Responsible Research & Innovation

Introduction to Responsible Research & Innovation,
Scientific Integrity, Open Science, and Stakeholder Management
in the Research Practice

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SB Science Management UG
www.sb-sciencemanagement.com

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Scientific Integrity

„Good Scientific Practice"

Scientific Integrity

Good Research Practices are based on fundamental principles of **Research Integrity**.

They guide researchers in their work as well as in their engagement with the practical, ethical and intellectual challenges inherent in research.

Scientific Integrity

It ensures:

- Objectivity
- Clarity
- Reproducibility
- Utility

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Why is it important?

Scientific Integrity...

...helps to **build public support**

...helps to ensure that scientists (and their collaborators) can be **held accountable**

...promotes **values that are essential to collaborative work** (trust, accountability, fairness)

...promotes the **aims of research**, such as knowledge, truth, and avoidance of error

...promotes a variety of **other important moral and social values**, such as compliance with the law, health and safety

Scientific Integrity

Violation of Scientific Integrity can be:

- Bias
- Fabrication
- Falsification
- Plagiarism
- Outside interference
- Censorship
- Inadequate procedural and information security
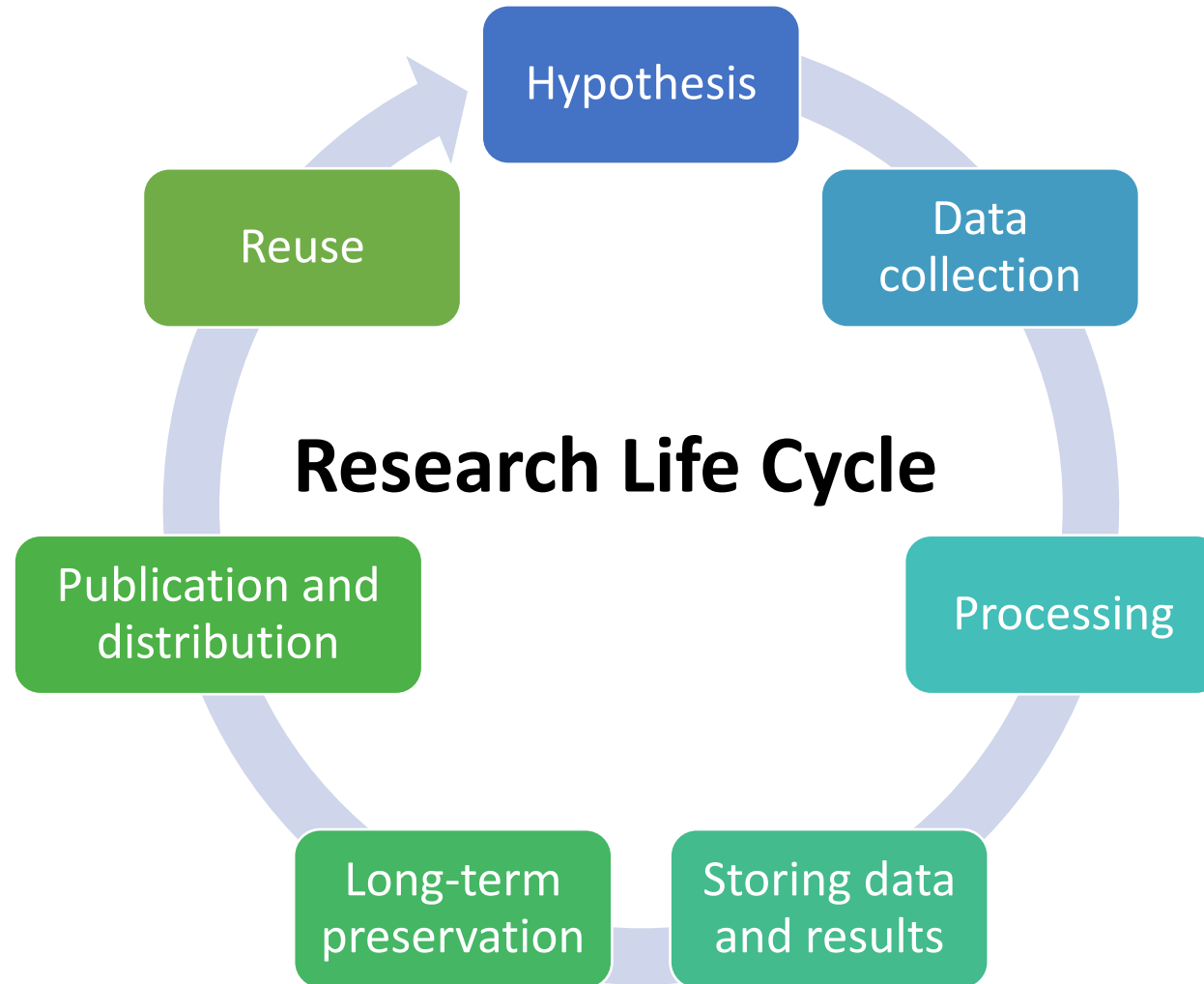
Principles of Scientific Integrity

- *Reliability* in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
- *Honesty* in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
- *Respect* for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
- *Accountability* for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.

www.allea.org/wp-content/uploads/2017/03/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017-1.pdf

Good Research Practices

Good Research Practices relate to the following contexts:

- Research Procedures
- Data Practices and Management
- Safeguards
- Collaborative Working
- Publication and Dissemination
- Reviewing, Evaluating and Editing
- Training, Supervision and Mentoring
- Research Environment

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The Research Life Cycle

Research Life Cycle

- Hypothesis
- Data collection
- Processing
- Storing data and results
- Long-term preservation
- Publication and distribution
- Reuse

Research Procedures

Researchers….

… take into account the **state-of-the-art** in developing research ideas.

… **design, carry out, analyse and document** research in a careful manner.

… make proper and conscientious **use of research funds**.

… publish results and interpretations of research in an **open, honest, transparent and accurate manner**, and respect **confidentiality** of data or findings.

… report their results in a way that is **compatible with the standards** of the discipline and **can be verified and reproduced**.

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Safeguards

Researchers …

… comply with **codes and regulations** relevant to their discipline.

… handle research subjects (human, animal, cultural, biological, environmental, physical) with **respect and care**, and in accordance with legal and ethical provisions.

… have due **regard for the health, safety and welfare** of the community, of collaborators and others connected with their research.

… ensure that **research protocols** take account of, and are sensitive to, relevant differences in age, gender, culture, religion, ethnic origin and social class.

… recognise and **manage potential harms and risks** relating to their research.

