management teams that must collaborate effectively) as well as all the **institutional structures** involved in the management tasks (such as the HR, procurement, financial offices, etc.).
Master communication skills are vital for such tasks.

- Communicating: interpersonal communication

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

Besides understanding the Do's and Don'ts about what and how to communicate with each individual (what are the sensible matters or what approach to the topics they prefer), actually the key aspect is to learn how to adapt your communication style for any scenario that may come your way. For that, it can be useful to self-reflect on our individual communication style and reflect on the other styles and techniques to help us to adapt.

- Communication styles

In the literature we can find several models that acknowledge and categorize different communication techniques and styles, such as the DiSC® Model that is based on the work of

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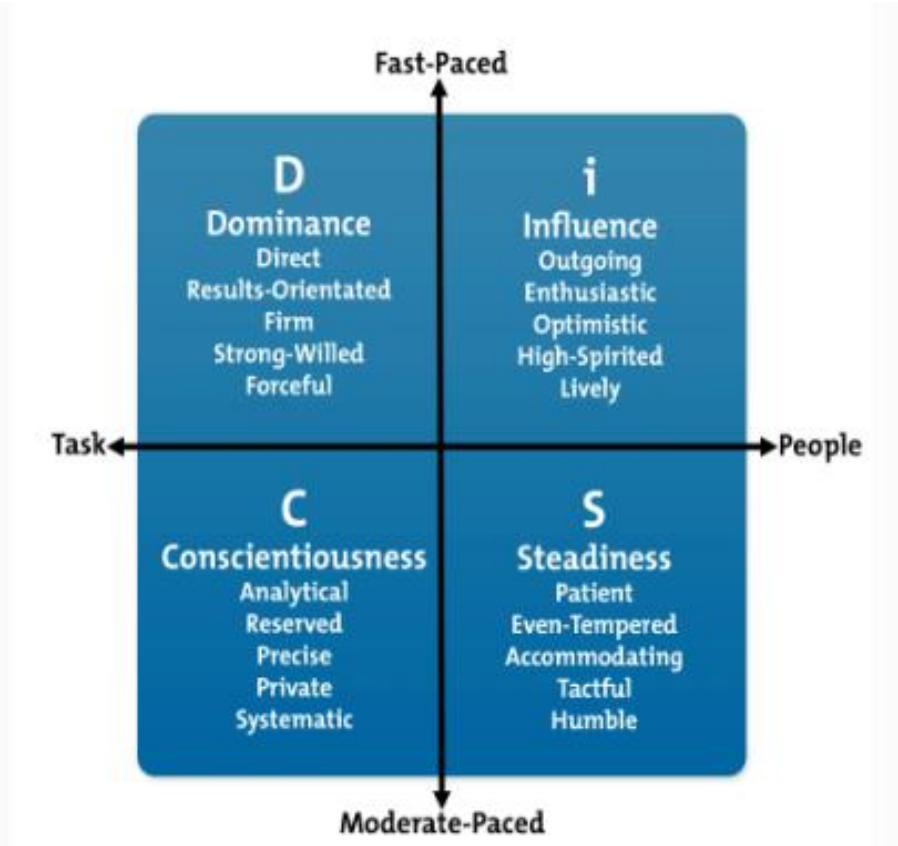
psychologist William Moulton Marston in the 1920s. This model classifies people's behaviour into four types (Dominance, Influence, Steadiness, and Conscientiousness) by looking at their preferences on two scales: a) Task versus People; b) Fast-Paced versus Moderate-Paced.

Connecting these preferences, we get the four quadrants of figure below:



Source: https://www.mindtools.com/pages/article/newCDV_92.htm
Reproduced with the permission of **www.everythingdisc.co.uk**.

Students can explore the DISC Model to self-analyse and identify their own communication style, but also, they can reflect about how to react to this different communication styles by others. Let's do the exercise of looking at the RMA effective reaction towards the PIs with this different communication styles:

- PI with the Dominant style:
  - Don't ramble on or waste their 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.
  - Be prepared and organized.

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- Present the facts logically; plan your presentation efficiently.
- Provide alternatives and choices so they can make their own decisions.
- If you disagree, focus on the facts, not the High D's

- PI with the Influencer style:
  - Talk and ask about their ideas and goals.
  - Plan interaction supporting their goals and ideas.
  - Allow time for relating 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.
  - Offer incentives for their willingness to take risks.

- PI with the Steady style:
  - 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.

- PI with the Conscientious style:
  - 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.

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Conversational basics

In all cases and for all communication styles, there are several principles that can potentiate a fruitful communication. On approach can be summarised as the LSD method - Listening, Summarizing and Disquisition (we have a short video here):

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

The University of Technology of Eindhoven developed a Hand-out Interview Techniques that summarises the these different conversation techniques and provides concrete examples for each of the 3 steps

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 regards, 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 facial expressions or gestures of the person on the other line.
- 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 really does make a difference on perceptions of confidence. Before you even open your mouth, you've made a first impression.
- Eye contact is an important tool to increase the perception of trustworthiness.
- 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 are in conflict, the listener must decide which to believe.
- The listener almost always relies on the nonverbal cues to make their decision.

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RMA 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 conscious, but, for an efficient and fair team management, it should be a role to train and develop.

In this regards, NACARA - an association of professional advisors, counsellors, faculty, administrators, and students working to enhance the educational development of students developed the its Academic Advising Core Competencies Model in 2017 to identify the broad range of understanding, knowledge, and skills that support academic advising, and which can be transferable and useful to clarify the RAMs advising roles and responsibilities, and to highlight the contributions of advising in a R&I setting. This framework looks at advising in three content components:

- The **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.
- The **Informational component** provides the substance of academic advising. It covers the knowledge advisors must gain to be able to guide the students at their institution.
- The **Relational component** provides the skills that enable academic advisors to convey the concepts and information from the other two components to their advisors.

A brief resume of all these three components is available NACADA Academic Advising Core Competencies Guide (PG23) (Abridgement). Transferring this model to the specific roles of RMAS, we can highlight the following:

Knowledge competences

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 campus to contact when clarification is needed
3. Credibility is critical for the advising role, as 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, as such advisors must 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. Collaborate with the other institutional departments, getting deep knowledge about the R&I facilities and resources that available for R&I activities is key

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Attitudes competences

1. Articulate a personal philosophy of advising, since advisors bring with them values, beliefs, and assumptions that can have a major influence their performance
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 in an inclusive and respectful manner
4. Facilitate problem solving, decision-making, meaning-making, planning, and goal setting
5. Engage in ongoing assessment and development of self and the advising practice

Regarding the attitudes competences, in the BESTPRAC Training school "Leaders for the future: knowledgeable and successful leaders in Research Administration" were identified the following skills for RMA advising:

- Communication skills: Clearly explaining, arguing, conversations, presenting, influencing, being able to give feedback.
- Listening skills: Listening what the other says, what the other means, what the other does not say but still means, keep asking questions.
- Conflict resolving skills: Understanding resistance by yourself and others. Insight in conflict styles: compromising, problem solving, avoidance, forcing
- Relationship skills: Building a relationship, understanding the other, respect, positive approach, interest, collaboration, understanding responsibilities.
- Personal skills and insight: Resilience, relativizing, self-reflection, letting go, insight in qualities pitfalls and irritations.
- Empathic skills: Placing yourself in the situation of the other, understanding stakes and needs
- Analytic skills: Being able to analyse the problem, distinguish between cause and effect, seeing connections, and seeing solutions.

Advising and influencing goes hand in hand, especially in those areas related to the project implementation in which the RMA is not responsible for but still needs to push the 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 be about making a point, persuade a solution or placing a boundary)
- Be honest and based on your expertise: use rational arguments based on evidence (such facts, information and numbers)
- Make it a collaboration: understand what the others think/want/ feel (because it is about building a commitment and agreement)
- Know your boundaries: identify the correct timing, the willingness of the target audience and put in place the adequate communication strategy

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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 to 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

The financial management occurs since the beginning of the project life cycle, but in different forms. At the initiation and planning phase the financial management is related to the preparation of the project budget based on estimated costs. This estimation of costs is defined according to the project needs in terms of human resources, procurement acquisitions and other types of acquisitions. At the executing phase the financial management is focused on the costs control, that is essentially the process of monitoring the project incurred costs and managing the changes to the cost baseline, defined in the project budget (PMI, 2017).
In order to update the project budget, the RMA needs to constantly know and update the actual incurred costs during the all execution phase of the project. The RMA must also take efforts in analysing the relation between the costs incurred and the work being accomplished through this expenditure, otherwise the RMA would only know the outflow of the project funds without valuable information for the project (PMI, 2017).

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

- Influencing the factors that create changes to the authorized cost baseline;
- Ensuring that all change requests are acted on in a timely manner;
- Managing the actual changes when and as they occur;
- Ensuring that 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 variances from the approved cost baseline;

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- Monitoring work performance against funds expended;
- Preventing unapproved changes from being included in the reported cost or resource usage;
- Informing appropriate stakeholders of all approved changes and associated cost;
- Bringing expected cost overruns within acceptable limits.

To a successful financial monitoring and control the RMA should adapt and make use of the best tools for each type of activity and even for each type of project, since certain projects have different costs categories and different funded forms (actual, lump sum, flat-rate and unit costs). Apart from this adjustment to the funding scheme, the RMA financial control will be strongly linked to the organisation internal practices and the report required by the EC/Funding Agency. In terms of organisational processes assets, the PMI (2017) observes that the following topics will influence 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 to be used.

When working with a large project with several partners it's useful to unify the strategy and use the same tools used for financial control by all partners. This will allow the RMA to aggregate the information sent from all partners with a smaller risk of misinterpretation and error and reduce the time it takes to prepare the financial report that should be submitted to the EC/Funding Agency.
The RMA should implement practices in the consortium, but sometimes this is not possible due to restrictions of the partners' organisations. Some organisations might have strict policies and procedures 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 documents should be used (e.g.: timesheets). The coordinator should, when possible, implement in the consortium the use of specific templates that all beneficiaries must use and that will allow them to comply with the EC/Funding Agency obligations.

Financial rules of relevant research EC funding schemes

In order to provide and promote between the project partners an efficient financial management the RMA should be up to date to the financial rules and obligations associated to 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 costs needs to have so it can be reported to the ECto EC/Funding agency.

