Artem Artyukhov

Open environment and open practices

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FOREWORD

Dear readers!

You are holding an experimental book. While teaching courses on "Open Scientific Practices," I noticed something striking: students weren't responding to the traditional "lecture-and-note-taking" approach. Instead, they came alive when engaging with visual materials – often popular, accessible content that deliberately broke away from conventional pedagogical formats in style and substance.

"Why not apply this approach to writing a book?" The thought emerged during one particularly engaged class session. At first, I dismissed it entirely ("Books need comprehensive theoretical foundations, detailed principles, everything thoroughly explained with extensive text"), but the idea persisted, eventually breaking through my academic reservations. And here you are, reading the result of that breakthrough.

Experimentation isn't typically encouraged when writing textbooks or academic manuals – there are established conventions, both written and unwritten. But this isn't a traditional textbook. It's an illustrated workbook designed for your active participation, where experimentation isn't just appropriate but essential (if student feedback from my courses is any indication).

I already have experience preparing similar workbooks (for example, "Research integrity: manual-notepad for freshmen"), so I am becoming more and more confident in my approach.

I invite you to explore and engage with the materials in these pages. What makes this book unique? You, the reader, become its co-author by recording your thoughts about the illustrations and concepts in the spaces provided. No two copies will end up identical, and that's precisely the point. Each person should experience these chapters in their own way, with their own emotional responses and insights. We build a culture of open scientific practices through personal experience and individual understanding. Think of this book as a blank map that you will color according to your journey.

I hope you find this workbook easy to use and look forward to receiving your feedback, recommendations, and constructive criticism.

Sincerely,
Author

INTRODUCTION: MYTHS AND REALITY OF OPEN SCIENCE

In 2020, as the world grappled with an unprecedented pandemic, something extraordinary happened in the scientific community. Within weeks of identifying SARS-CoV-2, researchers had shared its complete genetic sequence openly online. Data flowed freely across borders and institutions. Preprint servers buzzed with rapid-fire research updates. Traditional peer review timelines compressed from months to days. The result? Vaccines developed in record time, treatments identified faster than ever, and a global scientific response that saved millions of lives.

It was open science in action and offered a glimpse of what becomes possible when we tear down the barriers that have long constrained human knowledge.

For centuries, scientific progress has been hampered by artificial scarcities. Research is locked behind expensive paywalls. Data is hoarded in institutional silos. Failed experiments are buried in filing cabinets. Collaboration is stifled by competition for grants and publications. These barriers didn't emerge by design – they're relics of an era when information was genuinely scarce, when sharing knowledge required expensive printing presses and physical distribution networks.

But we no longer live in that world.

Today, we possess technologies that make knowledge infinitely reproducible and globally accessible at near-zero cost. The internet has created unprecedented opportunities for collaboration, data sharing, and collective problem-solving. Yet much of our scientific infrastructure remains anchored to the scarcity-based models of the past. We're trying to solve 21st-century challenges with 19th-century information systems.

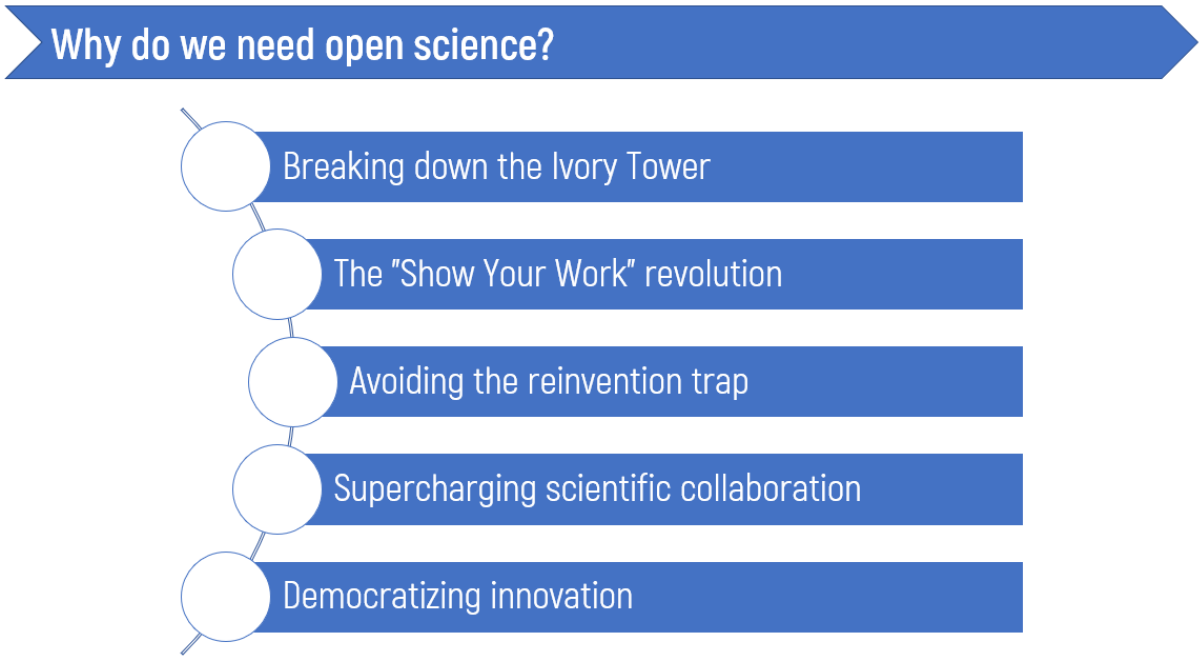
Open science represents a fundamental reimagining of creating, sharing, and building upon human knowledge. It's not simply about making research papers freely available online – though that's part of it. It's about embracing radical transparency in conducting research, fostering unprecedented collaboration across disciplines and continents, and recognizing that our most significant challenges require collective intelligence.

The stakes could not be higher. Climate change, pandemic preparedness, sustainable energy, food security, and artificial intelligence governance – these challenges transcend national boundaries and disciplinary silos. They demand rapid knowledge sharing, iterative problem-solving, and the ability to build quickly on each other's work. They require, in short, the full potential of human scientific collaboration unleashed.

In this book, the author has attempted to highlight the main aspects of open education and science environments through illustrations and brief comments. Realizing that it would be challenging to cover all the material on open science in this way, the author did not set such a goal. An academic guide on this topic already exists: "Open Scientific Practices", which

was created as part of the project "Open Practices, Transparency and Integrity for Modern Academia" (OPTIMA).

So why create a book with pictures that do not describe everything in exhaustive detail? The answer to this question is simple. Readers should have a "thesis" about open science, which they can refer to at any time for a detailed study of the necessary elements. These "theses" are easily understood thanks to the provided illustrative material and brief explanations. If readers want to explore a particular topic in more depth, they can always refer to the list of useful links. This book can also serve as a lecture note for the reader, since it is structured so that a part of the page is allocated for notes next to each illustration. The first thoughts on this outline can be introduced in the introduction, answering the question "Why do we need open science?"



For notes:

Do you want a real-world case of how open science saves human lives?

Here you are.

OpenStreetMap (OSM) demonstrates how open science principles save lives during emergencies. Unlike proprietary mapping services, OSM allows anyone to freely contribute and access detailed geographic data.

During the 2010 Haiti earthquake, traditional maps were outdated and inadequate for rescue operations. Within days, thousands of volunteers worldwide used satellite imagery to create detailed maps of Haiti through OSM, marking roads, buildings, hospitals, and refugee camps. These crowd-sourced maps became the primary navigation tool for rescue teams, aid organizations, and the UN.

The same pattern repeated during Typhoon Haiyan in the Philippines (2013) and countless other disasters. Relief workers could navigate damaged areas, locate survivors, and coordinate aid distribution using maps updated in real-time by global volunteers. Commercial mapping services couldn't match this speed or local detail because they relied on proprietary data and professional cartographers.

What is this book's structure?

Introduction: myths and reality of open science.

Most people think open science is a utopian fantasy where all knowledge flows freely or a dangerous threat to quality research. The reality lies between these extremes - open science is neither magical nor catastrophic, but a practical approach with real benefits and genuine challenges. This chapter dispels common misconceptions, from the myth that openness always means inferior quality to the fear that sharing research gives competitors unfair advantages, while establishing the evidence-based case for why transparency and collaboration strengthen rather than weaken scientific discovery.