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Data Practices & Management

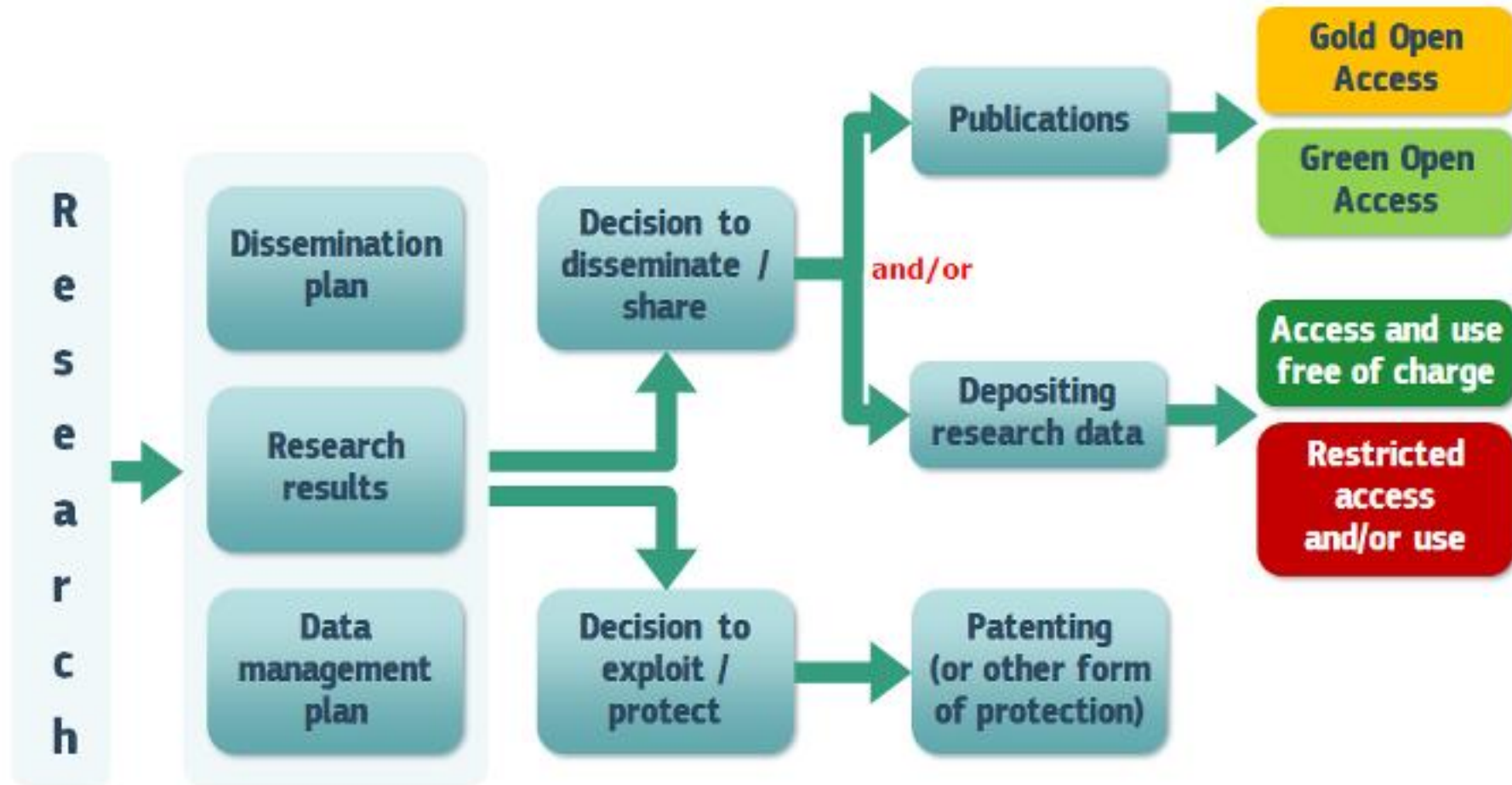**Researchers, research institutions and organisations ensure…**

…. appropriate **stewardship and curation** of all data and research materials, including unpublished ones, with secure preservation for a reasonable period.

… **access to data** is as open as possible, as closed as necessary, and where appropriate in line with the FAIR Principles for data management.

… transparency about **how to access or make use** of their data and research materials.

… **acknowledgement of data** as legitimate and citable products of research.

… that any contracts or agreements relating to research outputs include equitable and **fair provision** for the management of their use, ownership, and/or their protection.
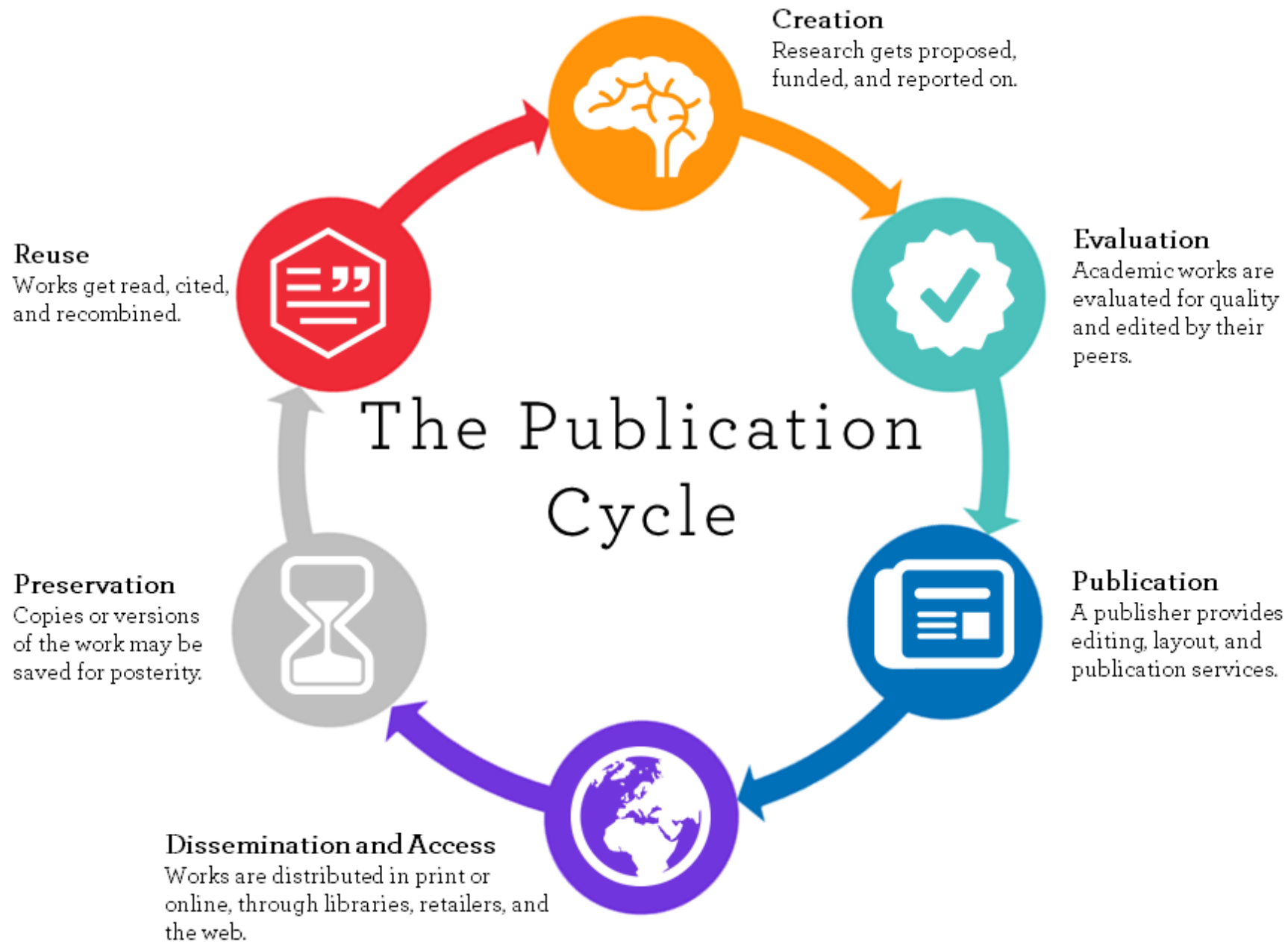
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Collaborative Working

All partners in research collaborations …

… take **responsibility for the integrity** of the research.

… agree at the outset on the goals of the research and on the process for **communicating** their research as **transparently and openly** as possible.

… formally agree at the start of their collaboration on e**xpectations and standards concerning research integrity**, on the laws and regulations that will apply, on protection of the intellectual property of collaborators, and on procedures for handling conflicts and possible cases of misconduct.

… are **properly informed and consulted** about submissions for publication of the research results.

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Publication and Dissemination

The Publication Cycle

Creation
Research gets proposed, funded, and reported on.

Evaluation
Academic works are evaluated for quality and edited by their peers.

Publication
A publisher provides editing, layout, and publication services.

Dissemination and Access
Works are distributed in print or online, through libraries, retailers, and the web.

Preservation
Copies or versions of the work may be saved for posterity.

Reuse
Works get read, cited, and recombined.

http://library.uwinnipeg.ca/scholarly-communication/index.html

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Publication and Dissemination - I

All authors …

… are fully **responsible** for the content of a publication.

… agree on the sequence of **authorship**, and that authorship is based on a significant contribution.

… ensure that **work is made available** in a timely, open, transparent, and accurate manner, and are honest in their communication to the general public and in traditional and social media.