Under the scope of the H2020 framework the EC has different types of funding schemes and of actions directed to the HEI and research institutions:

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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 technology. Funding rate - 100%;
Innovation actions (IA) - actions to fund activities that directly aim to the production of plans or designs for new or altered products, processes or services. Funding rate of 70%, except for non-profit organisations, in this case the funding rate is 100%;
Coordination & support actions (CSA) - actions to fund primarily accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking of R&I projects. These actions don't fund the R&I activities, but the dissemination and networking activities;
Frontier Research Grants – European Research Council (ERC) - grants to fund projects in any field of research to researchers that seek to establish/consolidate their research team or programme and who seek to pursue ground-breaking research. Funding rate of 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 of 100.;

All funded EC projects must comply with a certain set of financial rules in order to report eligible expenses. Additionally, each beneficiary must comply with the financial rules and respect all applicable national laws of its own country. The regular financial budget of a H2020 funded project is constituted by direct costs and indirect costs, that 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 the costs related with the research activities of the project development and can include the following costs categories:

- personnel costs - costs with employees (or equivalent), natural persons working under a direct contract;
- subcontracting costs - costs related to the of subcontracting of tasks that are part of the project and were discriminated on the Description of the action(annex 1 of the GA);
- financial support to third parties' costs;
- other direct costs - costs related with travel expenses and related subsistence allowances, equipment costs, costs of other goods and services.

Indirect costs are the costs that aren't directly related to the project activities but are related to the organisation functioning (e.g.: utilities and rents, infrastructure maintenance - water, gas and electricity).

Actual costs - are the real costs incurred by the beneficiary.

eligibility criteria:

1) effectively incurred by the beneficiary that is declaring the costs;

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2) incurred during the project duration period;
3) foreseen as eligible costs in the estimated budget of the project;
4) directly connected to the project objectives;
5) identifiable and verifiable (paid directly by the beneficiary account and supported with legal documentation);
6) in compliance with applicable national laws on taxes, labour and social security;
7) reasonable, justified and must comply with the principles of sound financial management, regarding economy and efficiency (best value for money);

Unit costs - are an amount defined per unit (e.g.: on MSCA action RISES' the project declares a unit amount per month of secondment = temporary transfer of a staff member (project team member) from organisation A (academic partner) to the organisation B (industrial partner).

eligibility criteria:

1) calculated by multiplying the number of actual units used to carry out the work (e.g.: e.g. number of hours or secondment months worked on the project) by the amount per unit;
2) the number of units must be necessary for the project;
3) the units must be used or produced during the project duration;
4) the beneficiaries must be able to show the link between the number of units declared and the work on the project and to show, through the presentation of records and supporting evidence, that 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 flat-rate - 25% of the total eligible costs, except for subcontracting costs).

eligibility criteria:

1) calculated by applying a flat rate to certain costs (actual, unit or lump sum costs);
2) the 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:

1) the lump sum costs must correspond to the amount of lump sum costs set out in financial guidelines (annex II of the GA);
2) the work must have been carried out in accordance to Description of the action (annex I of the GA);

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3) The beneficiaries must be able to show, through the presentation of records and supporting evidence, that the action tasks have been carried out as described in 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) covered by unit costs and another (e.g.: equipment, travel and subsistence allowance) by actual costs.

One important aspect to take in account when preparing, and later managing, a H2020 project budget is defining the work packages (WP) of the project. The WPs are the primary justification for the budget requested. A good relation between the WPs and the budget requested is useful for the proposal evaluators, so they can properly assess the reasonability of the requested budget, and for the coordinator and partners, during the executions phase.
In the figure 4 exemplifies the information that H2020 RIA applicants must fulfil for each of the WPs that are defined for the project 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 4 - Budget justification per WP

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Project Financial Monitoring setup

In the beginning of the execution phase, the RMA should start the articulation with the EC and the project partners, in order to start the preparation of the documents needed for the 1st instalment payment.

The RMA should prepare send to the EC the bank account information for the 1st instalment payment, on the EC specific template for this effect, the Financial Identification form (available at: https://ec.europa.eu/info/sites/info/files/about_the_european_commission/eu_budget/fich_sign_ba_gb_en_0.pdf). This form is mandatory to launch the awarding procedures for a contract (GA).

In order to simplify and standardize the form in which you receive the bank account details from the partners, the RMA can use the EC Financial Identification form or institute a template, for all consortium, that is already used at his/hers organisation. When sending this information (bank account details) request, the RMA can additionally send templates for the project financial monitoring (e.g.: timesheets, internal reporting template). The uniformization of the templates used by the consortium will aid the RMA when it's time to aggregate all beneficiaries' information to prepare the report and to simplify the regular monitoring of the project financial execution.

The information regarding the instalment payments to the partners (periodicity and budget execution targets) is already defined in the CA, but it's relevant to repeat this information so all partners are fully aware when the payments are to be made and/or which scientific or financial information is needed to process the payment. The coordinator can institute 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 define on the CA that the partners receive a smaller percentage of the 1st instalment and that the remaining payments (until the total the 60%) will be made against the delivery of an internal report that justifies the work developed and expenses incurred. All these internal consortium practices must have been negotiated with the partners.

Financial Monitoring

As mentioned previously the RMA should constantly update the financial execution of the project and analyse the relation between the expenditures made and the work developed. 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 try to verify the following:

- the actual project expenditure *per* cost category is within the cost limits defined in the budget distribution;
- the actual project expenditure is correspondent to the activity's execution timeline (costs *per* WP);

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Making use of the instruments and practices detailed in the CA and distributed on the setup moment of the financial monitoring, the RMA should verify regularly the global financial execution. This practice will allow the observation of which partners are in under or overspending and promptly initiate the needed measures to rectify the situation. To make this observation and analysis easier the RMA can prepare a checklist or other sort of document that allows to confirm the percentage of financial execution that would be expected in a determined moment of the project (e.g.: in a 36 months project, on the month 12th it was expected to have already a global financial execution of 33,33% but the actual financial execution is only 18%).
By having this information on a timely basis, the RMA can promptly anticipate the for-project reallocation and even tasks development period prorogation.

Expenditure framework

Another of the RMA tasks related to financial monitoring is to gather the expenditure justification and support documents. All project expenses must be directly linked to the development of the project activities and objectives and the RMA is responsible for this framework of expenditure and for attach the supporting documents (e.g.: deliverables development outputs, timesheets, boarding passes, conference participation certificate, open access publications links, copy of printing material). The supporting documentation can be request by the EC to make proof that:

- the working hours or human resources costs declared were effectively spent on the project deliverables development;
- the work hours declared match the actual hours worked by the project team members;
- the travel, subsistence allowance and conference registration costs declared did in fact occurred and the participant attended the conference;
- the publications and other forms of project dissemination (printing material) follow the EC rules (open access and funding scheme publicization - logos and acknowledgements).

Accounting - connection between the financial department and the project

The RMA isn't supposed to dominate the accounting terms and financial procedures that the financial department must undertake. Nonetheless the RMA should have a close contact with the financial department since the financial monitoring is extremely dependent on the information provided by this department.
The acquisitions requests of the project should be validated and analysed by the RMA, in order to ensure that the goods or services requested are in accordance with what was defined on the foreseen expenses, are within the limit of the budget and are related to the project activities.
Like mentioned above, it isn’t expected that the RMA should have a deep knowledge of the national laws and organisation financial practices, but it should have some basic notions that allows to analyse and validate the expenses requests (e.g.: limitation of the acquisitions amount through which a certain procedure of procurement can be applied) and forward them to the

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financial and/or acquisition and procurement departments with all the information they need to initiate the acquisition procedure.

Measures to maximise the project control

In order to facilitate the RMA intervention, the manager should seek to operate with tools that will help 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, establishment of milestones and the monitoring of the project progress. In Asana you are able to create a set of project tasks in four different layouts (task list, task board, task chronogram, task calendar), associate a responsible for each of the task inserted, add a conclusion 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 progress - consult the project updates, the number of tasks associated, how many tasks were completed or uncompleted and how many tasks are delayed.

Slack

Slack offers an internet relay chat type of resources, allowing you to create chat channels with your team and share files in an easier and faster way. The slack app allows the creation of workflows and is compatible with other apps like Google Drive and Office 365.

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 apps that are more commonly used (e.g.: Dropbox, Google Drive). This tool also allows you to manage tasks development, helping the project's development, by breaking down workflows into more easily manageable smaller tasks.

Time management

According to PMI time management "*includes the processes required to manage the timely completion of the project*" and it's crucial to the successful completion of the project (PMI, 2013; Dinsmore, P.C. & Cabanis-Brewin, J. 2011).

Time management can be separated in the seven following processes:

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- schedule management plan includes the establishment of policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule;
- activities definition includes the identification and documentation of the activities to be developed in order to achieve the project deliverables and outcomes;
- activities sequencing includes the identification and documentation of the relation between the project activities;
- 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;
- activities duration estimation includes the estimation of the number of workdays or hours necessary to the project activities completion with the estimated resources;
- project schedule development: elaborated through the analysis of the project activities sequence, duration, resource requirements;
- Project's schedule control includes the monitoring of the project activities status in order to update the project progress and manage the necessary changes to the schedule baseline so the project can be completed as planned.

Time management processes and associated tools are established in the schedule management plan, that by its turn is a plan integrated in the project management plan. In the schedule management plan are identified and detailed the scheduling method and scheduling tools. This plan also determines the format and identifies the criteria of the project schedule development and controlling. The scheduling method chosen on the schedule management plan will define the framework and algorithms necessary to elaborate the project schedule model, that is a representation of the plan for executing the project's activities including durations, dependencies, and other planning information. Some of the more commonly known scheduling methods are the critical path method (CPM), critical chain method (CCM) and 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 is based on the assumption that all resources will be available at any given time of the project and that if one activity is delayed all the delay will pass on to the next activity and therefore there will be a delay in all of the project. The CCM is a schedule network analysis technique that contemplates the activities dependencies, the limited resources availability (e.g.: Human resources, equipment, materials and work rooms), and buffers necessary to successfully conclude the project deliverables (PMI, 2013; Ray, S. 2020; Mrsic, M. 2017).

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Work breakdown structure

The WBS is the most time management tool and a very useful tool that essentially is based on the hierarchical division of the 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 subdivided any further. This process of deconstruction allows to make a better estimation of the task execution time and costs and makes the management of the task development easier (Heagney, J. 2016; Kourounakis, N. & Maraslis, A. 2016, Project Manager, 2020).

The WBS is based on the following components:

1. **task number and description**;
2. **task leader** - it could be a team member or even a beneficiary institution, being the task leader doesn't means that that should be the team member/institution that works exclusively on the referred task, but it's the team member/institution that oversees the task and ensures that it's successfully developed;
3. **task dependency** - some tasks might be dependant of the start or conclusion of some other task, so it's convenient to have all the tasks dependencies duly signalize to ensure that the final deliverables are completed in time and successfully;
4. **cost of the task**;
5. **start and finish dates of the task**;
6. **task status** - in the task status it should be visible to whom the task is assigned (task leader) and access its progress (e.g.: in progress, late, completed).