Open data: where to find it and how to use it effectively.

Hidden in plain sight across the internet are vast treasure troves of research data - from climate measurements to genetic sequences to economic statistics - waiting to be discovered and used. This chapter is your practical guide to finding these digital goldmines, whether you're a student looking for project data, a journalist investigating a story, or a curious citizen wanting to explore the world through numbers. You'll learn not just where to look, but how to evaluate data quality, combine different datasets, and avoid the common pitfalls that turn promising data into misleading conclusions.

Copyright and copyleft: how to follow the rules of using information.

The digital world has created a confusing maze of legal permissions around using and sharing information, where a single misstep can lead to lawsuits or wasted effort. This chapter demystifies the alphabet soup of licenses - especially Creative Commons -

explaining in plain language what you can and cannot do with different types of content. You'll discover how "copyleft" licenses flip traditional copyright on its head, requiring sharing rather than restricting it, and learn practical strategies for navigating these rules, whether you're creating, sharing, or building upon others' work.

Citizen science: an inexhaustible well of open knowledge.

Forget the stereotype of science as an exclusive club for PhD holders in lab coats - millions of ordinary people are already making genuine scientific discoveries from their living rooms. This chapter reveals the thriving ecosystem of citizen science projects where retirees discover new planets, gamers solve protein puzzles that stump supercomputers, and smartphone users track everything from bird migrations to disease outbreaks. You'll learn how to find projects matching your interests and skills, understand why distributed human intelligence often beats artificial intelligence, and discover how your curiosity can contribute to solving humanity's biggest challenges.

Academic integrity, open science and artificial intelligence: meeting at the crossroads.

Artificial intelligence is revolutionizing research by writing papers, generating data, and even conducting experiments, but this power raises uncomfortable questions about what constitutes honest scholarship. This chapter explores the collision between traditional academic integrity rules and AI capabilities, examining whether AI constitutes cheating versus legitimate assistance. As machine-generated content becomes indistinguishable from human work, open science principles of transparency and reproducibility become crucial tools for maintaining trust in research while harnessing AI's potential responsibly.

Open educational resources: everything better is here and now.

The best educational materials in the world are often free, continuously updated by global communities of experts, and completely customizable for your needs - yet most people still pay hundreds for inferior commercial textbooks. This chapter introduces the revolutionary world of Open Educational Resources, where MIT lectures sit alongside community college tutorials, medical students in Africa access the same materials as Harvard, and where teachers can modify textbooks to perfectly match their curriculum rather than forcing their teaching around rigid commercial content.

Open innovation: synergistic effect of science and business activities.

The most successful innovations increasingly emerge not from secretive corporate labs but from collaborative networks that blur the boundaries between companies, universities, and the public. This chapter examines how businesses are discovering that sharing knowledge often creates more value than hoarding it, from pharmaceutical companies pooling research to fight rare diseases to tech giants open-sourcing breakthrough algorithms. You'll learn why the traditional closed innovation model gives way to ecosystems

where competitors collaborate, customers become co-creators, and the best ideas win regardless of their source.

This is the first version of the book. The author plans to improve this version and release subsequent modifications that will consider the trends in developing the concept of open science.

The sources indicated in the main text were used in preparing the materials. To facilitate working with the material and reading it "in one breath", the author noted references to individual illustrative materials of a popular science nature and deliberately allowed "poor academic quality", without referring to primary sources for better readability. These and other interesting materials for reading are listed at the end of the book in the "Useful Links" section.

If you want to see this book as an online course, you can find it on the Open Environment and Open Practices page on the TU Bergakademie Freiberg digital platform. This book will also serve as the basis for the topic "Open environment and open practices in immersion" in the future author's course "Immersive University for Generations "Z" and "Alpha".

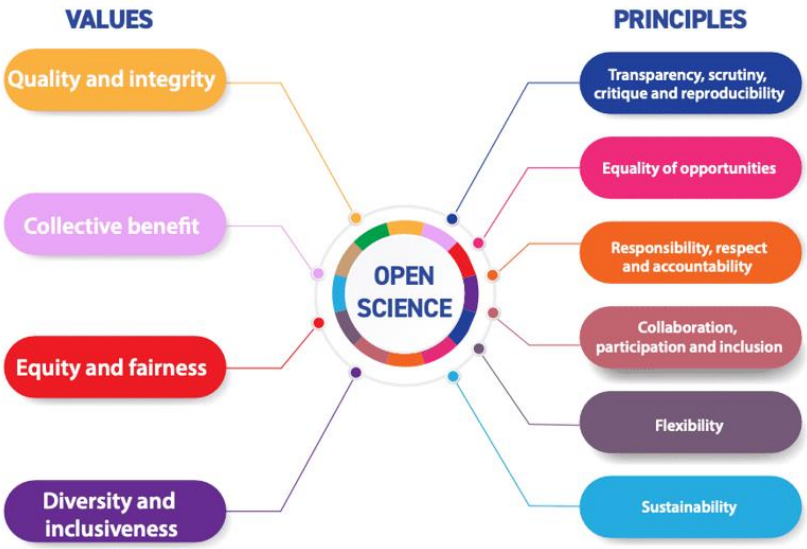
While preparing this book, the author had an assistant who assisted with structuring the materials, searching for information, translation, and other technical tasks. This is generative artificial intelligence. Of course, all the intellectual work was done by the author, but thanks to generative artificial intelligence, the layout of this book was completed much more quickly.

Open science: general keywords

- collaborative
- transparent
- accessible
- reproducible
- inclusive

For notes:

Open science: values and principles



Camkin J., Neto S,. Bhattarai B., Ojha H., Khan S., Sugiura A., Lin J., Nurritasari F.A., Karanja J.M. (2022). Open Science for Accelerating the Sustainable Development Goals: Status and Prospects in Asia and the Pacific. Front. Polit. Sci. 4:878761. https://doi.org/10.3389/fpos.2022.878761

For notes:

Open science: umbrella concept

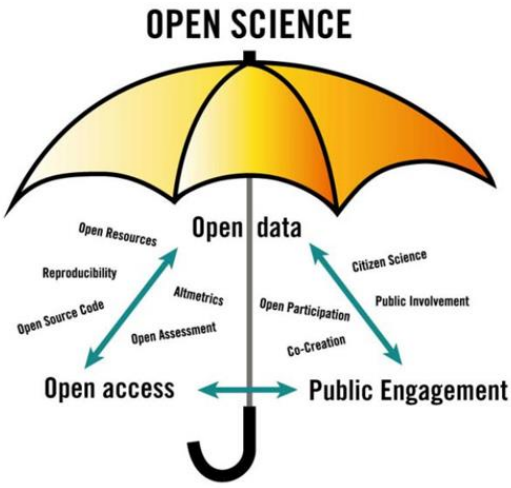
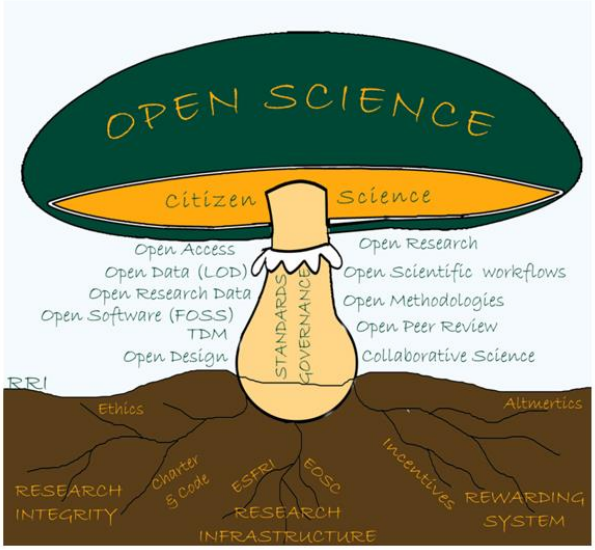


Illustration: Lotta W Tomasson/VA CC BY-NC 2.0

For notes:

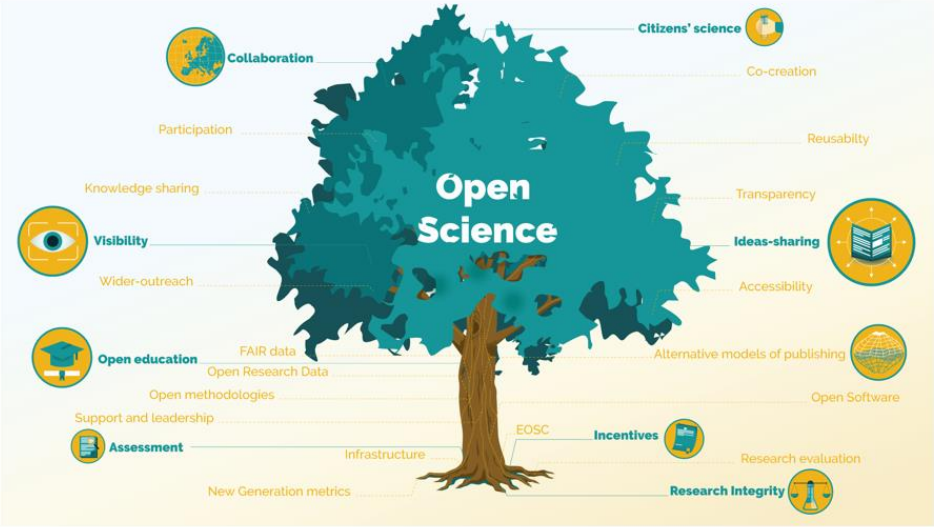
Open science: mushroom concept



https://blogs.lse.ac.uk/impactofsocialsciences/2023/08/14/the-benefits-of-open-science-are-not-inevitable-monitoring-its-development-should-be-value-led/

For notes:

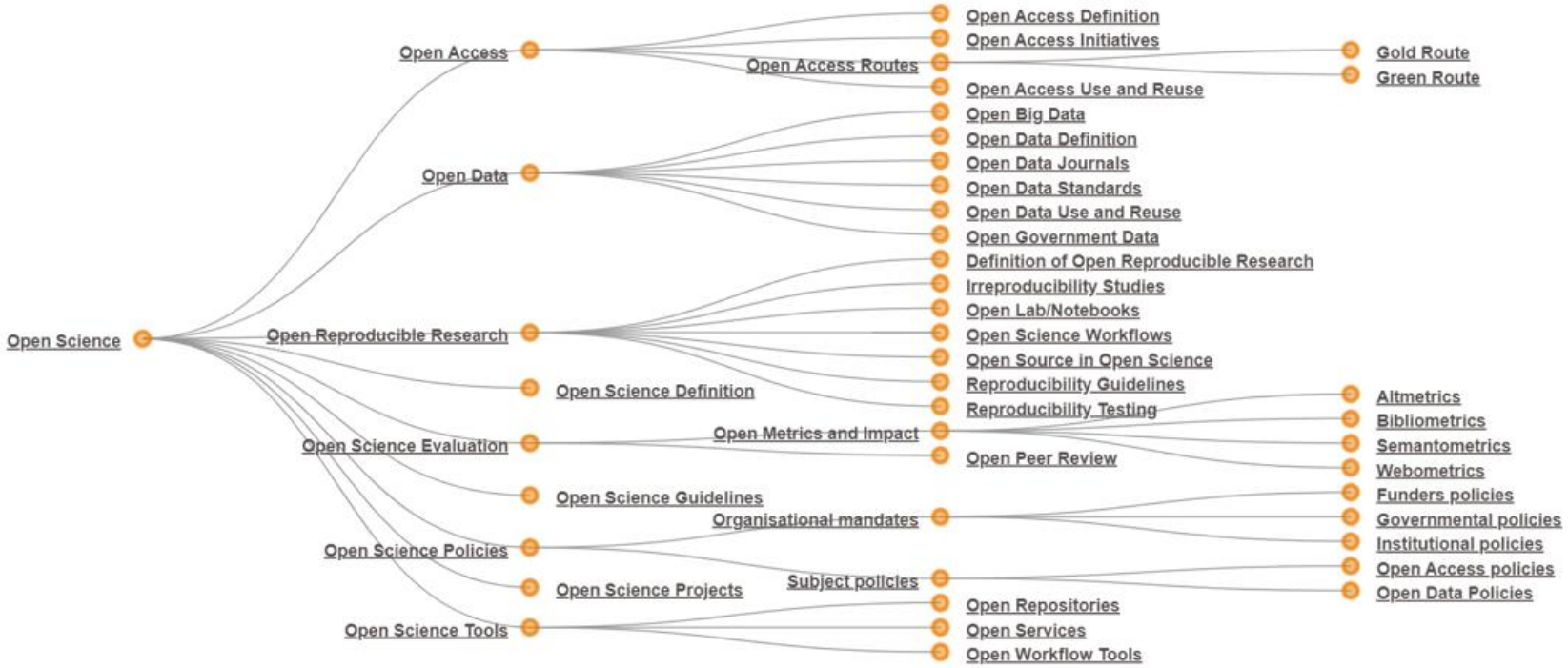
Open science: tree concept



https://yerun.eu/2018/05/yerun-statement-on-open-science/

For notes:

Open science: concept for “advanced” users, FOSTER taxonomy



https://www.fosteropenscience.eu/foster-taxonomy/open-science?page=37

Myths and reality

Myth: "Open science is a panacea for solving all challenges in academia"	→	*Reality:* While open science offers many benefits, it is not a cure-all for the complex challenges facing academia, such as funding disparities, career pressures, and incentive structures. Open science should be viewed as part of broader efforts to improve research culture and practices
Myth: "Open science leads to information overload"	→	*Reality:* While the volume of openly available research may be vast, open science also promotes the use of tools and technologies, such as data repositories, search engines, and metadata standards, to facilitate the discovery and organization of relevant information.
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For notes:

Myths and reality

Myth: "Open science reduces the quality of research"	→	*Reality:* On the contrary, open science can enhance research quality by promoting transparency, reproducibility, and collaboration. Open practices such as pre-registration of studies and open peer review can improve the rigor and reliability of research findings
Myth: "Open science requires significant financial investment"	→	*Reality:* While there may be initial costs associated with adopting open science practices, such as building infrastructure or transitioning to open access publishing models, the long-term benefits, including increased visibility, collaboration opportunities, and societal impact, often outweigh the investment
Myth: "Open science makes it easier for others to steal your ideas"	→	*Reality:* While sharing research openly may expose ideas to a wider audience, it also allows for collaboration, feedback, and recognition of intellectual contributions. Proper attribution and licensing mechanisms, such as Creative Commons licenses, help protect researchers' rights while promoting sharing and reuse

For notes:

Myths and reality

Myth: "Open science is a threat to intellectual property"	*Reality:* Open science encourages sharing and collaboration but doesn't necessarily undermine intellectual property rights. Researchers can still protect their inventions and discoveries through patents and licenses while contributing to open science initiatives
Myth: "Open science only benefits academics; it's not relevant to industry"	*Reality:* Open science can benefit industry by facilitating collaboration, accelerating innovation, and providing access to research findings and resources. Open-source software, for example, is widely used in industry for development and collaboration
Myth: "Open science is too time-consuming and impractical for busy researchers"	*Reality:* While adopting open science practices may require some initial investment of time and effort, tools and platforms are increasingly available to streamline processes such as data sharing, collaboration, and open access publishing. Moreover, many funders and institutions now encourage or require open science practices, which can incentivize adoption

For notes:

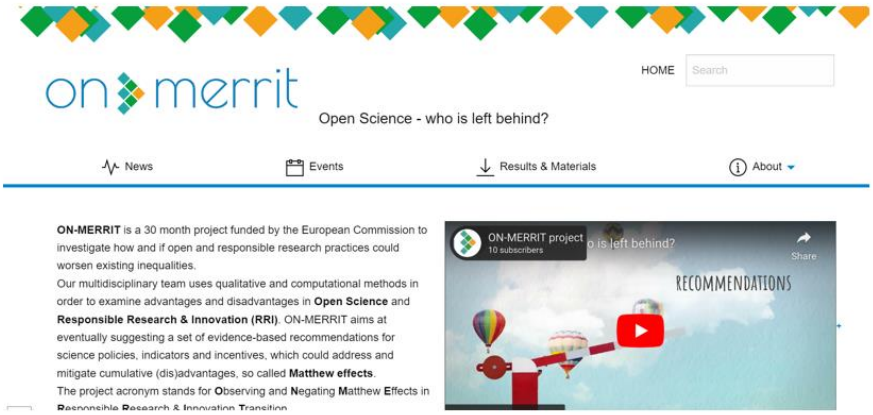
https://lpnu.ua/en/optima

For notes:

https://lpnu.ua/en/open4ua

For notes:

Open science projects and initiatives



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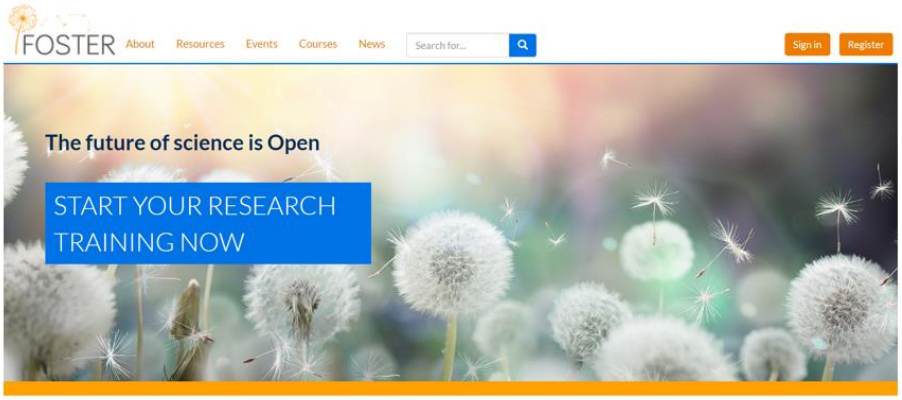
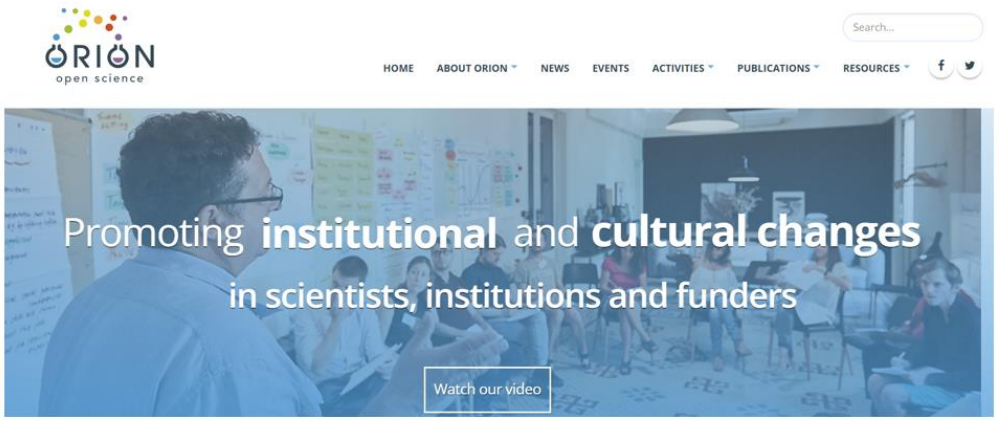
Open science projects and initiatives



https://www.fosteropenscience.eu/

For notes:

Open science projects and initiatives



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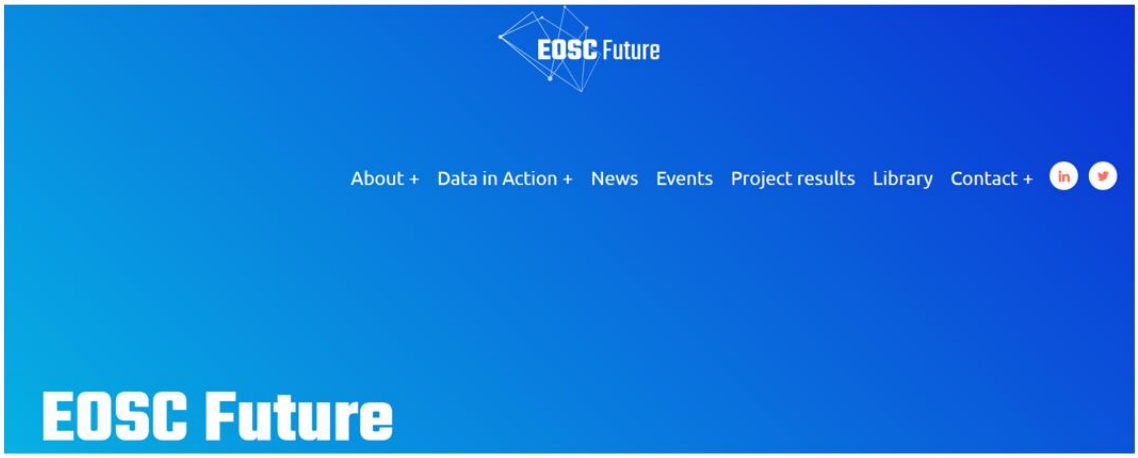

https://eoscfuture.eu/

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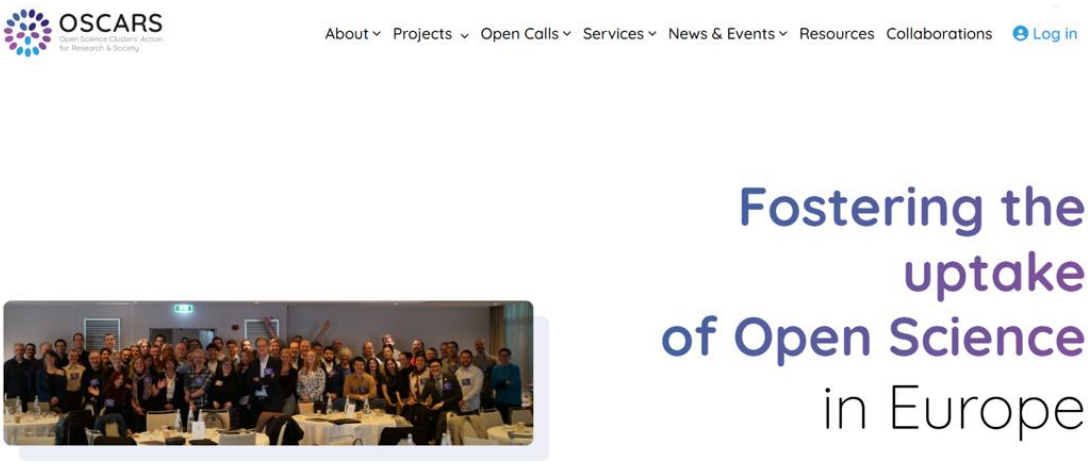
Open science projects and initiatives



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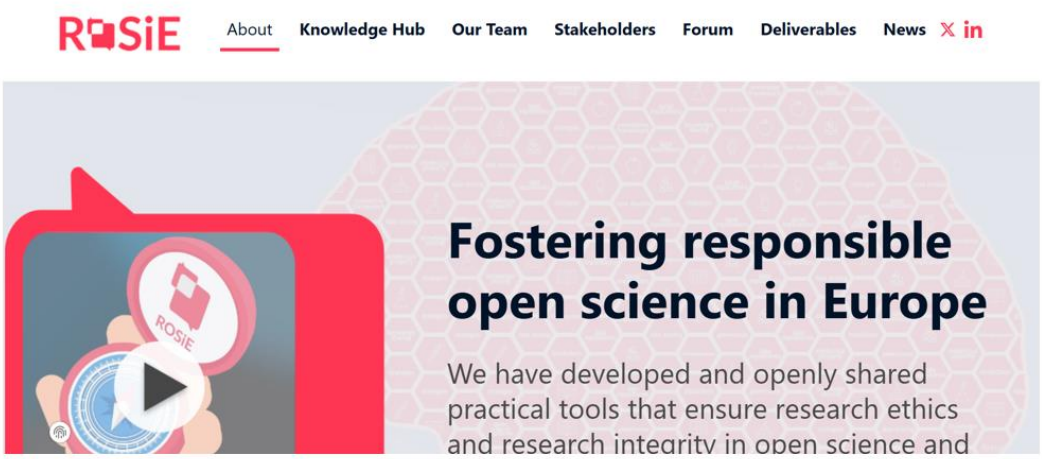
Open science projects and initiatives