… **acknowledge important work and intellectual contributions** of others, including collaborators, assistants, and funders, who have influenced the reported research in appropriate form, and cite related work correctly.

… **disclose** any conflicts of interest and financial or other types of support.

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Publication and Dissemination - II

Authors and publishers ...

... **issue corrections or retract work** if necessary, the processes for which are clear, the reasons are stated, and authors are given credit for issuing prompt corrections post publication.
... **consider negative results** to be as valid as positive findings for publication and dissemination.

Researchers adhere to the same criteria as those detailed above whether they publish in a subscription journal, an open access journal or in any other alternative publication form.

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CRediT – Contributor Roles

CRediT (Contributor Roles Taxonomy) is high-level taxonomy, including 14 roles, that can be used to represent the roles typically played by contributors to scientific scholarly output. The roles describe each contributor's specific contribution to the scholarly output.

Contributor Roles Taxonomy

Conceptualization
Data curation
Formal Analysis
Funding acquisition
Investigation
Methodology
Project administration

Resources
Software
Supervision
Validation
Visualization
Writing – original draft
Writing – review & editing

https://casrai.org/credit/

CRediT – Contributor Roles - I

- **Conceptualization** – Ideas; formulation or evolution of overarching research goals and aims.
- **Data curation** – Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.
- **Formal analysis** – Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.
- **Funding acquisition** - Acquisition of the financial support for the project leading to this publication.
- **Investigation** – Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.
- **Methodology** – Development or design of methodology; creation of models.
- **Project administration** – Management and coordination responsibility for the research activity planning and execution.

https://casrai.org/credit/

CRediT – Contributor Roles - II

- **Resources** – Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.
- **Software** – Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.
- **Supervision** – Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.
- **Validation** – Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.
- **Visualization** – Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
- **Writing – original draft** – Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).
- **Writing – review & editing** – Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.

https://casrai.org/credit/

Reviewing, Evaluating, Editing

Researchers …

… take seriously their **commitment to the research community** by participating in refereeing, reviewing and evaluation.

… review and evaluate submissions for publication, funding, appointment, promotion or reward in a **transparent and justifiable manner**.

Reviewers…

… or editors with a **conflict of interest withdraw** from involvement in decisions on publication, funding, appointment, promotion or reward.

… **maintain confidentiality** unless there is prior approval for disclosure.

… and editors **respect the rights of authors and applicants**, and seek permission to make use of the ideas, data or interpretations presented.

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Training, Supervision and Mentoring

- Researchers across the entire career path, from junior to the most senior level, **undertake training in ethics and research integrity**.
- Senior researchers, research leaders and supervisors **mentor** their team members and offer specific guidance and training to properly develop, design and structure their research activity and to foster a culture of research integrity.

www.allea.org/wp-content/uploads/2017/03/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017-1.pdf

Research Environment

Research institutions and organisations ...

...ensure that **researchers receive rigorous training** in research design, methodology and analysis.

... **develop appropriate and adequate training** in ethics and research integrity and ensure that all concerned are made aware of the relevant codes and regulations.

... promote awareness and ensure a prevailing **culture of research integrity**.

... demonstrate leadership in **providing clear policies and procedures** on good research practice and the transparent and proper handling of violations.

... **support proper infrastructure** for the management and protection of data and research materials in all their forms (encompassing qualitative and quantitative data, protocols, processes, other research artefacts and associated metadata) that are necessary for reproducibility, traceability and accountability.

... **reward open and reproducible practices** in hiring and promotion of researchers.

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Open Science

Open Science

"The idea captures a systemic change to the way science and research have been carried out for the last fifty years: Shifting from the standard practices of publishing research results in scientific publications towards sharing and using all available knowledge at an earlier stage in the research process."

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Open Science

The movement to make scientific research, data and dissemination accessible to all levels of an inquiring society.

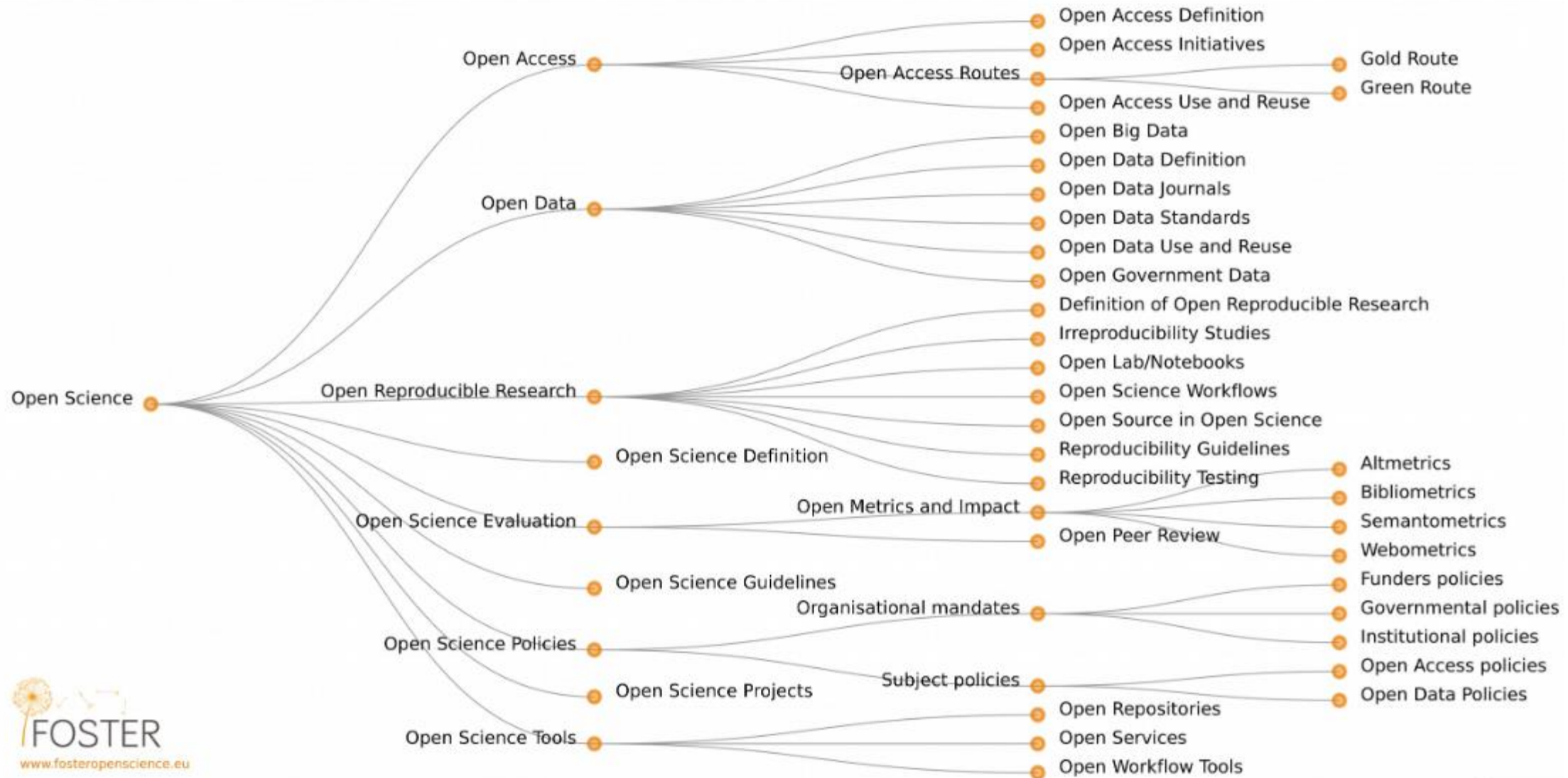*[Source: FOSTER, Open Science Definition https://www.fosteropenscience.eu/taxonomy/term/7]*
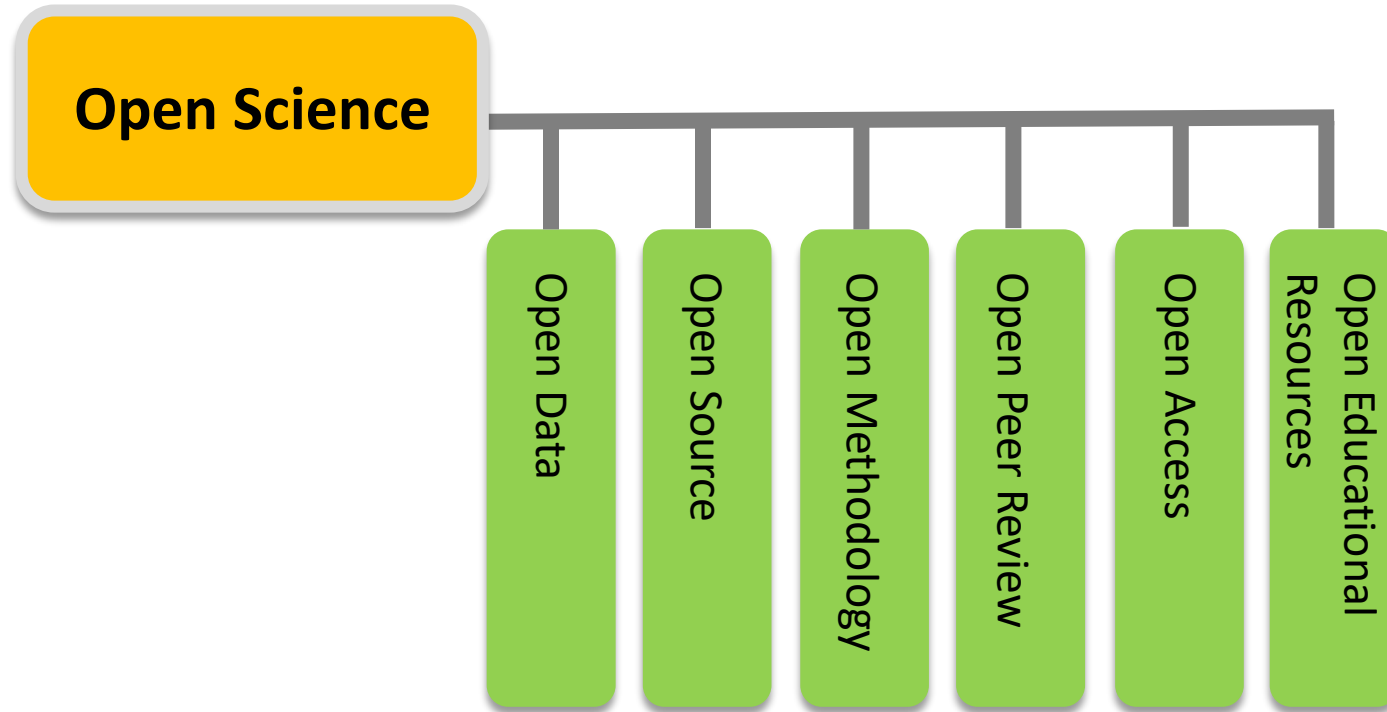
Scope:
- **Transparency** in experimental methodology, observation, and collection of data
- Public **availability and reusability** of scientific **data**
- Public **accessibility and transparency** of scientific **communication**
- Using web-based tools to **facilitate scientific collaboration**