According to ProjectManager.com, in order to create a work breakdown structure five steps should be made (Project Manager, 2020):

1. it should be determined and described the scope, objectives and who is participating in the project;
2. deconstruct the project into a "series of phases that will take it from conception to completion";
3. list all the project deliverables and determine what resources will be necessary in order to successfully develop the deliverables;
4. deconstruct the deliverables listed above into the tasks necessary to successfully achieve them;
5. plan the execution period of each task and determine the existing dependencies between them, and assign each task to a specific task leader.

The project schedule module is elaborated in the process of project schedule development, through the analysis of the outputs from the processes of activities definition, activities sequencing, activity resources and durations estimation in combination with the scheduling tool. The finalized and approved schedule model will be the baseline that will serve as a comparison

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for the schedule controlling process. Throughout the project life cycle most of the effort in the time management will happen in the schedule controlling process, in order that the project is successfully developed and completed on time (PMI, 2013).

Project reporting

Project reporting is a crucial part of the communication with the EC/funding agency. It's through the report that the project coordinator and partners document and summarise the status of the project progress. In the project reports it is relevant to present information regarding the scope, the schedule, the budget, quality of the work developed, risks issues, project modifications and management issues. Additionally, in the report it might also be relevant to include information regarding the project metrics and indicators, so the progress of the project can be duly evaluated. The 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 when a project report needs to be presented to the EC during the project execution phase (progress report) and the final report at the closing phase (final report) (Kourounakis, N., & Maraslis, A. 2016).

The RMA of the coordinator organisation is responsible for gathering the information needed to present on the progress report and final report. The RMA should early articulate with all the partners the periods when these reports must be submitted to EC and agree with them a set of dates when the partners should send the required information (negotiated already in the CA) to the coordinator or submit directly on the Participants Portal of the EC.

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Learning outcomes:

LO#4 - The student has a basic insight in negotiation theories and conflict management models, as well as 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 its effects in achieving the project's goals.

Quality Management

Project quality management encompasses the project management and the project deliverables and involves all processes necessary to analyse and achieve the quality required for the project deliverables development. Quality management is applicable to all projects, regardless of their nature and of the nature of the project deliverables. The project management quality is directly linked to what the stakeholders need from the project deliverables, so it can have a rather narrow focus, making it easier to achieve the project objectives. The RMAs generally only aid in overseeing the implementation of the project quality management plan, since typically this is a researcher's task in the consortium. Quality management and the implementation of the project quality management plan is extremely important in order to guarantee that the 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: 1) quality planning; 2) quality assurance; 3) quality control.

Quality planning passes by the identification of the quality requirements for the project deliverables and includes the definition on how the project should be managed, and how the compliance demonstration will be registered and documented. Additionally, in the project quality management plan are detailed the metrics that should be used for the assessment and measurement of the quality of the project deliverables, and is also included a quality assessment checklist to register and organise the baseline achievements that are needed to be met to a successful project deliverables development (Ray, S. 2020; PMI. 2017; Rever, H. 2007).

Essentially the project management plan has a crucial function, that is to provide guidance on how the project deliverables quality will be managed and controlled during the execution phase of the project. The quality management planning is elaborated considering certain inputs (e.g.:

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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 is the conversion of the quality management plan into a set of planned and systemic activities, that are put into practice in a quality system in order 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 us to identify ineffective processes and causes of poor quality in the project deliverables development. The assessment of the quality assurance can be possible through the implementation of quality checklists or audits (Ray, S. 2020; PMI. 2017).

Quality control corresponds to the constant monitoring of the quality metrics and the recording of the 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 successfully completed within satisfactory levels and meeting the stakeholders needs and expectations. The process of quality control is implemented throughout the execution phase of the project, in order to demonstrate that the stakeholder acceptance and quality criteria are being achieved. (Rever, H. 2007; PMI, 2017).

Besides internal practices of quality assurance and control, as the ones mentioned above, it is also possible to have external institutions or people responsible for it that complement such internal practices.

Risk management

Risk management is one of the most important processes of a project development and involves identification, planning, analysis, controlling and communication of risks. The risk assessment is essentially a scouting of threats and opportunities to the project's success. In a project there is always a probability of risks occurring that may cause issues and conflicts in the project development and affect each of the project management knowledge areas (Aziz, H. *et al*. 2018; PMI, 2017).

In order to understand the risk management relevance is important to define what are risks and what type of risks we can find. Risks are uncertain events or a condition that can have either a positive or a negative impact on the project outcome. A negative risk may cause disastrous repercussions on a project development, but a positive risk may lead to new opportunities that weren't initially foreseen in the beginning of the project. Apart from the differentiation of positive and negative risks, in a project we 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):

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- Individual project risks are an uncertain event or condition that can have a positive or negative impact in one or more project objectives;
- Overall project risks are the effect of the uncertainty of the project, that can arise from all sources of uncertainty, including the individual risks as well.

Facing these probabilities of risk (negative or positive - individual or overall) it's important to have strategies that allow us to cope with each type, in order to know how to implement exploitation strategies when we are facing a positive risk and how to implement mitigation strategies when we have negative risks. Unmanaged negative risks may lead to consequences such as project delays, cost overruns and low 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 performance (PMI, 2017).

Project management risk has the objective of identifying and managing risks that aren't considered in the other project management processes, with the focus being the project success optimization. In risk management, the project success optimization is achieved by increasing the probability and/or impact of the positive risks and reducing the probability and/or impact of the negative risks (PMI, 2017).

Project risk management encompasses the following processes: 1) risk management planning; 2) risk identification and analysis; 3) response planning and implementation; 4) risk monitoring.

Risks can occur during the project life cycle in any of the ten areas of knowledge of project management. Each knowledge area has its particularities, so the risks that can happen in each of the areas will be different. The project risk management is an iterative process that is applied during the project development. In a first phase risks are identified and addressed in the planning of the project and with the project execution should be monitored and managed to ensure the project is developed as planned (PMI, 2017; Aziz, H. *et al* 2018).

Risk management planning

The risk management plan is the process where it's defined on how the risk management activities will be conducted during the project. This plan should be detailed during the project planning phase and it may be needed to be updated and revised during the project development, if some significant changes occur during the project life cycle (PMI, 2017).

Risk identification and analysis

Risk identification consists in documenting the existence of individual and overall sources of project risks, gathering information so the project team can duly identify the risks during the project development and correctly address and manage them. The identification of the risks is an iterative process that can occur during the project life cycle, since new individual project risks

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may arise during the project development and the level of overall project risks can change as well.
The description and documenting of the individual project risks must be made in a coherent and consistent manner to make sure that the risk is clearly understood in order to be a viable tool for the risk analysis and response (PMI, 2017).

Risk analysis consists in the prioritization of individual project risks by assessing their occurrence and impact probability, throughout the project development. It's important to make notice that the assessment of the risks is subjective since they are based on perceptions of the risks by the project stakeholders. Therefore, it should be tried to identify and correct the bias induced by the risk perception. An effective risk assessment requires the complete and explicit identification and management of the risks. In risk assessment it's also important to have some visualization tool to increase visibility of risks and assist management decision making. The risk matrix, as shown on figure 5, is therefore a visualization tool used to determine the level of risk taking in consideration the impact and probability of risk events (PMI, 2017; Aziz, H. et al. 2018; Lavanya, N; Malarvihi, T. 2008).

Figure 5 - Risk Assessment Matrix (Wilson, F. 2021)

Risks responses planning and implementation

Planning the risks responses consists in the development of options, selection of strategies and the agreement on the actions to be undertaken in order to address individual and overall project risks. Through this process the project team will have documented the identification of the appropriate ways on how to face and address the risks that may arise during the project 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

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(...) 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 the opportunity it offers".

The risks responses must be adequate to the level and significance of the risk, realistic facing the context of the project and should have a person responsible to carry out the response. It should identify specific actions to be developed in order 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 this type of risks arise in consequence of the application of the primary risk response (PMI, 2017).

Implementation of the risk responses consists in the application of the risk response strategies, defined in the risk management plan. The process of risk response implementation, applied during all the project execution phases, allows the execution of the risk responses planned in order to address the overall project risk exposure, increase the positive risks and reduce the negative risks (PMI, 2017).

Several types of exercises will be proposed to give students diverse of options to deal with 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);
- assess potential solutions (use the graph: low effort, high effort, low impact, high impact);
- chronograms and Gantt charts;
- propose adjustments to overcome a problem.

Conflict management models

Conflicts are very common to emerge during the development of a research project, especially since they integrate the participation of different actors with different ideas, backgrounds and cultures. Risk assessment phases when possible threats in the project 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 the ways in which conflict emerges.

Karen A. Jehn and Elizabeth A. Mannix developed several studies about this subject on the last years and proposed three types of conflicts:

1. **Task conflict:** that represents conflicts about the content and/or outcomes of the team's task.

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2. **Relationship conflict:** that represent conflicts deriving from interpersonal issues within the team, with no relation with the tasks.
3. **Process conflict:** that represents 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 that task conflicts increase the quality of decisions and performance in projects, while process conflicts reduces the team productivity, team performance and team morale. As well, the level of relationship conflicts is low in high performance teams. In many circumstances conflict cascade from tasks to processes to relationships, so it is not an easy task to identify the type of conflict of departure. Nevertheless, it is important to acknowledge that different types of conflicts must be addressed differentially.

We can find in the same article a list of the most common conflicts found in projects. We highlight the 10 most common ones:

1. Shared/Common Resources
2. Differences in Project Goal/Objective
3. Cultural Differences
4. Values Differences
5. Personality Issues
6. Differences in Technical Opinions/
7. Approaches
8. Schedules
9. Costs
10. Administrative procedures

Different authors have provided inputs about the different techniques on how to handle conflicts. In regards to the typical conflicts within the project implementation and management, we have the following (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 pares in conflict (Lam et al., 2007).
- *Integration* style is an effective approach for project performance, and it creates a win-win situation for the parties (Leung et al., 2005; Lamet al., 2007).
- *Avoiding* is the most disruptive style of conflict management in projects (Brahnam et al., 2005). In this style of conflict resolution, one party is indifferent to feelings of the other party and one party keeps away from participating in contact at all (Barki et Hartwick, 2001).

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- In *Accommodating*, one party sacrifices their own needs, wants and expectations to satisfy the other party.
- In *Compromising* style of conflict resolution, both the parties give and take, and they win something and lose something (Barki et Hartwick, 2001; Ohlendorf, 2001).
- *Confrontation* or *problem solving* tries to satisfy all the parties in conflict by keeping all the facts and figures in picture and uses science techniques in solving the problem. It creates a win-win situation for all the parties in conflict (Verma, 1998; Ohlendorf, 2001; Heldman, 2003; Mosaic, 2012). Understanding each pares standing through a pre-caucus is a foundation of conflict management (Billikopf, 2003).

The author identifies the most common conflict management techniques, with the 5 most common being:

1. Avoiding/ Withdrawal
2. Compromising
3. Confronting/Problem Solving
4. Accommodating
5. Smoothing

More information about such techniques can be found at https://www.hrpersonality.com/resources/conflict-management-techniques

But does conflict always bring a negative outcome? Not necessarily. Often, a conflict presents opportunities for improvement and many authors have emphasized the importance of the constructive conflict. Embracing differing ideas and worldviews, clarify of common work issues can be an exercise where people learn about each other and consider new solutions to move the institution toward its goals and mission.

Applying constructive criticism at the RMA workplace can bring lots of challenges but also lots of positive results. For that we highlight 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 tactics characteristic of high-performing teams:

- They work with more, rather than less, information.
- They develop multiple alternatives to enrich debate.
- They establish common goals.
- They try to inject humour into the workplace.
- They maintain a balanced corporate power structure.
- They resolve issues without forcing a consensus.

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Negotiation

During the project implementation the RMA acts as facilitators of conflict with a goal: reach a solution that benefits 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 off assuming a collaborative approach / *integration style*. As thus, successful negotiators will make both sides feel they won 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 its teams: the PI and its scientific team, the funding agency and its contact points, the consortium partners (in a case of collaborative projects) and its management teams, the other institutional offices and divisions (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 and especially for the RMA**. Nevertheless, an RMA can also coordinate efforts from the different actors involved in the project management as well as the project implementation. This lesson is thus dedicated to leadership.

Management and Leadership

Management and leadership roles are interlinked but are not the same. There several definitions about leadership, but the following one provided by Steve Myers clear stat its 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 that they follow, i.e.: a leader is the 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.

Leadership theories

The studies about leadership spans over more than 100 years, with different concepts of leadership being debated through time and different models and styles being proposed by different authors. On this regard, we can identify three seminal leadership theories:

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1. **Situational Leadership Theory**: created by Paul Hersey and Ken Blanchard in the 1970's, this theory proposes that effective leadership requires a rational understanding of the situation and an 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 then 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. taking also into account 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 that works with teams to identify the need of a change, creating a vision to guide the change through inspiration, and executing the change in tandem with committed members of a group.
3. **Transactional Leadership Theory**: focuses on the exchanges that occur between leaders and followers, where leaders promote compliance by 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 critics 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 propose in their 2003 article A new approach to assessing leadership dimensions, styles context where they bring together the latest thinking on competencies, emotional intelligence and intellectual ability into the leadership performance. In here, the authors identify the following features of an effective leadership:

1. Key competences:
    a. Envision – the ability to identify a clear future picture, which will inform the way in which people direct their efforts and utilise their skills.
    b. Engage – finding the appropriate way for everyone to understand the vision and, hence, the way in which they can contribute.
    c. Enable – acting on a belief in the talent and potential of individuals and creating the environment in which these can be released.
    d. Inquire – being open to real dialogue with those involved in the organisation and encouraging free and frank debate of all issues.
    e. Develop – working with people to build their capability and help them to make the envisioned contribution.

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2. Personal characteristics:
    a. Authenticity – being genuine and not attempting to “play a role”; not acting in a manipulative way.
    b. Integrity – being consistent in what you say and do.
    c. Will – a drive to lead, and persistence in working towards a goal.
    d. Self-belief – a realistic evaluation of your capabilities and belief that you can achieve required goals.
    e. Self-awareness – a realistic understanding of “who you are”; how you feel and how others see you

Personal characteristics: 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.

Myers Briggs Personality Types was developed by Katherine Briggs and Isabel Myers as an adaptation of the theory of psychological types produced by Carl Gustav Jung in the 1920s. It started with the goal of assisting women entering the industrial workforce for the first time, was continuously further developed and popularized and, since 1975 it has become the best known and most used personality type assessment. In brief, Myers-Briggs theory It is based on 16 personality types, which Jung viewed as stereotypes (Jung based on four preference points (what type of person do you prefer to deal with:)

3. People and things (Extraversion or "E"), or ideas and information (Introversion or "I").
4. Facts and reality (Sensing or "S"), or possibilities and potential (Intuition or "N").
5. Logic and truth (Thinking or "T"), or values and relationships (Feeling or "F").
6. A lifestyle that is well-structured (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 that proposes eight leadership styles that can applied in different situations, groups, or cultures.

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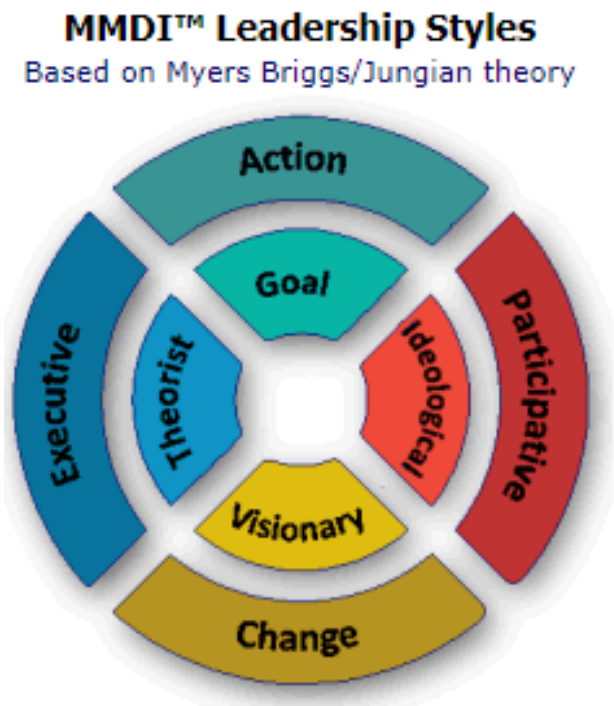

Source: https://www.teamtechnology.co.uk/leadership/styles/

MMDI™ system eight leadership styles are described as below:

1. **Participative leadership**

Participative leaders achieve through people, teamwork and collective involvement in the task. They promote ownership amongst the followers so that they feel jointly responsible in the decisions taken and its achievement. Participative leaders make the group itself become the focus for the team, as the team members achieve through their relationships and collaborative work.

2. **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 championing causes with which they are associated.

3. **Change-oriented leadership**

Change-oriented leaders achieve through the promotion of the exploration of new/better ways of doing things, or trying to uncover hidden potential in people, things or situations. They promote change based towards a better future (even if they don´t know yet what lies ahead) and then learn from experimentation where exactly that potential lies. The initiatives that succeed are pursued further to uncover even more potential.

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4. **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 as well as position the organisation to meet those challenges. They present a vision, a direction.

5. **Executive leadership**

Executive leaders achieve through the introduction of organisation into the way things are done, such as the organisational structure, the processes and procedures, the skills/competencies of the people involved, etc. Executive leadership can lead directly and indirectly by a control structure or a quality assurance process.

6. **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 better ones into their own understanding of how the organisation they are leading operates.

7. **Action-oriented leadership**

Action-oriented leadership involves acting and leading by example. They achieve focusing on the task in hand and its completion. Often other team members act as supporters of the action-oriented leader, who is the prime achiever.

8. **Goal-oriented leadership**

Goal-oriented leadership involves setting clear, specific and achievable goals. This type of leadership is based on experience/ previous knowledge and a realistic outlook, taking in 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 try out this personality/ leadership test at https://www.teamtechnology.co.uk/tt/t-articl/mb-simpl.htm. Students can be asked to share their results and a discussion will be generated around the personality types, main characteristics of each type, strong points, how can these personality types fit into a team work, how to avoid conflict by knowing that each person has different characteristics, but that bring diversity into a team and may be seen as an added value instead of a problem.

Leadership in action: the main functions

Working in an R&I institution, in many of the different types of private and public institutions that compose the R&I ecosystem, an RMA can perform leadership roles, such as leading a R&I management office or a small group of RMA colleagues in a particular task-force or being the

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responsible to management a R&I project. When looking at leading a team, it is important to understand the leadership processes and its development across time. McMorgeson et al. in the article Leadership in Teams: A Functional Approach to Understanding Leadership Structures and Processes identifies 15 functions divided amongst two mutually dependent phases of team activity - transition phase (planning activities) and action phase (towards goal accomplishment).

Leadership functions during the transition phase:

1. Compose the team – bringing together the best available people for the job, considering complementary competences and ability to work together for a common goal
2. Define the mission – clarifying the team purpose
3. Establish performance expectations and set team goals – goals which are appropriately challenging and motivating
4. Structure and plan – dividing out tasks and responsibilities, scheduling and so on
5. Train and develop team members – including through coaching 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. Providing feedback – both to individuals and to the team collectively

Leadership functions during the action:

8. Monitor the team – "examining the team's processes, performance, and the external team context"
9. Manage team boundaries – "representing the team's interests to individuals and groups outside the team in order to protect the team from interference as well as persuading others to support them" and co-ordinating activities with other teams
10. Challenge the team – 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 social climate – 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 for 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 to 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.

Students will be challenged to apply the knowledge and skills acquired from Lesson 1 in this module, by presenting a plan to optimise the performance at the services / organisational level. The students will work in groups of four. A consortium project will be delivered as a case study to each group at the end of lesson 2. The group has to develop a plan that includes the different perspectives of the project lifecycle, from awarding of the funding to the establishment of a management plan, identifying the steps to follow, important time points in the project, contract negotiation, budget distribution, CA, IP, etc.

In the end, this plan should mirror what should be the path to optimise the performance at the services / organisational level through a good and detailed strategy to lead to a successful project completion. The work should be presented by all the members of the group. 10 min presentation followed by 5 min discussion.

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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 research matters?

Learning outcomes:

LO#1 - The student can understanding of 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 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 for 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' going beyond academia. This separation can be justified by the fact that academic assessment was often separated from the research impact outside academia. Nevertheless, nowadays the research impact is understood as all-encompassing all the changes created through research.