[The OpenScience Project, What exactly is open science http://www.openscience.org/blog/?p=269]

https://www.fosteropenscience.eu/content/what-open-science-introduction

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Open Science Taxonomy

Six Principles of Open Science

Open Science

Open Data | Open Source | Open Methodology | Open Peer Review | Open Access | Open Educational Resources

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Open Science

The rationale behind Open Science is …

…sociological: Scientific knowledge is a product of social collaboration and its **ownership belongs to the community**

…economic: Scientific outputs generated by public research are **a public good** that everyone should be able to use at no cost

Open Science

General benefits

- Increases research efficiency
- Promotes scholarly rigour and enhances research quality
- Enhances visibility and engagement
- Enables the creation of new research questions
- Enhances collaboration and community building

Open To All? Case studies of openness in Research
http://www.rin.ac.uk/system/files/attachments/NESTA-RIN_Open_Science_V01_0.pdf]

https://www.fosteropenscience.eu/node/2269

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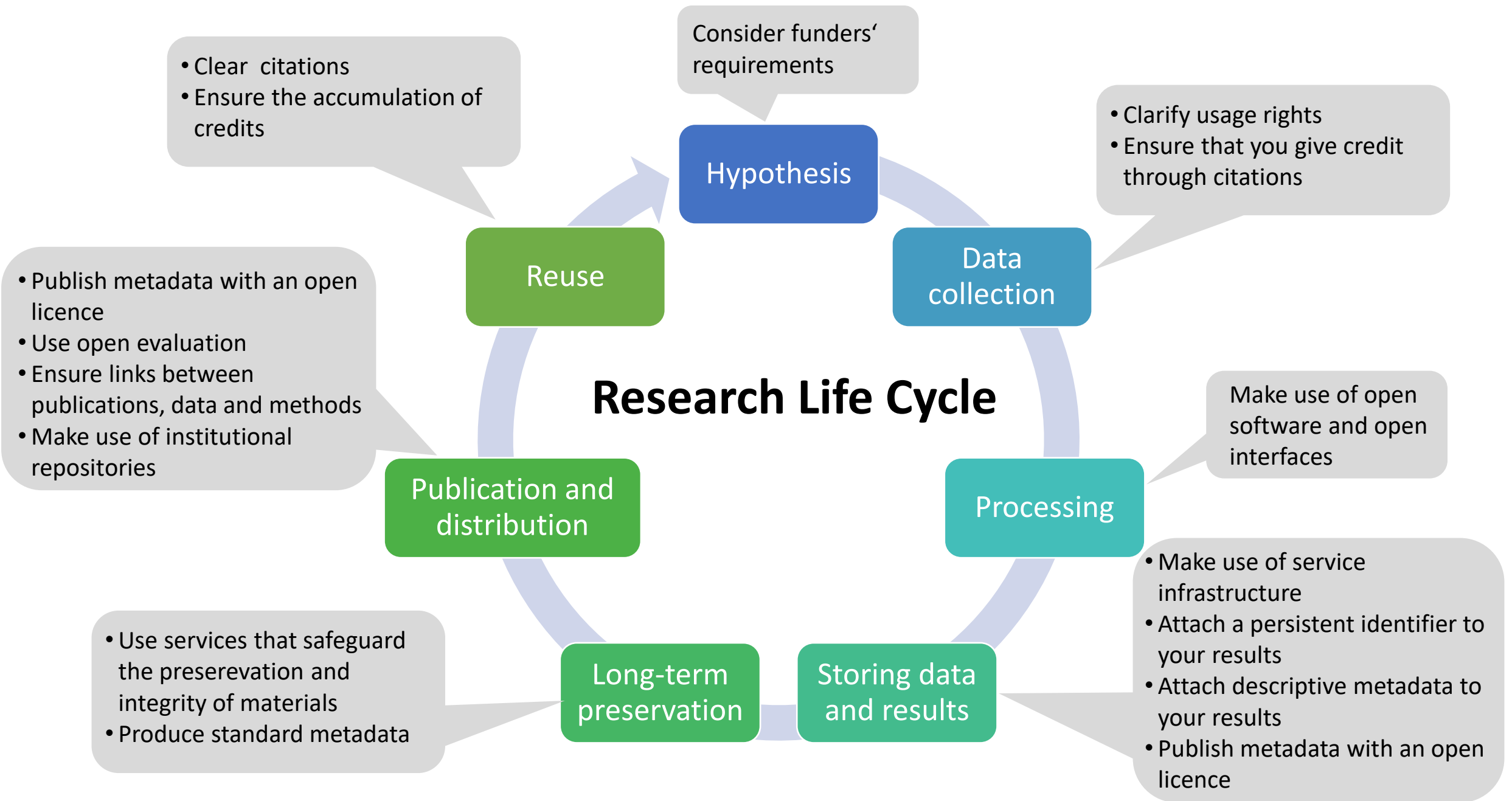science
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Open Science

Benefits for early career researchers

- Become pioneers
- Have gained valuable experience
- Distinguish from the crowd
- Plan successful research proposals
- Receive higher citations
- Know how to comply with funders' policies
- Demonstrate research and societal impact

https://www.fosteropenscience.eu/node/2269

See also: http://oro.open.ac.uk/44720/

Research Life Cycle

- Consider funders' requirements

- Clarify usage rights
- Ensure that you give credit through citations

- Make use of open software and open interfaces

- Make use of service infrastructure
- Attach a persistent identifier to your results
- Attach descriptive metadata to your results
- Publish metadata with an open licence

- Use services that safeguard the preserevation and integrity of materials
- Produce standard metadata

- Publish metadata with an open licence
- Use open evaluation
- Ensure links between publications, data and methods
- Make use of institutional repositories

- Clear citations
- Ensure the accumulation of credits

Hypothesis

Data collection

Processing

Storing data and results

Long-term preservation

Publication and distribution

Reuse

https://www.fosteropenscience.eu/content/what-open-science-introduction
Promoting openness at different stages of the research process (Open Science and Research Initiative, 2014)

Open Science

From Open Access to Open Scholarly Communication

" "The days of keeping our research results to ourselves are over. There is far more to gain from sharing data and letting others access and analyse that data."

Commissioner Carlos Moedas,
"European research and innovation for global challenges",
Lund, 4 December 2015

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Open Innovation

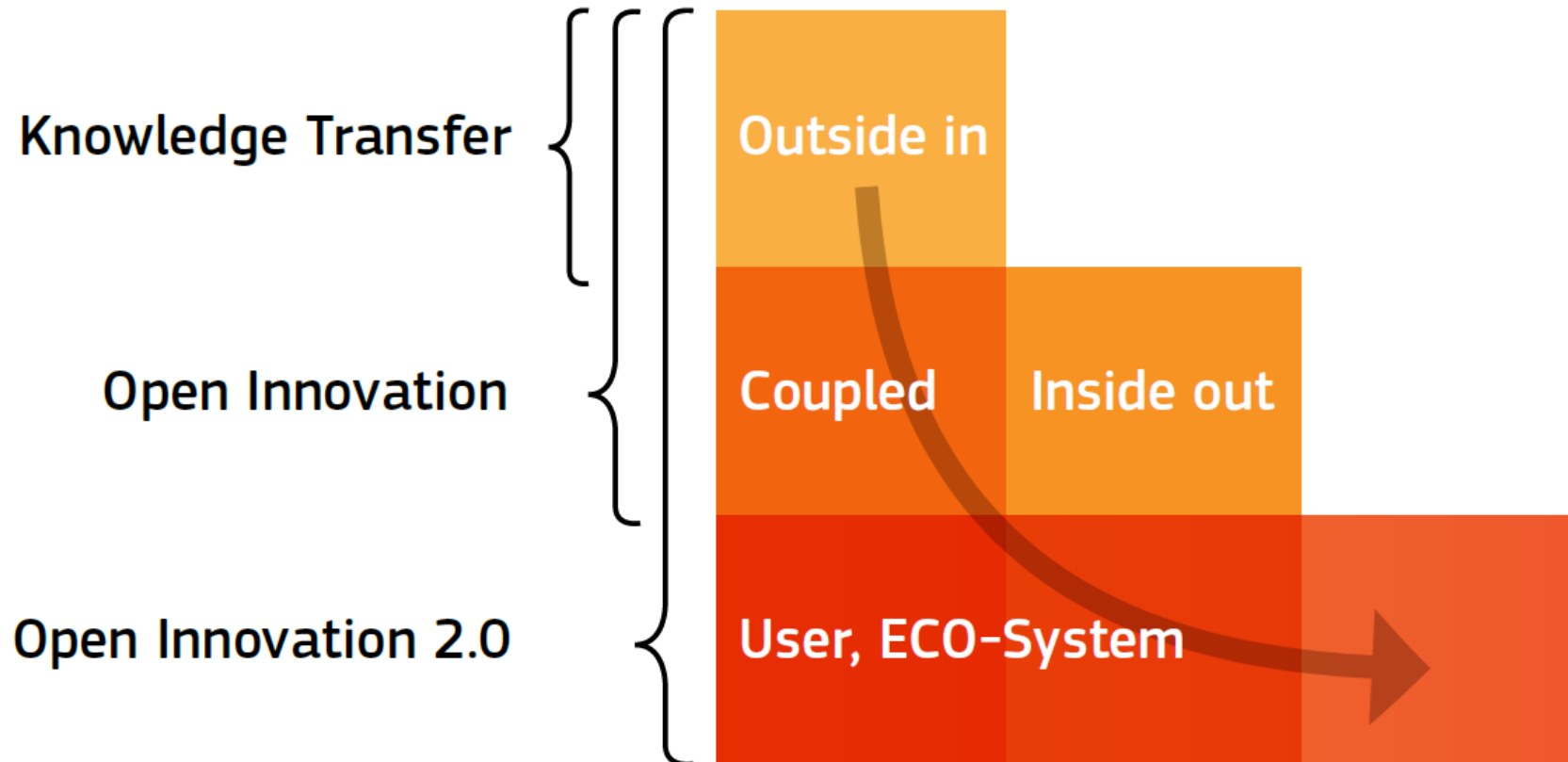What is meant by Open Innovation?

To open up the innovation process to all active players so that knowledge can circulate more freely and be transformed into products and services that create new markets, fostering a stronger culture of entrepreneurship.

Originally: transferring knowledge, expertise and even resources from one company or research institution to another

New concept: moving from linear, bilateral transactions and collaborations towards dynamic, networked, multi-collaborative innovation ecosystems.

Chesbrough, Henry (2006) http://openinnovation.net/Book/NewParadigm/ Chapters/index.html; "Open Innovation: A New Paradigm for Understanding Industrial Innovation," in Henry Chesbrough, Wim Vanhaverbeke, and Joel West, eds. http://hchesbrough.wpengine.com/NewParadigm" Open Innovation: Researching a New Paradigm. Oxford: Oxford University Press

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Open Innovation

From Knowledge Transfer to Open Innovation 2.0

Responsible Research & Innovation - RRI

RRI

Responsible Research and Innovation (RRI) is a term used by the European Union's Framework Programmes to better align both the process and outcomes of R&I with the values, needs and expectations of the European society.

This should lead to a closer interaction between research institutions and societal actors during the whole research and innovation process and take into account **effects and potential impacts on the environment and society**.