Depending on the goals and objectives, different organizations and stakeholders had provided focused definitions of research impact, such as:

- The European Commission's Better Regulation Guidelines and related toolbox describes 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

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and EU). In an evaluation context, impact refers to the changes associated with a particular intervention which occur 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 of the research impact definitions stress the positive effects of the research, it has been argued that, not only the positive and negative determination is subjective (what benefits one does not always benefit another) but also that some positive effects may turn out negative with time (as for example, the development of a medicine that after time is assessed has having negative effects in one's health).

Different levels and scales of research impact

Research can have an impact at different scales (from individual research activities to institutional performance) and at different areas, such as:

- Academic impact
- Cultural impact
- Economic impact - contributed to cost savings, or costs avoided; or increases in revenue, profits or funding
- Environmental impact
- Social impact
- Impact on health and wellbeing
- Policy influence and change
- Legal impact
- Technological developments

The **Academic impact** refers to the contribution that research makes in shifting the understanding and the advancing of scientific knowledge, method, theory and application across and within disciplines. Impact at the areas outside academia embraces all the diverse ways in which research-related knowledge and skills benefit individuals, organisations and nations.

For all areas of research impact, its effects can be of different natures:

- **Conceptual**: contributing to the improvement of knowledge (e.g. understanding of policy issues, reframing scientific debates, etc.)

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- **Instrumental**: contributing to influence changing of practices (e.g. influencing the development of policy, shaping legislation, etc.)
- **Capacity building**: contributing to the development of individual or collective competences (e.g. technical and personal skill development of the research community, empowering research institutions with tools to improve research performance)

Major scientific achievements and impact case studies

Let us look at some scientific achievements that reveal 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 Top 20 scientific discoveries of the decade or the Smithsonian Magazine article The Top Ten Scientific Discoveries of the Decade. Some selected science communication articles that provide an overview of some of these major discoveries as follows:
  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
  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 world's oldest animal drawing
  10. Lock the Planck: the kilogram has a new definition

At the same time, we can also look at research project's impact case studies that reveal impact at a level of a concrete and current research projects:

- REF (Research Excellence Framework) - the system for assessing the quality of research in UK higher education institutions - 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

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- Fast Track Impact R&I company developed a study that analysed 7 of these case studies and recognized best practices and common errors. The results of such studies are available at the blog post 10 lessons from grant proposals that led to the most significant and far-reaching impacts and on 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 or climate crises, and the research community is also called to collaborate and take actions to overcome them. The social responsibility of research is thus at the forefront of this discussion with R&I institutions bringing societal impact as the core goal of its 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 associated 169 targets identify the areas considered of critical importance for humanity to achieve a very ambitious goal: to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 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. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

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- 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

Academia is clearly mentioned in the list of stakeholders in target 52:

> *'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."*

In consequence of 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 national and international level is aligned with this agenda, as the R&I framework programme Horizon Europe will have the SDGs as the backdrop for its funding mission to address a set of global challenges.

The UN SDGs impact goals also provide recognition to the institution/ project that links their achievements with such a Policy Agenda. As such, several impact measurements were developed to rank institutions regarding their contribution to SDGs, as Times Higher Education (THE) Impact Rankings in regards to universities. Here, **impact on society** is based on the institutions' success in **delivering the United Nations' Sustainable Development Goals**. While impact rankings can provide interesting insights, they can also result in biased analysis on impact assessment. For that regards, 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 acknowledge challenges related to the use of SDGs by companies, concerns that can be easily transferable to R&I institutions.

Impact assessment

As impact implies change, to assess the impact we must be able to understand, identify and assess change. When we analyse a research activity, for example a research project, we can identify changes at different levels and at different stages. As such, it is important to distinct what is changed within the project timeframe (outputs) and the impact. LERU - the 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:

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- **Input**: the resources a researcher, a research funder or 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, in a more immediate term than the research 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)

In the LSE blog article What is the difference between an impact and an outcome? Impact is the longer-term effect of an outcome we can see a concrete example of such distinction. In here we have as output an information and advice intervention programme on healthy eating, nutrition or weight loss:

- Example of outcome: changes in body weight or body fat - *it is a measurable objective change brought about by engagements with information and advice*.
- Example of impact: increased sense of happiness and or a decreased sense of insecurity - *it is the effect information and advice had on ability to make an informed choice, empowerment or wider life experiences*.

In conclusion, to be able to achieve impact, we must be able to convert **outputs** into **outcomes** and, subsequently into **impact(s)**.

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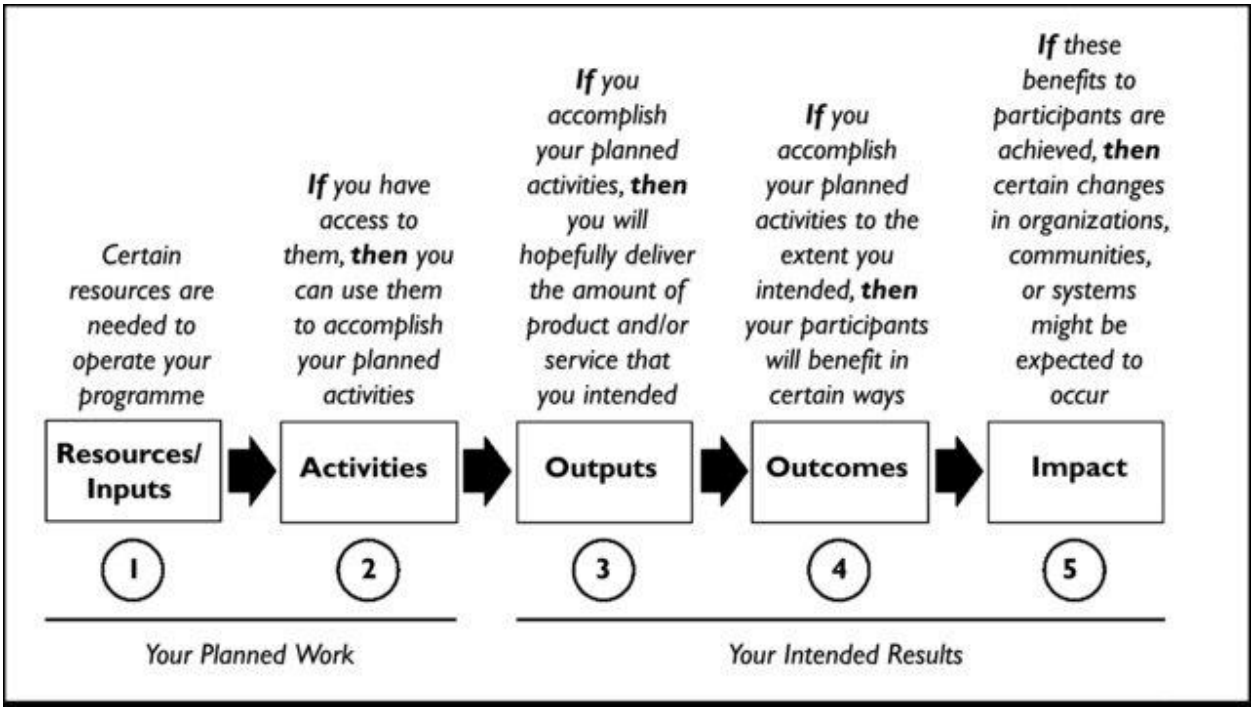

Source: A Simple Logic Model (W. K. Kellogg Foundation, 2004)

Planning and assessing research impact are thus a complex and multi-faceted phenomenon that requires a non-linear understanding and network-oriented process of engagement with stakeholders beyond the academia community. Although researchers are requested to plan and maximize their projects' impact, doing it 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 the target audience and stakeholders. At the same time, as impact represents a long-term effect, assessing it shortly after the research project conclusion is an impossible task since we only have outputs and outcomes to assess at that time.

If we look at the implementation, "delivering impact" is also not an easy task. As thus, the process is often planned in a very linear way, using 'Default' activities (workshops, seminars), assume dissemination/ information leads to impact, aiming too broad impacts not easily transferable to the realities of implementation.

But, then, **why do we evaluate research impact?** Impact assessment is a useful exercise since it helps researchers and its institutions to achieve (and learn how to achieve) different goals. Teresa Penfield et.al in Assessment, evaluations, and definitions of research impact: A review summarizes it into four main reasons:

1. overview their performance
2. inform funding decisions

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3. understand the pathways to maximize research impact
4. demonstrate to government, 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 define the main reasons to assess impact as "the 'Four As' of research impact assessment:

- analysis
- allocation
- advocacy
- accountability

Source: https://www.researchgate.net/figure/The-Four-As-of-research-impact-assessment-advocacy-analysis-accountability-and_fig2_323024747

The role of the RMA in promoting research impact

RMAs play an important role in all of these "Four As" or in the four reasons proposed by Penfield, such as:

- RMAs working at pre-award encourage researchers to reflect and identify potential areas of impact and stakeholders to engage, as well as support the writing of such elements in the research proposal.
- RMAs are also the facilitators involved in many public engagement activities (the focus of next lesson)

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- RMAs working on post-award also have an important role in monitoring and reporting the Key Performance Indicator (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, RMAs, as part of the research community, are big players in advocating and lobbying for science

In lesson 1 we can look closely at the RMA role in supporting the researcher to design its pathways/ routes for impact. For example, and as a first step, an RMA can help the researcher to self-reflect and identify the possible impacts (at its different levels and natures) and also to map the activities to achieve those impacts. Researchers often do not reflect on the non-intended impacts of their own research activity/ project, so it is important to promote the identification of possible negative impacts but also non-intended ones.

A useful tool to map this potential impact, but also to explain how research plans will enable the impacts you are anticipating, is the Theory of Change (TOC). TOC is basically 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 identify the activities that must be put in place for that long-term goal to be achieved. This mapping strategy, by identifying the link between activities and the major goal, leads to a better overview of how change actually happens and, in consequence, to a better planning. It is important to stress the need to think beyond the activities themselves, to what those activities actually achieved – what difference it made to those participating and the areas they work in.

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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 answer to the EU focus areas of impact defined in the Responsible Research and Innovation Policy that define focus areas of impact. At the same time, addressing RRI means also to approach impact by looking at how R&I meets the social, ethical and political current demands. This lesson is about RRI and its different aspects.

Responsible Research and Innovation approach: a vision for research impact

Research and Innovation (R&I) have improved our world and our lives for many years and it will continue to transform our future. Nevertheless, at the same time that it brings a positive impact on societal development, R&I is socially, ethically and politically entangled and, as such, it can have potentially widespread, uncertain and unpredictable social effects. Since new R&I developments can generate a certain level of new risks and ethical dilemmas with impact on the citizens, several policy meetings and research groups, projects and networks around the world have highlighted the need to conceptualize and implement Responsible R&I.