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Need for RRI

Problem → Research → Implementation

Science and practice join hands
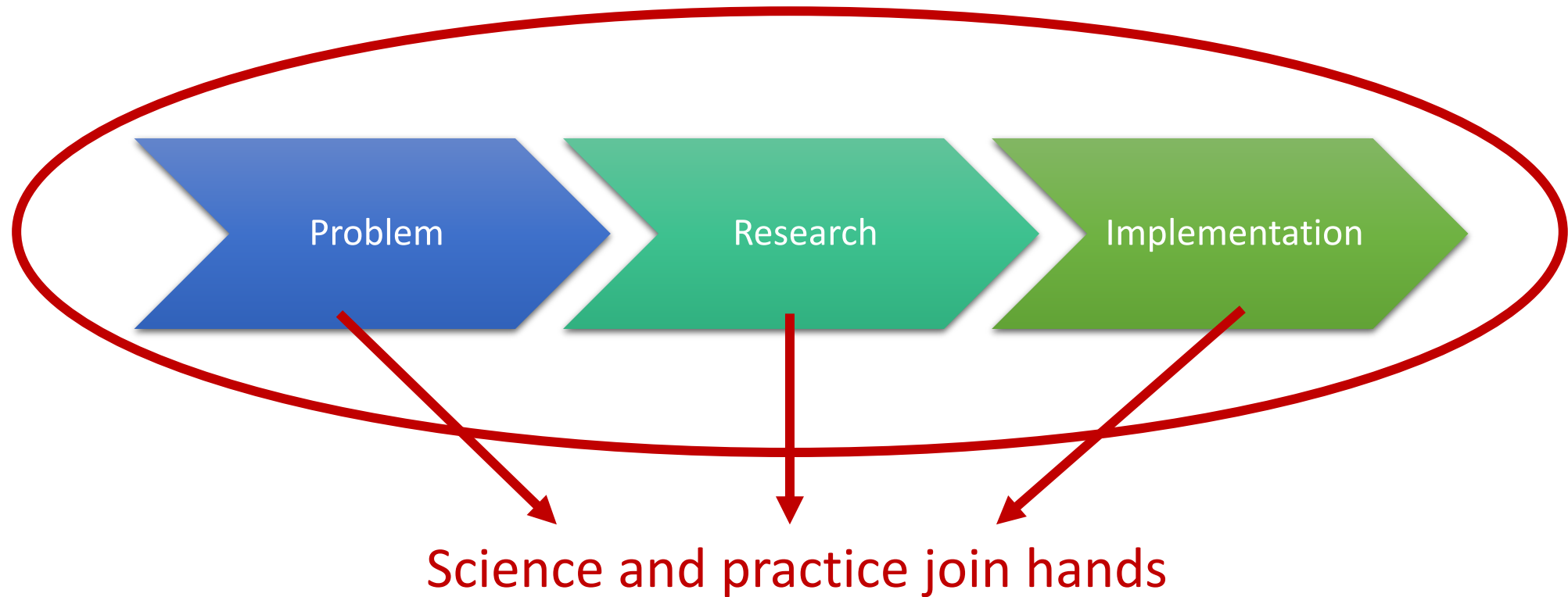
Definition of RRI

Working definition (by project RRI-Tools):

- *Responsible research and innovation is a dynamic, iterative process*
- *all stakeholders involved in the practice of research and innovation become mutually responsive*
- *these stakeholders share the responsibility regarding the **outcomes** and **processes of research and innovation***

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RRI in practice

Current interest in RRI is motivated by e.g.:

- Motivation to use new technologies for social benefits, especially considering that innovations in medicines, energy, electronics, materials and computing are becoming more complex, more disruptive and global in their reach and impact
- Avoiding the loss of another technological advance, such as occurred in the case of the total ban on genetically modified organisms
- Prevention of catastrophic effects like those connected to, e.g., asbestos
- Anticipation of negative unintended consequences of scientific and technological research, which are now magnified by the potentials of current and future technologies.

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RRI in practice

"

"RRI is about trying to get better at anticipating problems, taking into account wider social, ethical and environmental issues and being able to create flexible and adaptive systems to deal with these unintended consequences."

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RRI

"...we can only find the right answers by involving as many stakeholders as possible in the research and innovation process. **Research and innovation must respond to the needs and ambitions of society, reflect its values and be responsible...our duty as policy makers (is) to shape a governance framework that encourages responsible research and innovation.**"

Georghegan-Quinn, "Science in Dialogue – Conference on Responsible Research and Innovation"
(Odense, Dinamarca, 23-25 April 2012)

"To support *"the best science for the world"* and not just *"the best science in the world"*

P. Morten Østergaard, Ministre danès de Ciencia i Economia (Odense, Dinamarca, 23-25 April 2012)

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RRI – A Policy Agenda

The six policy agendas (as defined by the Euopean Commission)

Ethics

focuses on (1) research integrity: the prevention of unacceptable research and research practices; and (2) science and society: the ethical acceptability of scientific and technological developments.

Open Access

addresses issues of accessibility to and ownership of scientific information. Free and earlier access to scientific work might improve the quality of scientific research and facilitate fast innovation, constructive collaborations among peers, and productive dialogue with civil society.

Gender Equality

is about promoting gender balanced teams, ensuring gender balance in decision-making bodies, and considering always the gender dimension in R&I to improve the quality and social relevance of the results.

Public Engagement

fosters R&I processes that are collaborative and multi actor: all societal actors work together during the whole process in order to align its outcomes to the values, needs and expectations of society.

Governance

arrangements that lead to acceptable and desirable futures have to (1) be robust and adaptable to the unpredictable development of R&I (de facto governance); (2) be familiar enough to align with existing practices in R&I; (3) share responsibility and accountability among all actors; and (4) provide governance instruments to actually foster this shared responsibility.

Science Education

focuses on (1) enhancing the current education process to better equip citizens with the necessary knowledge and skills so they can participate in R&I debates; and (2) increasing the number of researchers (promote scientific vocations).

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https://www.rri-tools.eu/about-rri

RRI – Process dimensions

Practicing a more responsible R&I requires that processes are:

Diverse & inclusive: Involves early a wide range of actors in R&I practice, deliberation, and decision-making to yield more useful and higher quality knowledge (oncludes more sources of expertise, disciplines, perspectives).

Anticipative & reflective: Envisions impact and reflects on the underlying assumptions, values, and purposes to better understand how R&I shapes the future; yields in an increase of capacity to act an what we know.

Open & transparent: Communicates on methods, results, conclusions, and implications to enable pulic scrutiny and dialogue.

Responsive & adaptive to change: Enables to modify modes of thought and behaviour (and organisational structures) in response to changing circumstances, knowledge, and perspectives. This aligns action with the needs of stakeholders and public.

Source: https://www.rri-tools.eu/about-rri

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RRI is about: including all actors, and considering specific key issues and process dimensions

Diverse and Inclusive

Open and Transparent

Policy Makers

Ethics

Research Community

Science Education

Gender Equality

Education Community

Governance

Public Engagement

Open Access

Civil Society Organisations

Business & Industry

Anticipative and Reflective

Responsive and Adaptive

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RRI - Expected Outcomes

Adopting RRI is meant to aim at the following outcomes:

LEARNING OUTCOMES

Engaged publics
Responsible actors
Responsible institutions

R&I OUTCOMES

Ethically aceptable
Sustainable
Socially desirable

SOLUTIONS TO SOCIETAL CHALLENGES

Seven Grand Challenges

RRI leads to empowered, responsible actors across our R&I systems (researchers, policymakers, businesses and innovators, CSOs, educators). Structures and organisations should create opportunities for and provide support to actors to be responsible, ensuring that RRI becomes — and remains — a solid and continuous reality.

RRI practices strive for ethically acceptable, sustainable, and socially desirable outcomes. Solutions are found in opening up science through continuous, meaningful deliberation to incorporate societal voices in R&I, which leads to relevant applications of science.

Our societies face several challenges, which the European Commission has formulated as the seven 'Grand Challenges' — one of the three main pillars of the Horizon 2020 Programme. In order to support European policy, the EC requires R&I endeavours to contribute to finding solutions for these Grand Challenges.

https://www.rri-tools.eu/about-rri

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Grand Challenges

… as defined by the European Commission:

Health, demographic change and wellbeing

Food, agriculture & forestry and water

Secure, clean and efficient energy

Smart, green and integrated transport

Climate action, environment and resources

Europe in a changing world: inclusive, innovative and reflective societies

Secure societies: freedom and security of Europe and its citizens

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Stakeholder Engagement

Stakeholder Groups

How are stakeholders defined?

"Stakeholders are people, groups, or institutions which are likely to be affected by a proposed intervention (either negatively or positively), or those which can affect the outcome of the intervention."

(Rietbergen-McCracken et al. 1998).

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Stakeholder Groups

Policy Makers

Researchers

Business & Industry

Education Community

Civil Society Organisations

Citizens

https://www.slideshare.net/RRITools/rri-tools-project-for-creatit-9-october-2014

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Stakeholder Analysis

How to identify relevant stakeholders?

Some questions to ask:

Who are the people/groups/institutions that are interested in the intended
       initiative? *What* is their role (patient, regulator, user etc.)?
Who are the potential beneficiaries? *Who* will be affected by my research?
Who might be adversely impacted? *Who* has constraints about the initiative?
Who may impact the initiative? *Who* has the power (and interest) to influence?
Who controls the ressources?
What are motivations and interests of your stakeholders?