The term ''responsible development'' was used for the first time already in 2003 in the US Act about nanotechnology development, and in Europe from 2009 by the Netherlands Organization for Scientific Research (NWO). As such, many efforts have been put in place worldwide for several years, leading up to the EU Programme for Research and Innovation 2014-2020 (Horizon 2020) approach called "Responsible Research and Innovation" (RRI). EU definition: cf: "Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation."

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RRI is an approach aiming at diminishing the gap between Science and Society which implies that societal actors (such as researchers, citizens, policy makers, companies and civil society organisations) work together in the whole research and innovation process in order 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. It is, from Horizon 2020 onwards, a guiding principle for the European Research Area.

Although RRI is a concept that is recently gaining momentum but it still lacks agreement on its definition, content and details. About that, it is important to reference the EU funded project MoRRI: Monitoring the Evolution and Benefits of Responsible Research and Innovation main objective is to provide scientific evidence, data, analysis and policy intelligence to support directly Directorate General for Research and Innovation (DG-RTD) research funding activities and policy-making activities in relation with Responsible Research and Innovation (RRI).

To tackle such a policy approach, RRI acts upon different aspects of the relationship between R&I and society: 1) public engagement, 2) open access, 3) ethics, 4) gender, 5) science education and 6) science governance. All of these aspects are described below, with a selection of case studies/ list of best practices that intend to provide a concrete vision of each RRI element.

At the end, and although RRI is a concept that is recently gaining momentum, it still lacks agreement on its definition, content and details. The role of the RMAs in the accomplishment of each of these RRI is also highlighted, 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 is composed of bringing new voices and creative perspectives in R&I design and results and aims specifically to 1) contribute to a more scientifically literate society able to support democratic processes and R&I developments; 2) foster R&I outcomes that are more focused on tackling societal challenges. In brief, it seeks a democratization of science and research.

Engagement with the public approaches has 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 processes, both citizens and scientists have a say on the discussed subjects.

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While “Public Engagement” is commonly understood, it is still unclear how to effectively engage the public, how to deal with contradictory positions between the different publics (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 of the topic, it develops an empirical study of these topics in action, highlighting some of the problems of its practical implementation. It is also particularly relevant because it addresses the issue of the practitioners - the 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 act as moderators between the different actors (e.g. civil society organisations, public representatives, individual citizens) as well as the responsible for the whole engagement process. They must master communication skills as well as conflict management and creative problem-solving, while understanding of the policy context, the understanding of the political processes, the knowledge of which political actors and institutions to engage with, and their ability to communicate effectively (Powell & Colin, 2009). Open University summarised also some features of these RMAs “who can actively listen by connecting meaningfully with people from different academic disciplines and roles, and with multiple external stakeholders. It also requires analytical and rhetorical skills to filter ideas and construct arguments that work in particular contexts. At times it requires flexibility, adaptability, tact and diplomacy; at others a progressive vision« (Holliman et al., 2015, p.13)

Open Access (+Open Science)

Open Science is based on the evidence that making results more accessible will foster better and more efficient science contributing as well to boosting 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 scientific community but also with the society and companies, Open Science aims to increase the recognition and social and economic impact of science. In 2012, the European Commission released a clear recommendation encouraging all EU Member States to put public-funded research results in the public sphere and in 2016 published the book “Open Innovation, Open Science, Open to the World - A Vision for Europe” developed under the EC Commissioner for Research, Science, and Innovation Carlos Moedas. Here, the European Commission defines Open Science as “a new approach to the scientific process based on

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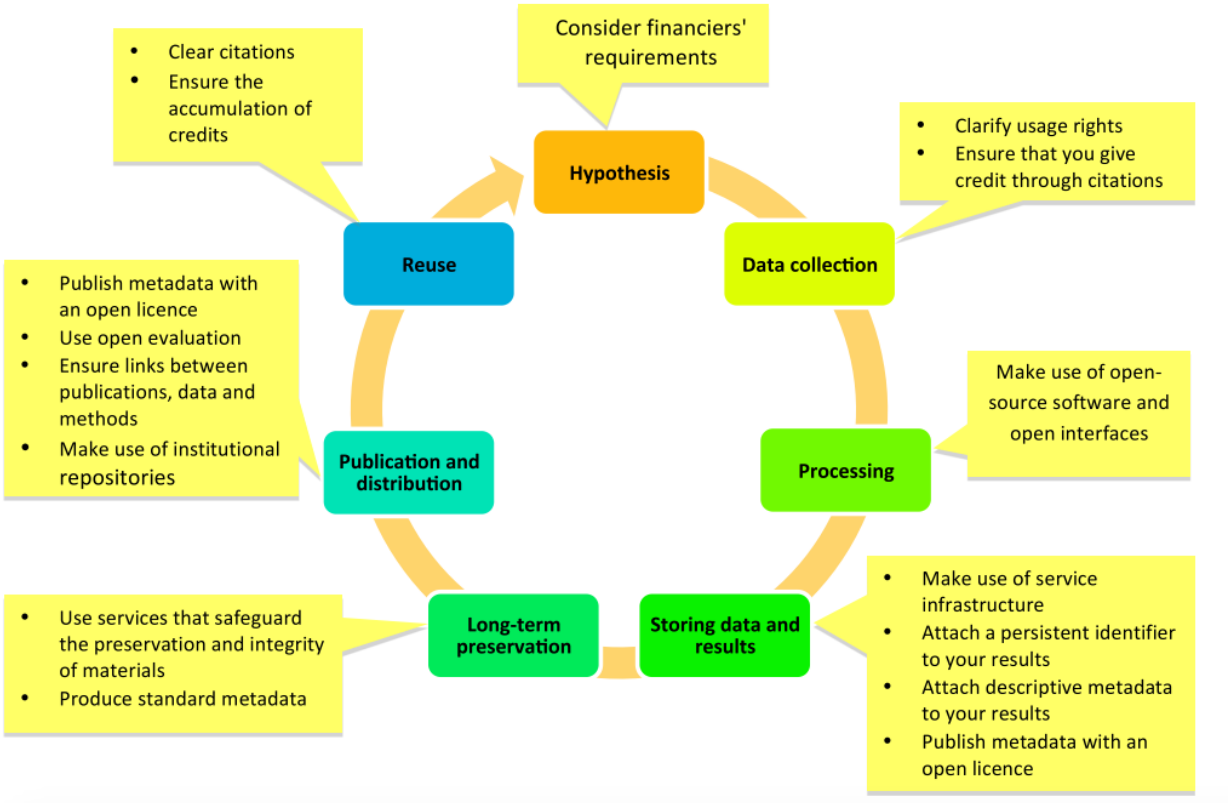
cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools".

We can also find other definitions of Open Science, such as the OECD definition "to make the primary outputs of publicly funded research results – publications and the research data – publicly accessible in digital format with no or minimal restriction". Nevertheless, while Open Science encompasses the Open access of data and publications, it also represents the openness of the scientific process as a 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, open monographs, citizen science and research crowdfunding. The openness to the scrutiny of science and scientific practices by the citizens, that will now have access to data and take part in R&I discussions, it intends to advocate for the public trust in science, a major goal of RRI.
Open Science concepts can be extended to the whole project lifecycle, as the following figure shows:



Source: Open Science and Research Initiative, 2014

In all R&I projects funded by the European Commission, as set out in European Code of Conduct for Research Integrity, providing Sound and FAIR data (Findable, Accessible, Interoperable and

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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 Figures and case studies related to accessing and reusing the data produced in the course of 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 1) effectively *training and supporting* the evolving information needs of researchers, 2) providing *support to the infrastructures* to share publications articles or data, 3) *advocating, raising awareness and contributing* to developing open access policies within the institutions, and 4) *carrying and monitoring Open Access Policies* themselves. As such, EU-funded project Foster Plus (Fostering the practical implementation of Open Science in Horizon 2020 and beyond) highlights the following RMA tasks:
  - 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, in regard to 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 to identify potential funders for Open Science activities;
  - Provide advice and training in data management, preservation and analysis to assist researchers to open their research workflows, sharing and reusing the research outputs produced by others.

Ethics (+ Data Management)

Ethics in the RRI approach includes all ethical issues from the beginning to the end of the research lifecycle. It represents the commitment to an ethical research conduct which implies the application of fundamental ethical principles and legislation to scientific research in all possible domains of research.

All R&I activities are obliged to comply with ethical norms and principles. US National Institute of Environmental Health Sciences (NIEHS) highlights the relevance of such norms since:

1. they promote the nature of research purpose: search for knowledge, truth, and avoidance of error;

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2. they promote the essential values for a collaborative work, such as trust, accountability, mutual respect, and fairness, which are especially relevant for cooperation and coordination among many different people in different disciplines and institutions;
3. they make researchers accountable for their research practices, boosting the public support for research;
4. they integrate a set of important moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and public health and safety, which are specially relevant as some research activities have the potential to harm human and animal subjects, students, and the public.

Related to ethical principles the concept of **research integrity** has to be mentioned, which refers to developing research in a way which 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 to 4 main principles:

1. **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the 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, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.

Besides the application of such fundamental ethical principles by researchers and its institutions, an ethical research conduct also involves the compliance with ethical norms and principles specifically related to the R&I activity in place. Although this obligation is mostly linked to medical research, which has a longer historical context starting already 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. In the document "Ethics for Researchers- Facilitating Research Excellence in FP7" the European Commission identified **Twelve Golden Rules to Ethical Research Conduct**. The researcher must ensure that the research:

1. Respects the integrity and dignity of persons (that this intrinsic worth protects them from being used for greater perceived benefits)
2. Follows the "Do no harm" principle. Any risks must be clearly communicated to the subjects involved
3. Recognises 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 in accordance with the 3 Rs: Replacement, Reduction, 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 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 does 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 from your research must be considered (with the acceptance that perhaps certain research practices might have to be abandoned)

These principles are legally converted in the EU and international legislation that can be linked to specific domains of research – such as the EU Clinical Trials Regulation or the Code of Ethics of the International Sociological Association - or with a broad scope - such as the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights. During the application to a R&I EU funded programme, researchers are requested to identify any ethical issues related to the project and, if any ethical issue arises, to complete an ethics self-assessment. These ethical issues are organized into 8 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

The proposals retained for funding that identified ethical issues are then submitted to an Ethics Review process.

Another key related concept is the **ethics dumping**, which is the exportation of non-compliance research practices outside Europe. This issue is of particular relevance in the current reality of

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globalization of research activities, where EU organisations develop their work outside the EU, and where international science collaboration and diplomacy is 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. Ethically managing these data is critical for maintaining participants' confidentiality and privacy.

In case of 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 could be used for that purpose.

Regarding ethics, it is in this DMP where 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 ethics chapter in the Description of the Action (DoA).
- Is informed consent for data sharing and long term 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, at the end, with Open Science. You can find more information about that in the previous chapter.

- **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 not directly involved in doing research, RMAs have an important role in promoting RRI in their own institutions by:
  - complying also with a core of ethical principles (for example see the National Council of University Research Administrators (NCURA) Statement of Principles
  - identify real and potential ethical issues related to research activities (at the level of a research project planning and implementation, but also at the level of daily research activities at the institution)

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Related to this, Boston College has developed the online program called Administrators and the Responsible Conduct of Research with 5 modules with specific case-studies of ethical issues for a diversity of RMA tasks related to:

- Conflict of Interest
- Financial Management
- Mentor-Trainee Responsibilities
- Collaborative Research
- Data Management

Gender

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 content (i.e. analysing and taking in 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. seek at having 50/50 participation in the project scientific teams and in its management structures)
3. Fostering gender balance in the 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 namely at the R&I and Higher Education institutions. This recommendation sits in strong evidences that R&I institutions, as in many other areas of society) reproduce social values leading to gender bias and discrimination. In this regard, 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.

- **Gender case studies**: 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 to integrate gender dimension in their ongoing research activities/ projects and to apply it while conceiving new activities/ projects.
    - GARCIA project - Gendering the Academia and Research: combating career instability and asymmetries developed a Toolkit for Integrating Gender-Sensitive Approach into Research and Teaching targets researchers, teachers and RMAs. It integrates a checklist that RMAs could use to promote reflection about the level of gender-

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sensitivity of the research team and plan while writing a new research project. This checklist intends to support researchers through 3 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 that science is a powerful tool for shaping the future of Europe and showcases how Science education has an important role to educate the future scientists. With a decreasing number of young people interested in the science topics and careers, Science education is in the agenda of EU and national science and education authorities for some years and it is a priority in the current R&I Framework Programme.

Science education priority within RRI is thus related to the improvement of science and technology literacy in the society, as well as creating audiences for STEM (Science, Technology, Engineering and Mathematics). To make science more attractive to young people that could pursue careers in STEM, it is necessary to innovate in several areas and involve different actors in science education, from formal to informal education, from curriculum to teaching methods. The European Commission highlights the following areas and actors:

- different levels of the education system,
- universities and other higher education establishments,
- research and innovation funding and performing organizations,
- civil society organizations and NGO's,
- industry, policymakers,
- professors,
- teachers,
- students and pupils,
- Science museums and science centres.

Science education plays an important role not only in educating future scientists, but also in developing the science literacy tools in all social actors to participate in the R&I process.

- **Science Education case studies**: The 2015 EU report SCIENCE EDUCATION for Responsible Citizenship (Chapter 7) we can find a list of Interesting Practices Promoting Responsible Science Education

Science Governance

Governance is the umbrella term for activities from the individual to the institutional level to foster sustainable change towards Responsible Research and Innovation in the institutions or

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towards other stakeholders. The main goal is to open up policy-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 a good governance: 1) openness, 2) participation, 3) accountability, 4) effectiveness and 5) coherence. In the context of RRI, the EU Project RRI Tools provides the following highlights for governance in RRI:

- 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 provides a list of "inspiring practices" of RRI governance initiatives and project: 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 RRIs to the institutional practices will also require the involvement of the RMAs, as they participate actively 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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Lesson 3: Pathways to research: planning a strategy for public engagement

Learning outcomes:

LO#5 - The student will become familiar 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 its roles at different stages of the research project

LO#13 - The student is able to select the engagement strategies, platforms and communication style suited for each target audience.

For a research activity/ project to have impact beyond academia, developing top research is not enough. Depending on its major goals, the different potential beneficiaries and stakeholders should be engaged throughout the project lifecycle to maximize its impact. As thus, defining the **pathways to impact** means defining a **public engagement strategy for the design, implementation and dissemination of research.**

For a research activity/ project to have impact beyond academia, developing top research is not enough. Depending on its major goals, the different potential beneficiaries and stakeholders should engage throughout the project lifecycle to maximize its impact. As thus, defining the **pathways to impact** means defining a **public engagement strategy for the design, implementation and dissemination of research.**

Public engagement is a fundamental element to maximize the research impact as it focuses on co-creating the future with citizens and civil society organisations, bringing together all possible actors that 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 along the research activities is needed, with mutual understanding and co-creation of R&I outcomes and policy. Public engagement is by definition a two-way process and, as thus, it is also a way of empowering the citizens to act on a basis of evidence and also to influence Research Policy and decision-making, while promoting research impact and also raising the visibility of the researcher and develop his/her transferable skills (such as communication, negotiation, cultural awareness, etc.).

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Researchers are requested to demonstrate their research (project) impact already at the application stage and define ways to maximize it. As such, defining and designing primarily a public engagement strategy that includes multiple engagement activities feeding into one another is essential to potentiate the highest possible impact. In order to define them, researchers must answer the following questions:

- **PURPOSE: Why to engage the public?**
- **STAKEHOLDERS: Who might benefit from this research?**
- **PROCESS: How to engage and when?**
- **EVALUATION: How to assess the success of such activities/ public engagement strategy?**

In this lesson we will take a closer look to these four steps necessary to draw a research impact plan.

1. **PURPOSE: Why to engage the public?**

Public engagement is multi-faceted, and it integrates 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 is fitted to the project, the researcher must define clearly 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:

1. Sharing what we do (inspiring, informing)
2. Responding (to societal needs / requests)
3. Creating knowledge together / Doing research together (collaborating, innovating)
4. Applying knowledge together (collaborating, innovating)
5. Learning from others (consulting)
6. 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 and exploring 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 this project divides the levels of public involvement as follows (based on the purpose of the action):

1. Dialogue: aims to improve the "two-way" communication between scientists, policy makers and citizens to ensure a regular exchange of views.

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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.
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: happens when the involved participants acquire certain skills/knowledge in the process of engagement.
6. Direct decision: takes place when final decision-making is in the hands of the public.

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 **scope about what is being said about the project subject** - in news media, public statements and on websites, social media, blogs and forums; and where relevant in advertising, policy documents or reports. This is of particular relevance to draw a more concrete picture of where people are starting from when they engage with the issue, and also where you might find the people you need to engage.

1. 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 define who are the stakeholders needed to engage with 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 to develop quality targeted engagement activities. As such, it is necessary to identify the particular interest groups or specific segments of society for which the research is relevant or likely to appeal. For that, it is useful to take a step back and understand the potential impact of such the research activity/ project

1. What could be the change beyond academia (even if at a small scale)?
2. What new insights will the potential beneficiaries gain and how can they use them?
3. What current or emerging debates does your research contribute to?

It can also be helpful to break the public down into different types based on categories such as age, gender, ethnicity, location or interests. Examples of types of audience include:

- Adults
- Minority groups

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- 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 teacher's association if the target audience are teachers at large).

1. PROCESS: How to engage and when?

It is very important to stress that public engagement must be integrated at different stages of the research: design, implementation and dissemination. As such, different levels of engagement activities responding to different purposes (informing, collaborating, consulting, etc.) should be planned to be developed through the activity/ project, not leaving the engagement with the potential beneficiaries to the end of the research process. This interlinkage between the purpose - 1 with process - 3 can be easily understood by looking to the public engagement onion - developed by the Wellcome Trust:

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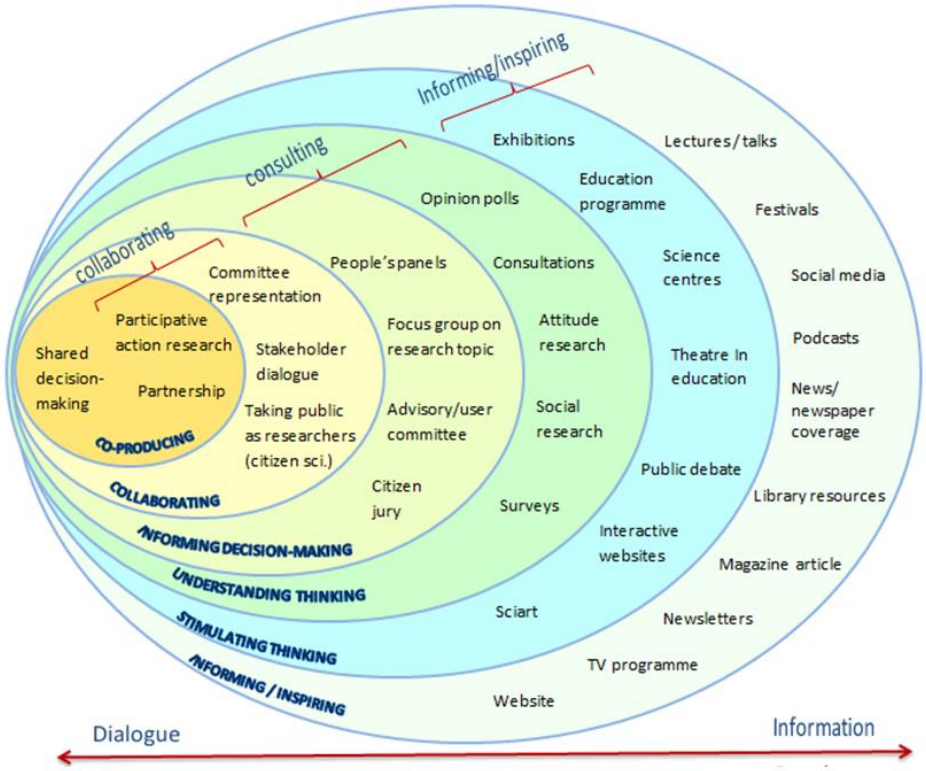

Source: https://www.mpls.ox.ac.uk/public-engagement/what-is-public-engagement

Several research associations and projects have described and categorized these different engagement activities and strategies, such as:

- The UK National co-ordinating centre for Public Engagement identified following categories of public engagement activities:
  - Lecture / Presentation
  - Broadcast
  - Event
  - Writing
  - Encounter
  - Websites
  - Performance
  - Exhibition
  - Exhibit
  - Workshop
  - Network
  - Social media
  - Collaboration

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- Consultation
- Formal learning
- Citizen research
- Collaborative research
- Enquiry service

- The selection of such activities must take in consideration the 1. purpose and 2. stakeholders identified previously, as some activities are more suited than others. As such, students may find examples of how to choose the suited activities in https://www.publicengagement.ac.uk/do-engagement/quality-engagement/process