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Categories of Stakeholders

Core Stakeholders

Internal but Indirect Stakeholders

External and Indirect Stakeholders

Parents

Accrediting Bodies

Institutional Advancement

Enrollment Management

Institutional Assessment & Research

Registrar

Faculty, staff advisors, students, administrators

Alumni

Finance & Human Resources

Office of Student Affairs

Office of Academic Affairs

Employers

State of Regional Governing Boards

https://www.conceptdraw.com/How-To-Guide/stakeholder-management-system

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Stakeholder Groups

How to select your relevant stakeholder groups
for engagement activities?

Stakeholder Map

Power (high / low)

Interest (low → high)

	Interest
high Power	Anticipate and meet needs
	Manage most closely
	Regular minimal contact
low	Keep well informed/ satisfied
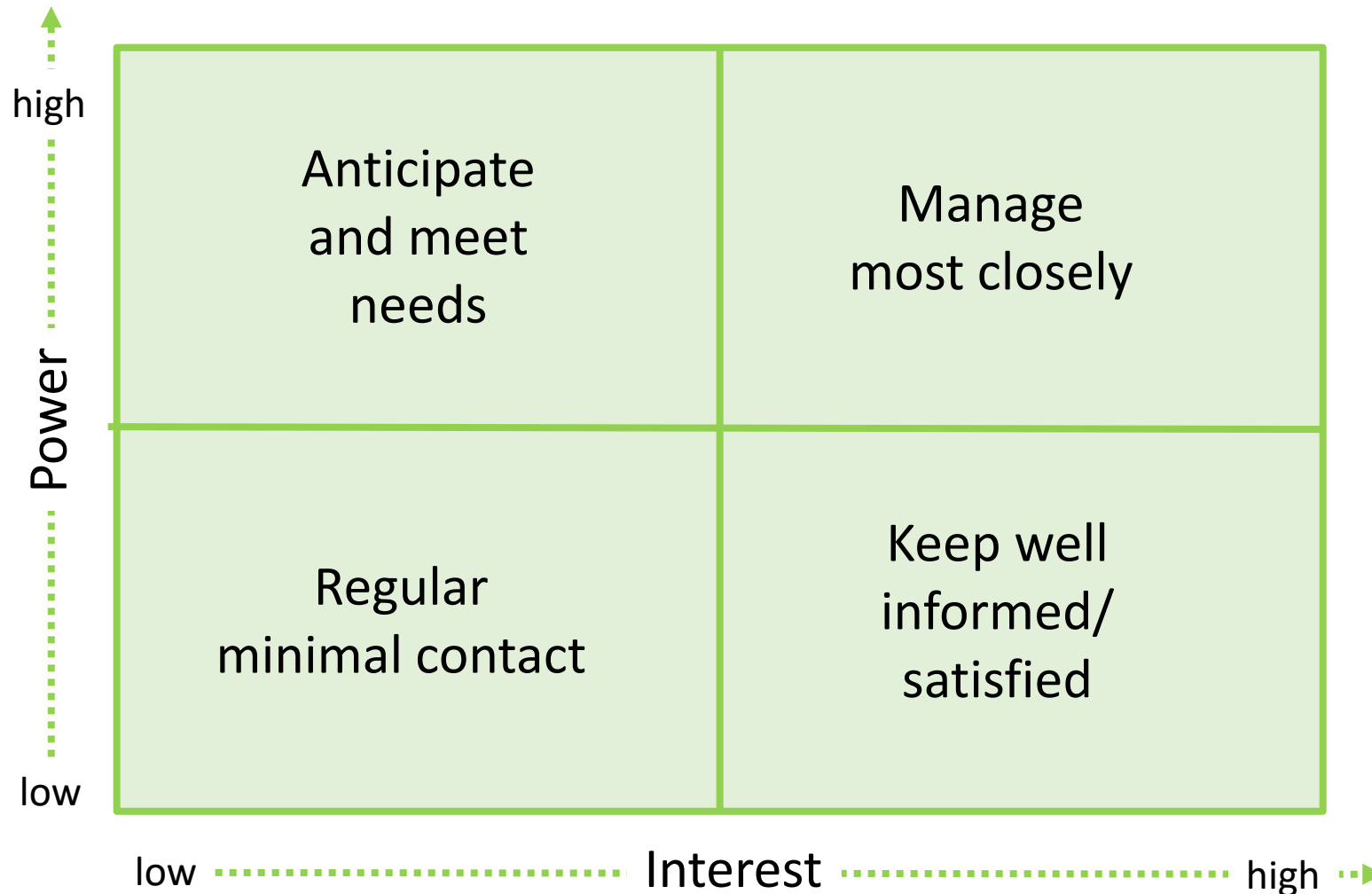
Are your stakeholders….?

Advocates
Blockers
Neutral („Swiss")

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Stakeholder Groups

Stakeholder Communication:

Who needs to know what and when?

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Stakeholder Communication Plan

Target Group	Effect/Impact	Needs of target group	Communication measure

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Impact

Impact = The tangible effect(s) of your research activity.

-> Who will benefit from my research results?

-> Which change will it make?

Examples for Impact

Societal Impact

- Quality of life
- Health
- Environment
- Administration
- Politics
- Public engagement
- Regulations
- Education
- …..

Economic Impact

- Innovations
- Competition
- Growth
- Jobs
- Savings
- …..

Academic Impact

- Theory building
- Methods
- Knowledge
- Technology development
- Scientific education
- Teaching and training
- Application
- …..

Jussi Alho & Maarit Haataja, Univ. of Helsinki, 2015

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Communication measures

Consider the needs of your target group

Target Group	Effect/Impact	Needs of target group	Communication vehicle

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Persona Modeling
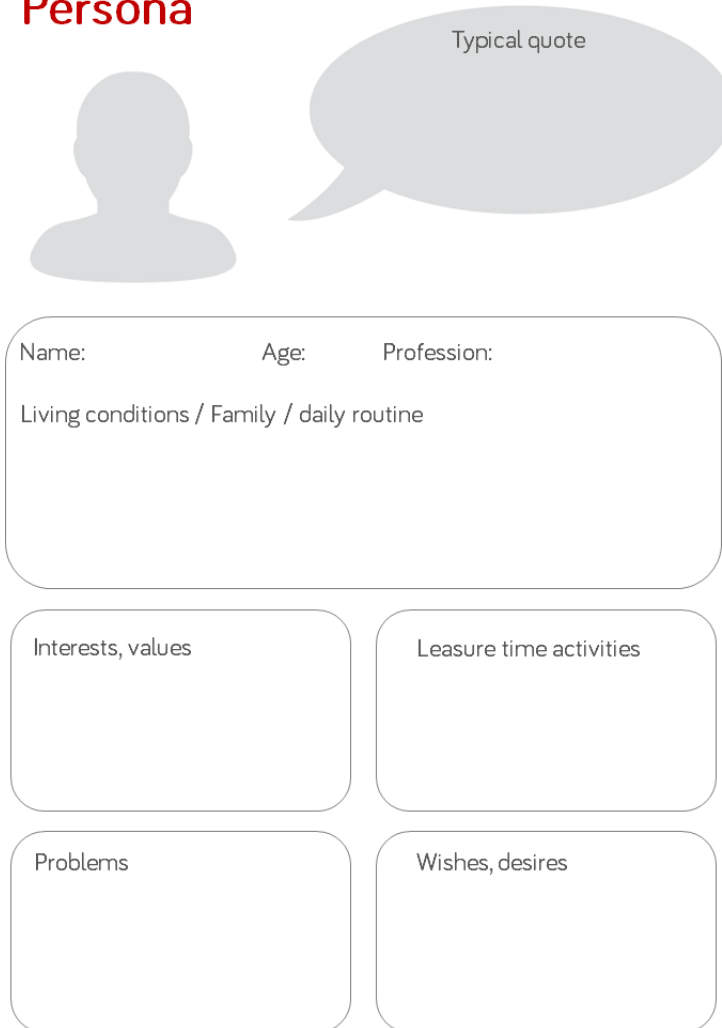
Persona modeling

Persona Modeling

Personas are fictional characters, which you create based upon your research in order to represent the different user types that might use your service, product, site, or brand in a similar way.

Personas make the design task at hand less complex, they guide your ideation processes, and they can help you to achieve the goal of creating a good user experience for your target user group.

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Persona Modeling

Persona

Typical quote

Name: Age: Profession:

Living conditions / Family / daily routine

Interests, values

Leasure time activities

Problems

Wishes, desires

- name, age, family status, lifestyle, workstyle, leasure time
- catchphrase that distinguishes the persona from others
- key attributes that might affect opinion, perspective, expectations, behaviour
- problems, pain points
- interests, wishes
- ....

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Impact – Success Formula

Research × Stakeholder needs × Successful communication = Impact
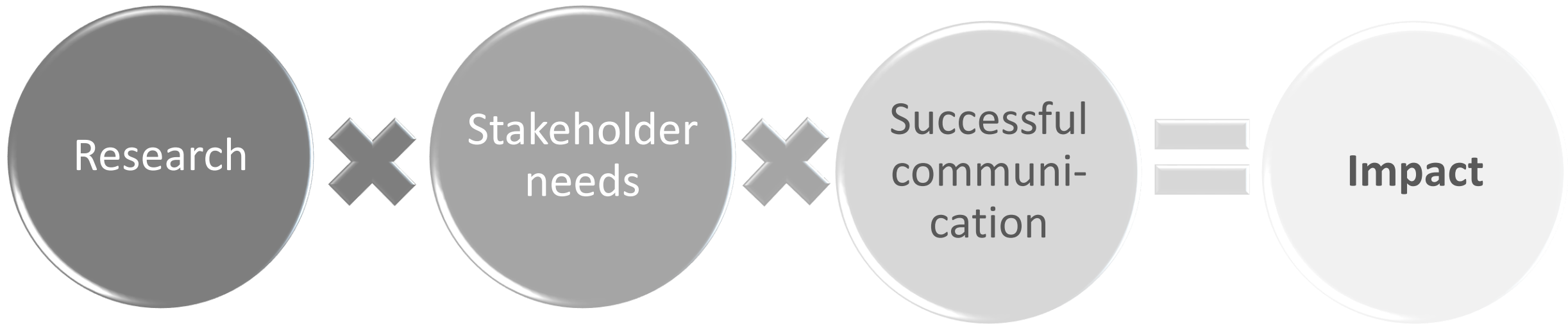
Communication measures

Which communication vehicles can we use?

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Communication measures

Examples of interpersonal , two-way communication

- Dialogues, face-to-face conversation
- Group discussions
- Conferences
- Brokerage events
- School visits
- Tours
- Round tables
- Exhibitions
- Meetings
- Workshops
- Open days
- Demonstrations and prototypes
- Telephone calls
- E-mail information service (question and answer)
- Internet debate

Smaller audience, lower costs, more effort (more effect?!)

Interactive, good for acquiring input

Flexible (easy to change tone, strategy and content)

Examples of mass media, one-way communication

- Newspapers and magazines
- Press releases
- Newsletters
- Manuals
- Brochures, booklets, flyers
- Letters
- Radio
- Television
- Video
- Posters
- Stickers
- Banners
- Billboards
- Website
- Policy briefs

Potentially large audience
Uses the credibility of the mass media

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Communication measures
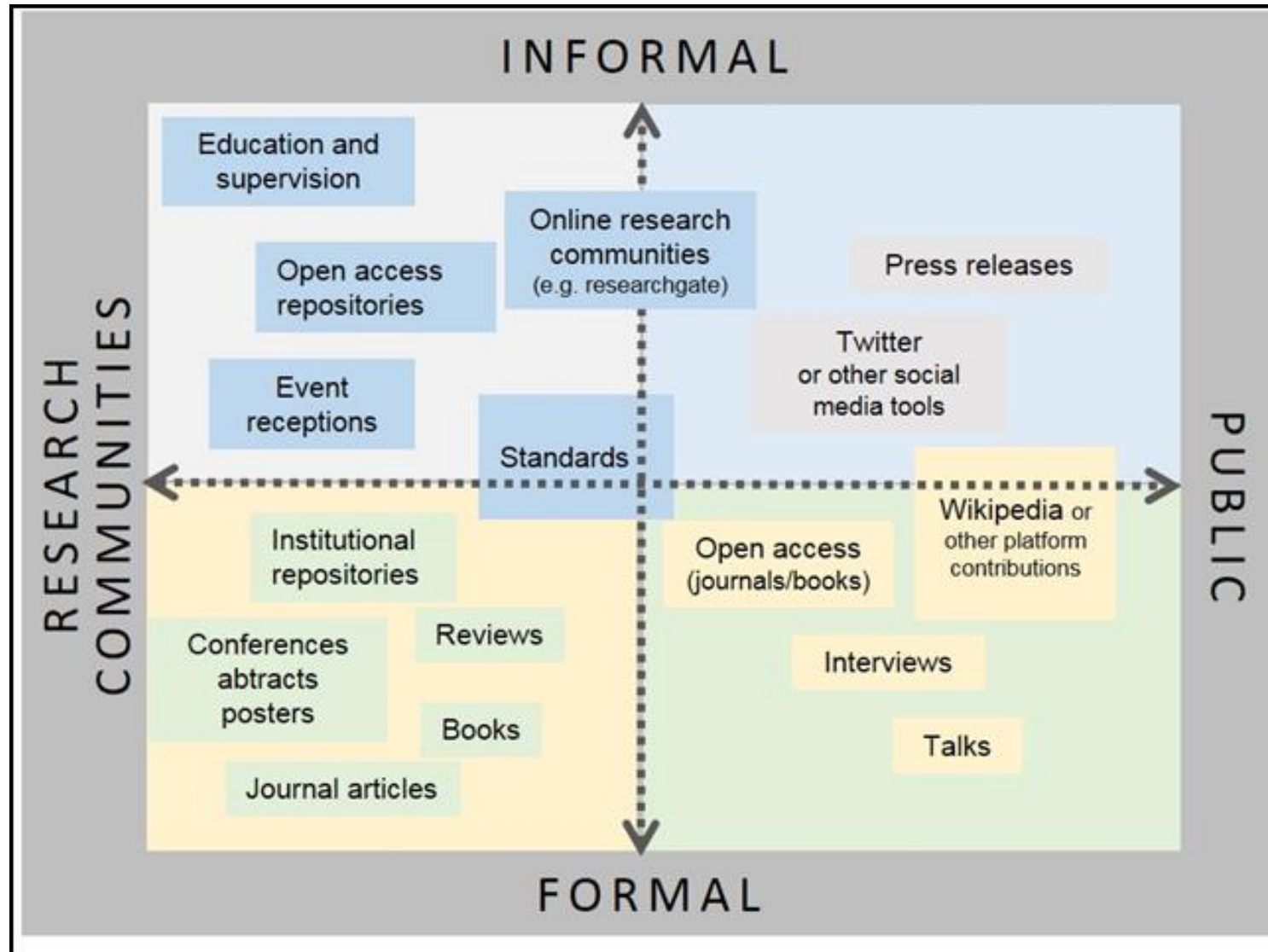
HOW TO COMMUNICATE YOUR PROJECT

Think, Plan, Act strategically
· What do you want to achieve?
· Communicate from day one

Be creative
· Vamp up the visual, reduce the writing
· Use social media

You can't reach everyone
· Define your target audience
· Use consortium resources, expertise and ideas

Get into the media mindset
· Identify relevant media people
· Understand media language and needs

Think Issue, not project
· What issue is the project addressing?
· Link communication to hot topics in society

Think global, act local
· Local and regional media are effective targets
· Use the project's local connections

Make it relevant to daily life
· Show the impact on society
· Avoid technical language and jargon

Build your brand
· Become a trusted source and voice
· Contribute where and when you can

Contact

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