- If we look again at the Engage2020 project we can find a list of 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 types with very detailed information concerning the application of such methods with examples of past experiences.
    - Another tool developed by this project is the Action Catalogue, an online decision support tool that is intended to enable researchers, policy-makers and others wanting to conduct inclusive research, to find the method best suited for their specific project needs.
        - Students may explore this tool to select one or more engagement methods fitted to their research projects. For that, they must select the objective of engagement and the level of involvement (i.e. 1. purpose), the participants (i.e. 2. stakeholders), the geographic scope of the application and also the skills needed for such activity (which can make them think about their skills but also the relevance of developing management skills). When selecting a method, students can explore a detailed description with examples of 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 people. 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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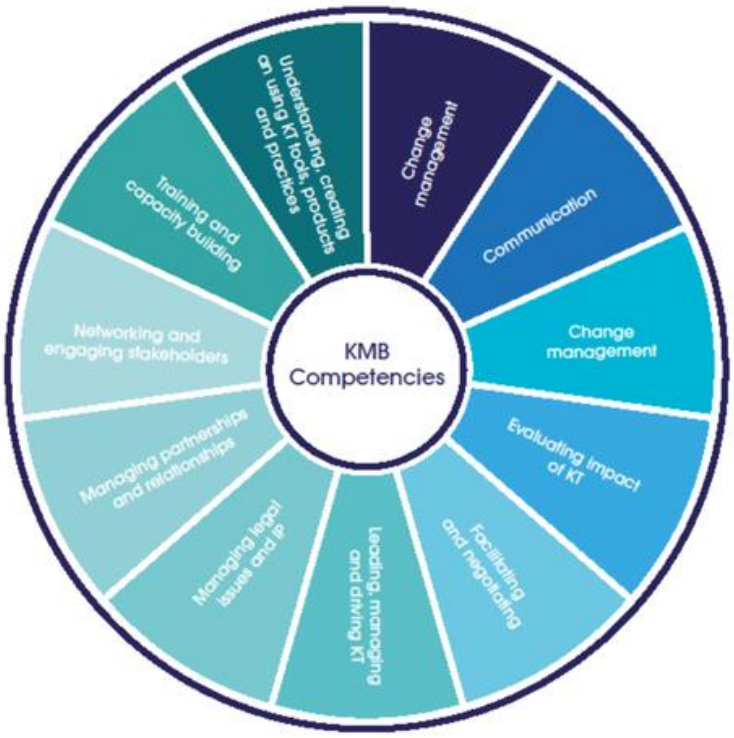
EVALUATION: How to assess the success of such strategies?

Evaluating the effectiveness of the public engagement activities means assessing the effect of such activities, looking at “whether” the goals were achieved and also “to what extent” the activity was effective. Evaluation must be used strategically so that it can provide useful information to concretely asses if the engagement goal was achieved but also to gather insights for future pilot approaches/ further exploration. As such, evaluation must also be part of the impact planning, right from the start. Also, at the level of evaluation different aims, approaches and methods, as well as types of data can be found. We can have a 'summative evaluation” – assessing the outcomes of the engagement activity - or the “formative evaluation” - looking closely to the process to ensure that your approach is as effective as possible.

The role of the RMA as facilitator

As mentioned in lesson 1, the role of implementation (and supporting the implementation) of such strategies and activities is often in the hands of an RMA, often named facilitator or knowledge broker. Julie Bayley et.al. development a framework for knowledge mobilisation and impact competencies were the authors list a series of key competencies required for such roles:



Source: https://juliebayley.blog/2018/03/19/knowledge-broker-competencies-across-the-institution/

On the top rated competencies we have:

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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, plans at more macro levels might exist, such as at the level of **Research Performing Organizations (RPO) or Research Funding Organizations (RFO).** At these levels, the Public Engagement (PE) Plans establish the main aims, objectives and underpinning principles for public 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 strategy, their monitoring and evaluation, as well as the activities of interface between the different stakeholders that are often called to contribute to such plan/ strategy includes the participation of RMAs. The examples below illustrate such strategies and processes within the Universities:
    - UCL Public Engagement strategy 2017: This strategy is developed by the UCL public engagement unit and 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 a vision of Public Engagement a journey, with five phases:
        1. Find your voice
        2. Learn to listen
        3. Start a conversation
        4. Develop a dialogue
        5. Embed a change

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- Imperial College of London Public Engagement with research strategy 2017-2020: This strategy also identifies four areas for research engagement activities
  - Schools outreach and widening participation
  - Local community engagement
  - Patient engagement
  - Engagement with research

  It also lists a set of initiatives through which they will realise their strategy divided in: One-way communication, Interactive engagement and Two-way engagement.

- **Public engagement plans of a funding body:** examples
  - Research Councils UK Public engagement strategy focuses on:
    - 1. stimulating a reflexive and responsive research community that engages the public within the research process;
    - 2. enabling public views to inform policies and research strategies across Research Councils and the broader community; and
    - 3. helping to secure and sustain a supply of future researchers and enable the next generation to act as informed and involved citizens.
  - Welcome Trust foundation new Public Engagement strategy: that describes a outcomes-led approach with a vision of an engagement that's led by researchers. 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 pertaining to 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 whom is a crucial task that can make or break the success of the research impact plan.

Framing the message

If we look at Public Engagement in a coherent and transversal way through the project lifecycle, there are many messages you must want to engage with the different stakeholders, from research objective definition to the project findings outreach. One key element is framing the message - In the Oxford Research Encyclopaedia of Climate Science, framing is defined as "making certain considerations salient as a way to simplify or shape the way in which 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 different audiences and to different goals.

In all cases, there are some key communication principles to follow:

- *Messages should be clear, simple, and easy to understand* - appropriate for the target audience and avoid jargon
- *Messages should be tailored to the different audiences* - know the audiences, what drives them and what are they pre-concepts/ underlying assumption on the subject
- *Messages should be correct* - using simple message does not mean we can disregard the content

Define the goals: Communication, dissemination and Exploitation

If we are looking at a research project, we must have the following plans connected to specific engagement goals:

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1. Communication: *how to get your project known to a wider audience*
2. Dissemination: *how to get your project findings to target audiences*
3. Exploitation: *how to use the project results by potential users*

Let us look closer to each of these plans:

a. Communication

The communication activities of a project is a transversal task throughout the all project. In the EC Research & Innovation Participant Portal Glossary/Reference Terms we can find the following description: "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."

Thus it targets multiple audiences beyond the project's own community including the media and the general public. As such, it is important to use a clear and simple language so that anyone can easily understand the goals and meanings of the project.

Communication activities include:

- visual identity (logo, graphic charter…)
- Press & Media
- Social media
- Website
- Blogs
- Newsletter
- Promotional materials as leaflets and flyers
- Audio-visual products, etc.

In order to design a communication plan, the researcher, supported by the RMA, must ask the following questions:

- What does the public need to know about?
- How to describe the project (goal/ key findings / impact) to a non-specialist audience?
- What channels can be targeted? Social media / Blogs and Wikipedia / Press releases and news stories

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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b. Dissemination

Dissemination is about transferring knowledge and results. In the EC Research & Innovation Participant Portal Glossary/Reference Terms we can find the following description: "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 here is promoting the effective use project results, turning them into concrete value and impact for society. As thus, the target audiences are the stakeholders that may take an interest in the potential use of the results (e.g. scientific community, industrial partner, policymakers).

Dissemination activities include:

- publications
- media releases
- policy briefs
- training and workshops
- demonstrations
- online repositories
- events (exhibitions, demo days, cluster events, guided visits), etc.

In order to design a dissemination plan, the researcher, supported by the RMA, must ask the following questions:

- What are the main project findings?
- Who are the target audiences?
- How to communicate the project main findings to each specific audience? What are the adjustments necessary?
- What channels and communication strategies fit for each audience?

c. Exploitation

In the EC Research & Innovation Participant Portal Glossary/Reference Terms we can find the following description: "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."

As thus, the target audiences are people or organisations that make concrete use of the project results (not restricted to commercial use).

Exploitation activities include:

- market Identification
- business models

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- product concept
- stakeholder mapping
- strategic grant planning

In order to design an exploitation plan, the researcher, supported by the RMA, must ask 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 going to be 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 – 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 your results have for everyday life? How would society benefit from your work? What would be the consequences for future policymaking?
- What are the market & customers' needs and wants?

Communication, dissemination and exploitation plans: some examples

Communication, Dissemination and Exploitation activities are developed in order to maximize the impact of the R&I activity or project and must be understood intertwined since one drives the other – and vice versa. Often, we may see the same type of activity or product in more than one of these actions - for example, a press-release or even a magazine article can address multiple actors and goals. **What it is more relevant to distinguish these 3 levels of action is the goal, the focus and the target groups that are addressed.** Let us look at concrete examples:

- 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

General tips an RMA can provide:

a. Start from the beginning: study and plan - know your project, set your goals and design your communication, dissemination and exploitation plans is a clear and simple way

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b. Design SMART activities: Specific, Measurable, Attainable, Realistic and Time-Bound activities

c. Set Key Performance Indicator (KPI) 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 in social media).

d. Set out your key messages in clear, accessible language - frame your message, avoid jargon

e. Test your messages in different media - to try out and select the most effective media of presenting a type of message

f. Draw up an overall project plan - by including all the activities it will make it easier to envision their interconnections, as well as to achieve a feasible plan with deadlines, responsibilities and costs**.**

g. Don't underestimate the time and money needed - budget it (human resources, equipment, specialized services, materials, etc.**)**

h. 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. Here are the most important obligations to acknowledge, most of them already included at the Annotated Model Grant Agreement (AGA):

1. Each beneficiary must – as soon as possible – disseminate its 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)
3. Each beneficiary must – up to four years after the end of the project – take measures to ensure exploitation of its 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 needs to acknowledge the EU funding by using the wording and criteria specified in the AGA (Articles 27, 28, 29, 38)**.**

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Lesson 5: Oral presentations

Learning outcome:

LO#15 - The student can design a research engagement plan and identify suitable key performance indicators to assess stakeholder engagement.

Students will be challenged to apply the knowledge and skills acquired from Lesson 1 in this module, by presenting a public engagement plan of their projects or a given project. Public engagement should follow the structure indicated on lesson 2, identifying:

1. purpose - what is the main goal of their engagement plan
2. stakeholders - how are the different target audiences/ stakeholders
3. process/ strategies - detailing their communication/ dissemination / exploitation plan
4. evaluation - how of evaluate the success of such engagement plan for the project goal

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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 in the gap for 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 in PBL 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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