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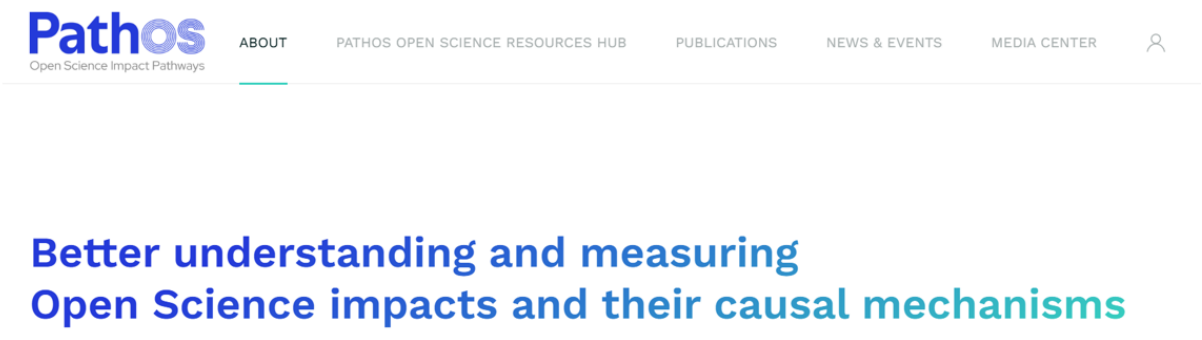

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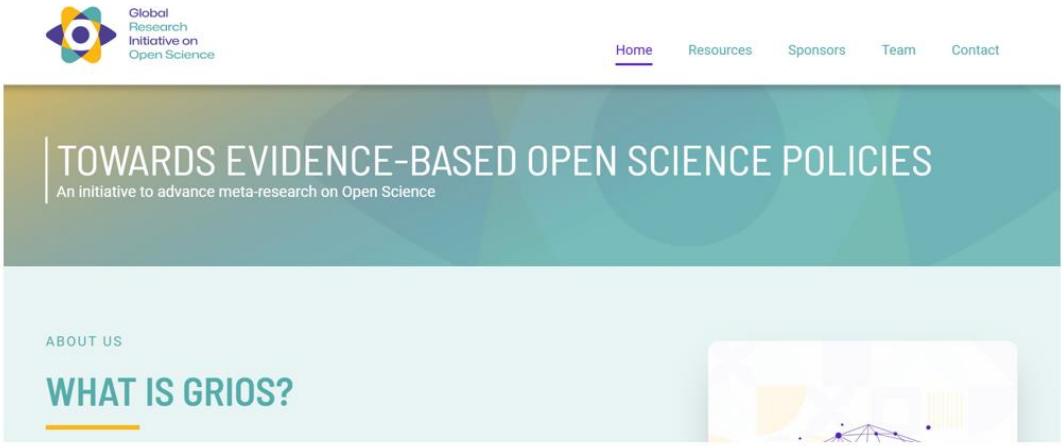
Open science projects and initiatives



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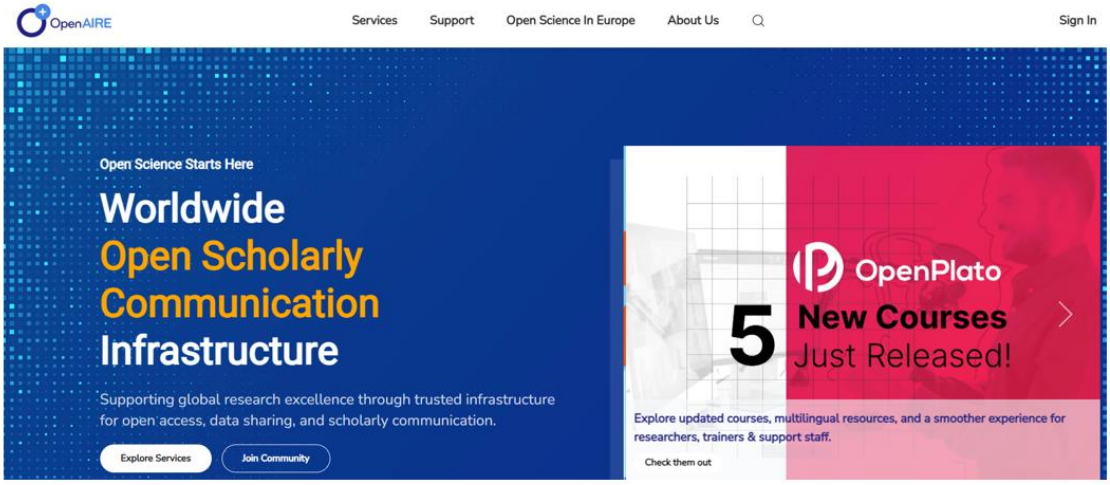
Open science projects and initiatives



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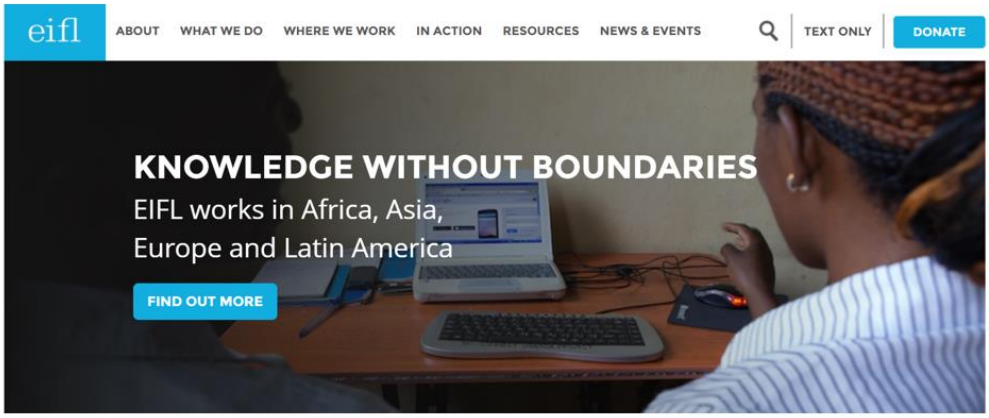


https://www.eifl.net/

For notes:

OPEN DATA:
WHERE TO FIND IT
AND HOW TO USE IT
EFFECTIVELY

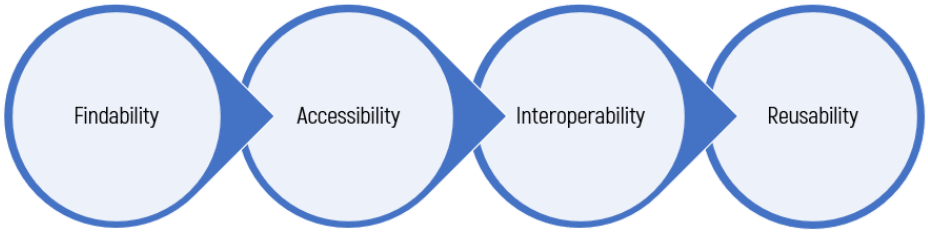
Definition of open data

data that is available for everyone to

- access
- use
- modify
- share

For notes:

FAIR principles



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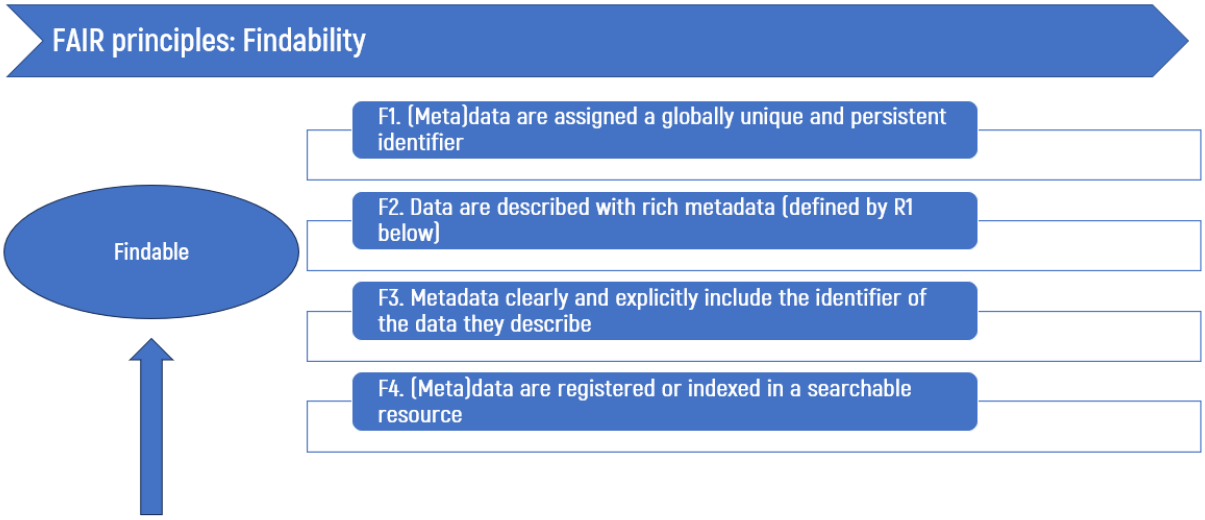
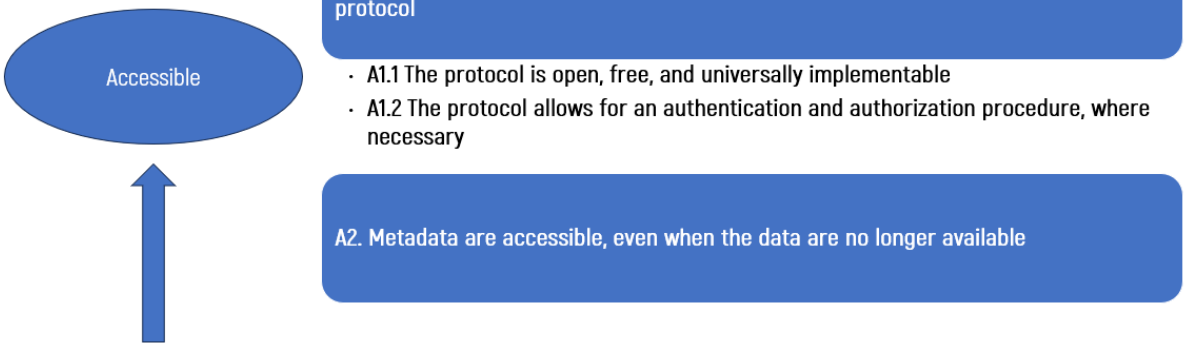


The first step in (re)using data is to find them.
Metadata and data should be easy to find for both humans and computers.

For notes:

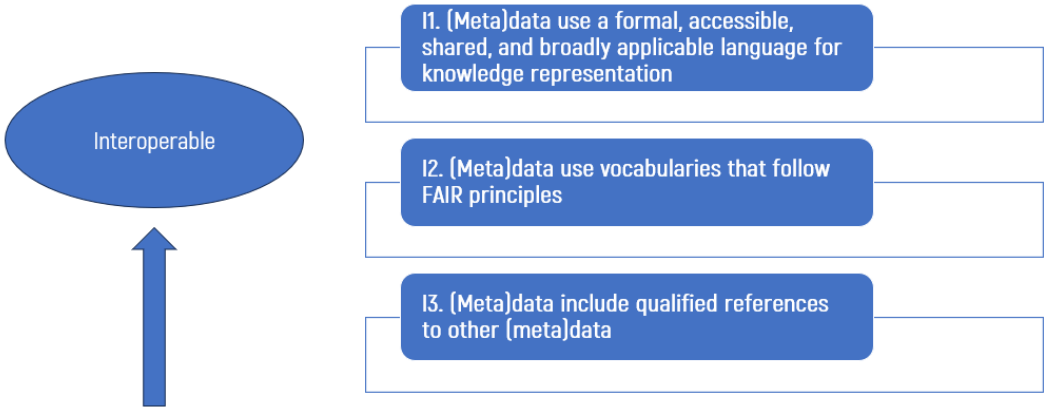
FAIR principles: Accessibility



Once the user finds the required data, she/he/they need to know how they can be accessed, possibly including authentication and authorization.

For notes:

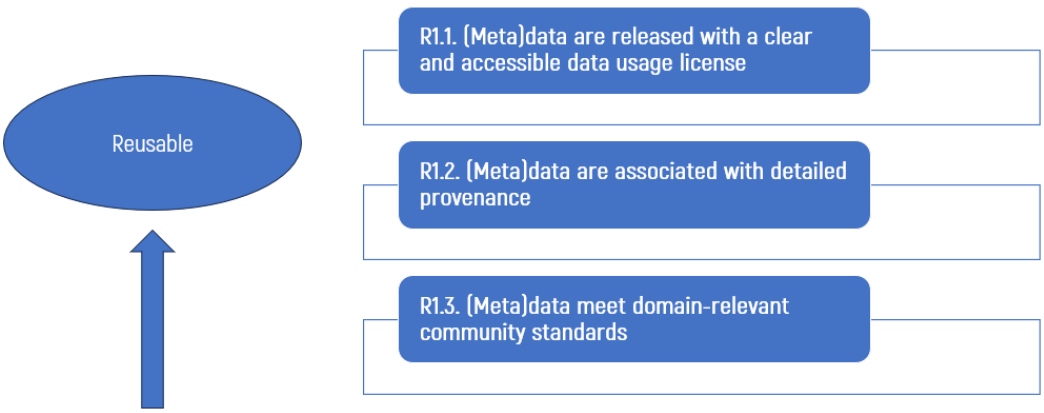
FAIR principles: Interoperability



The data usually need to be integrated with other data. In addition, the data needs to interoperate with applications or workflows for analysis, storage, and processing.

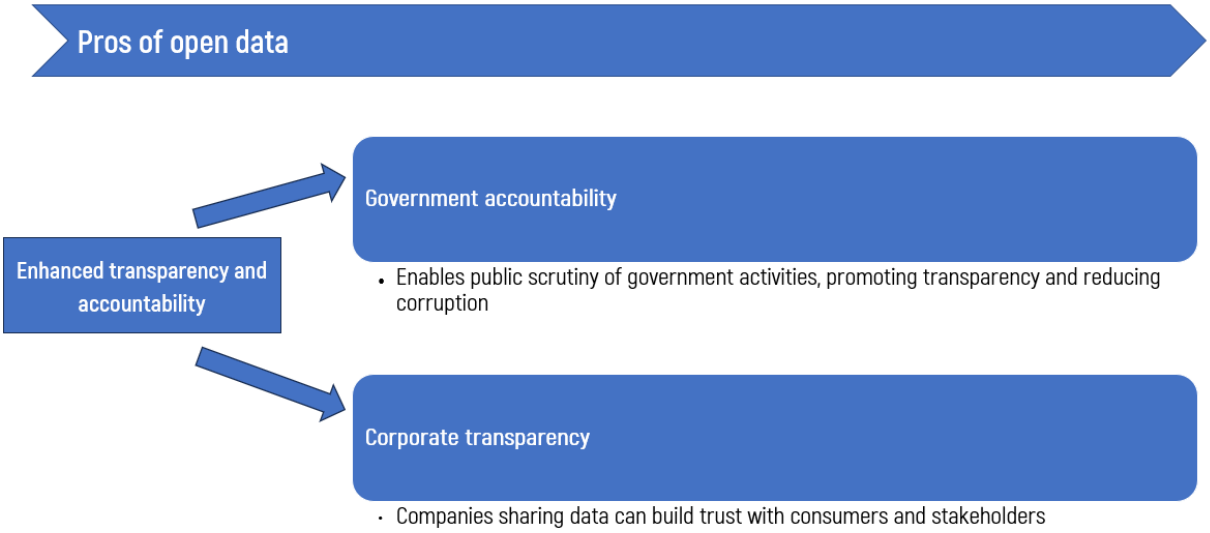
For notes:

FAIR principles: Reusability



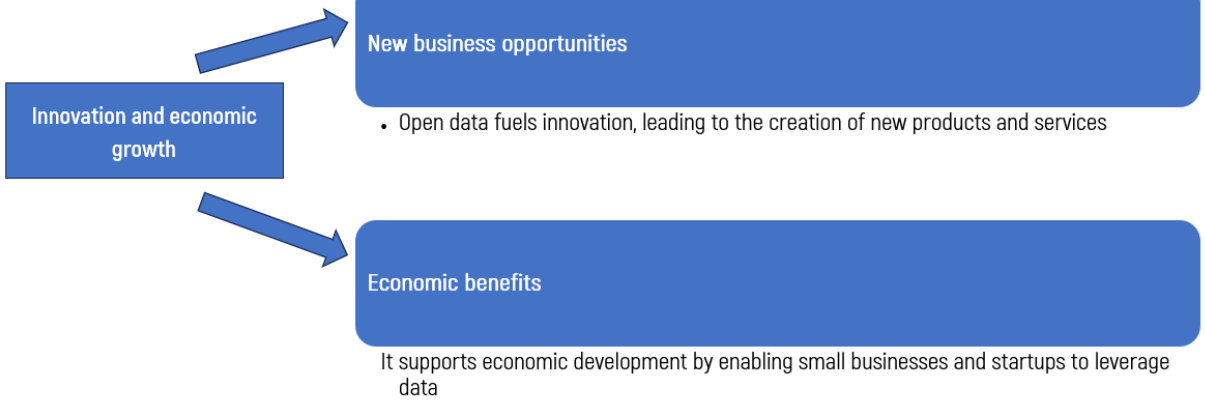
The ultimate goal of FAIR is to optimize the reuse of data. To achieve this, metadata and data should be well-described to be replicated and/or combined in different settings.

For notes:


Pros of open data
Enhanced transparency and accountability
Government accountability
• Enables public scrutiny of government activities, promoting transparency and reducing corruption
Corporate transparency
• Companies sharing data can build trust with consumers and stakeholders

For notes:

Pros of open data



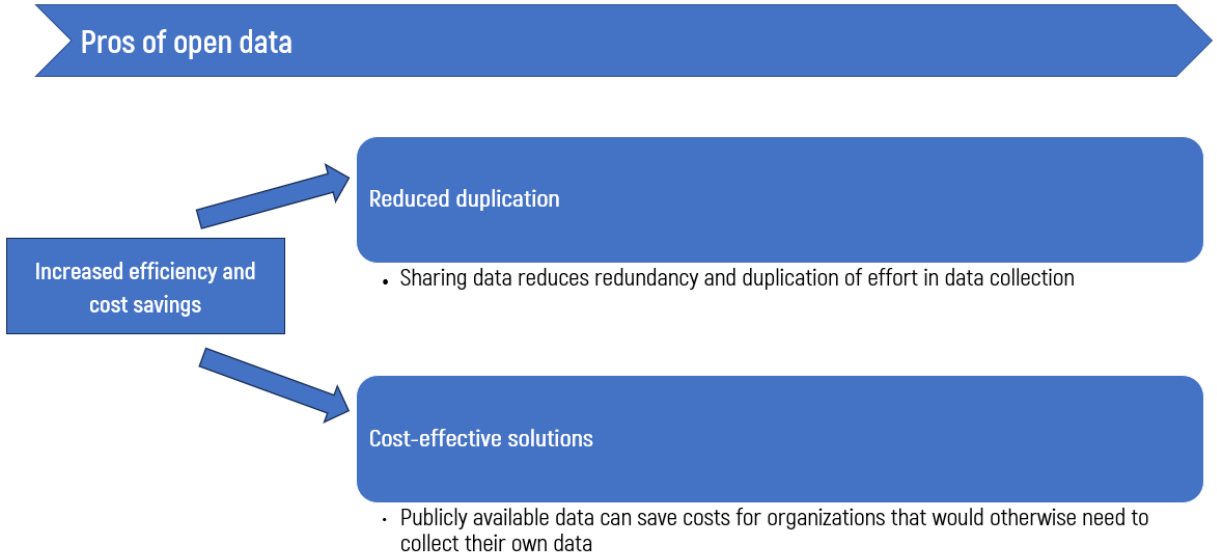
For notes:

Pros of open data

For notes:


Pros of open data
Enhanced collaboration and sharing
Cross-sector collaboration
• Facilitates collaboration between different sectors, including academia, industry, and government.
Global sharing
• Enables global data sharing, promoting international research and development efforts.

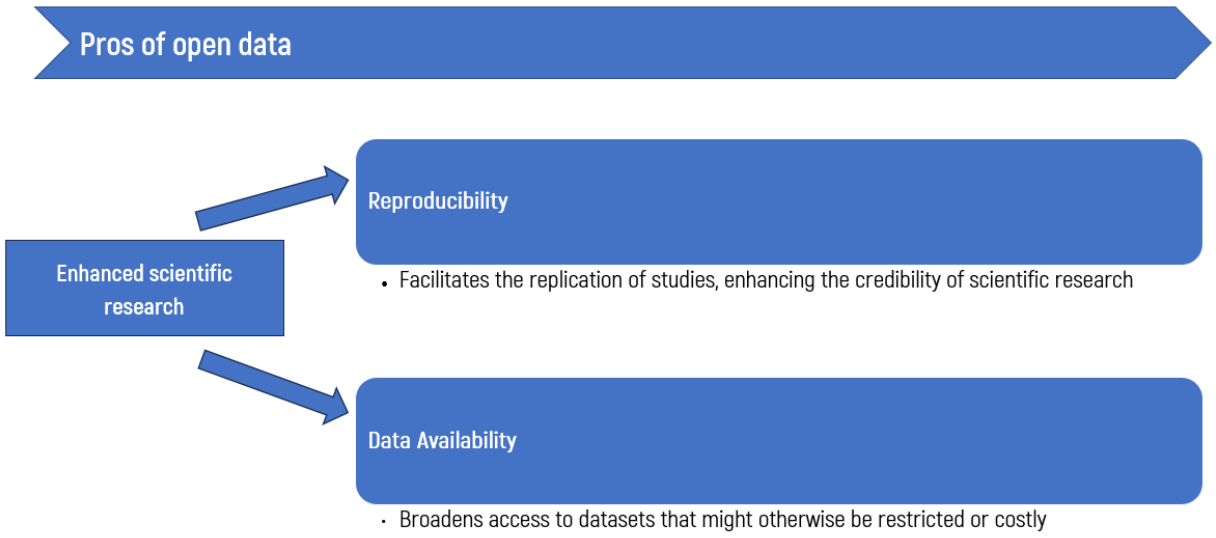
For notes:


Pros of open data
Increased efficiency and cost savings
Reduced duplication
• Sharing data reduces redundancy and duplication of effort in data collection
Cost-effective solutions
• Publicly available data can save costs for organizations that would otherwise need to collect their own data

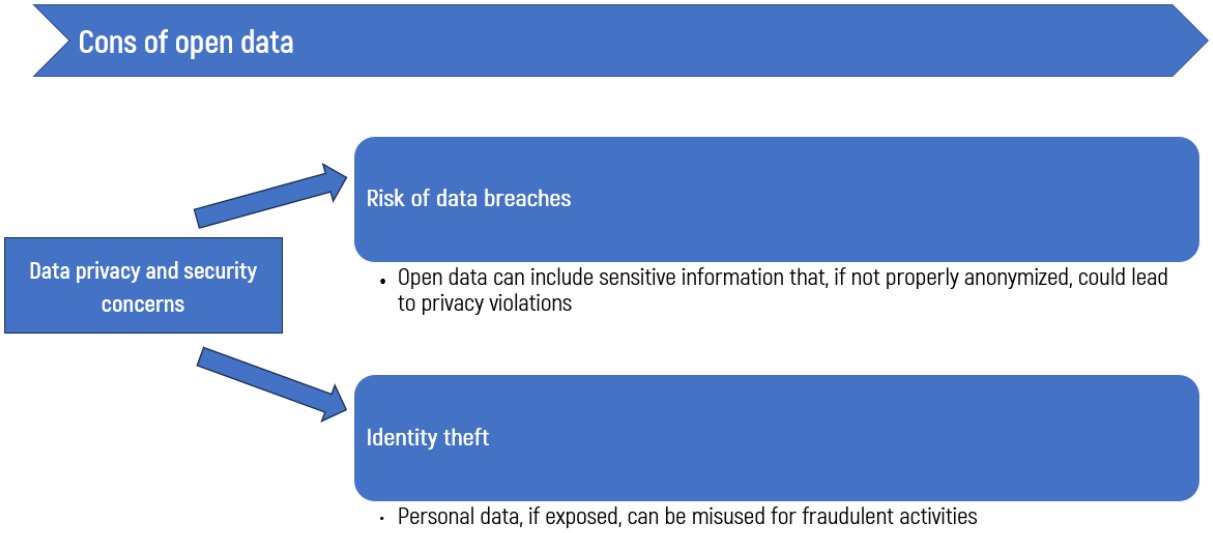
For notes:


Pros of open data
Social benefits
Public awareness
• Educates and informs the public on various issues, from health to environmental concerns
Community empowerment
• Empowers communities to engage in civic activities and contribute to societal improvements

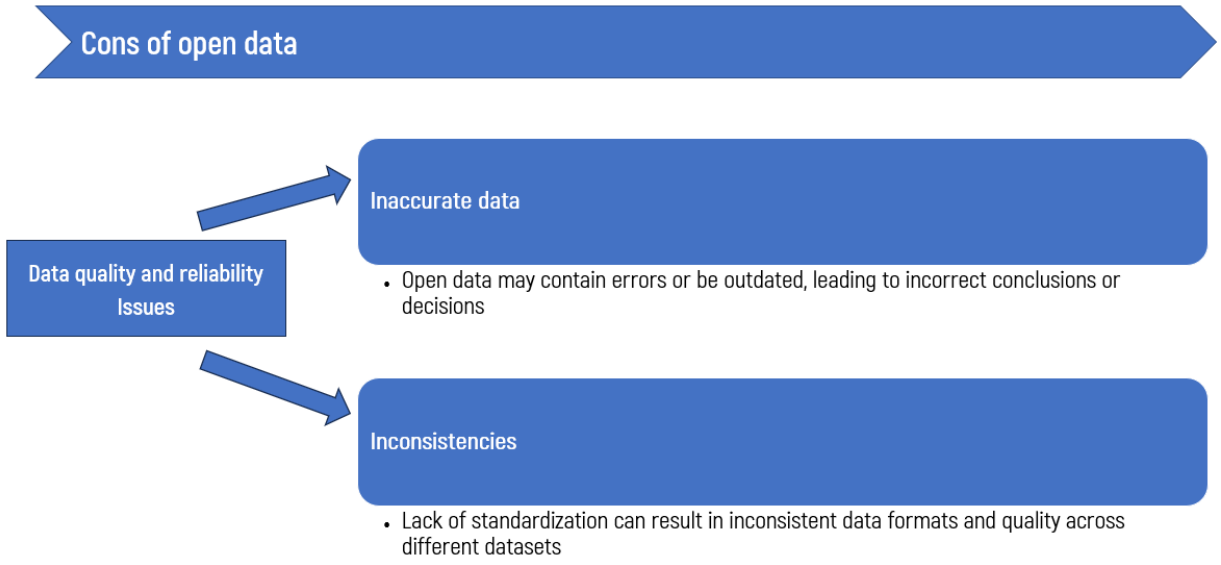
For notes:


Pros of open data
Enhanced scientific research
Reproducibility
• Facilitates the replication of studies, enhancing the credibility of scientific research
Data Availability
• Broadens access to datasets that might otherwise be restricted or costly

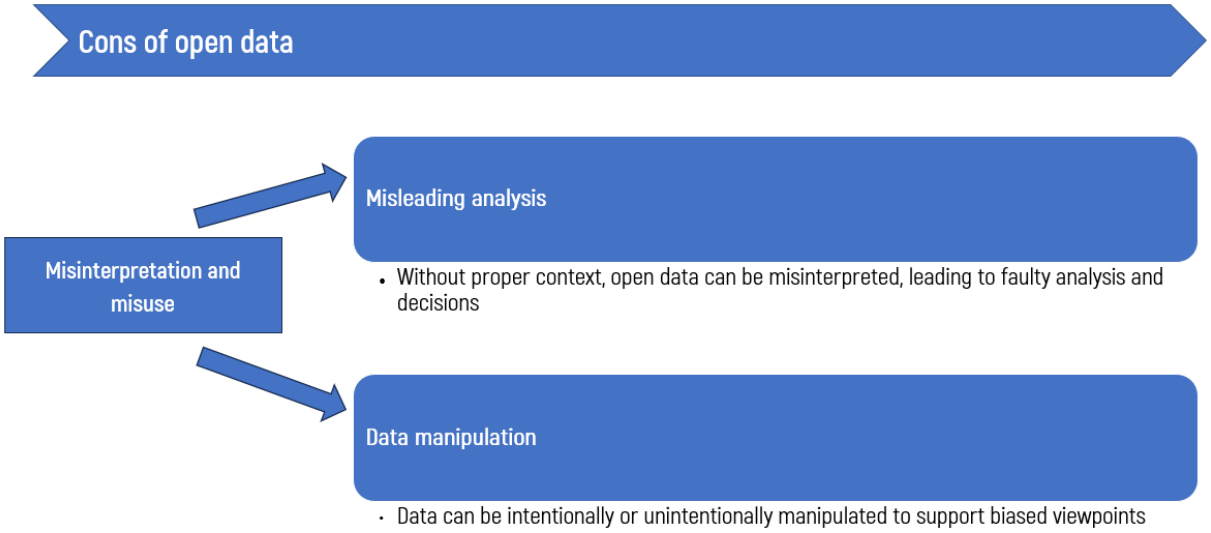
For notes:


Cons of open data
Data privacy and security concerns
Risk of data breaches
Open data can include sensitive information that, if not properly anonymized, could lead to privacy violations
Identity theft
Personal data, if exposed, can be misused for fraudulent activities

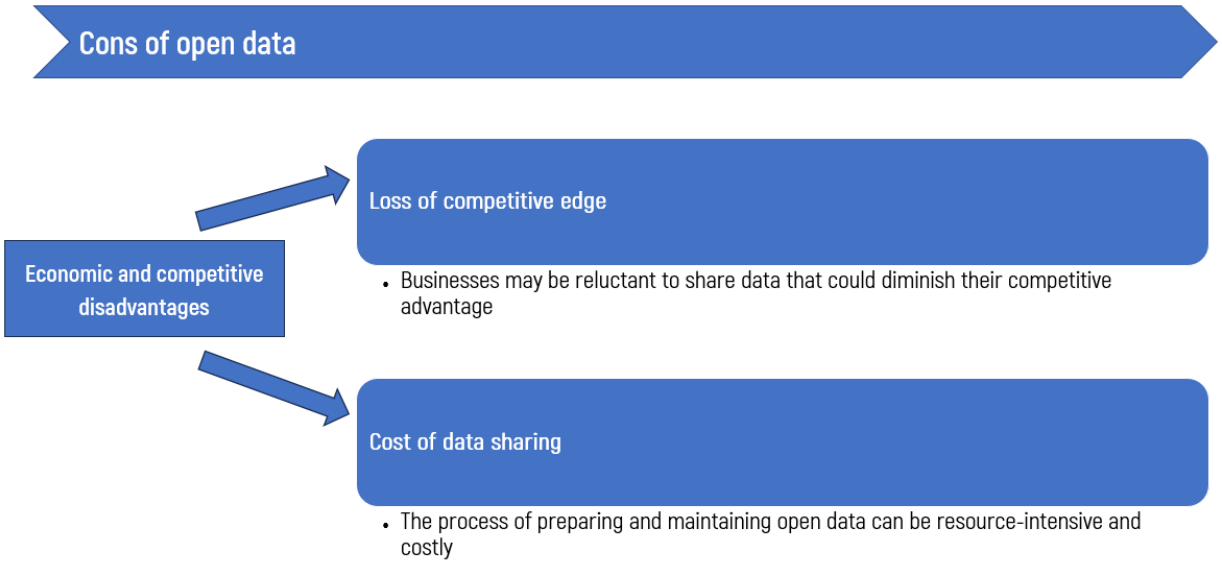
For notes:


Cons of open data
Data quality and reliability Issues
Inaccurate data
Open data may contain errors or be outdated, leading to incorrect conclusions or decisions
Inconsistencies
Lack of standardization can result in inconsistent data formats and quality across different datasets

For notes:

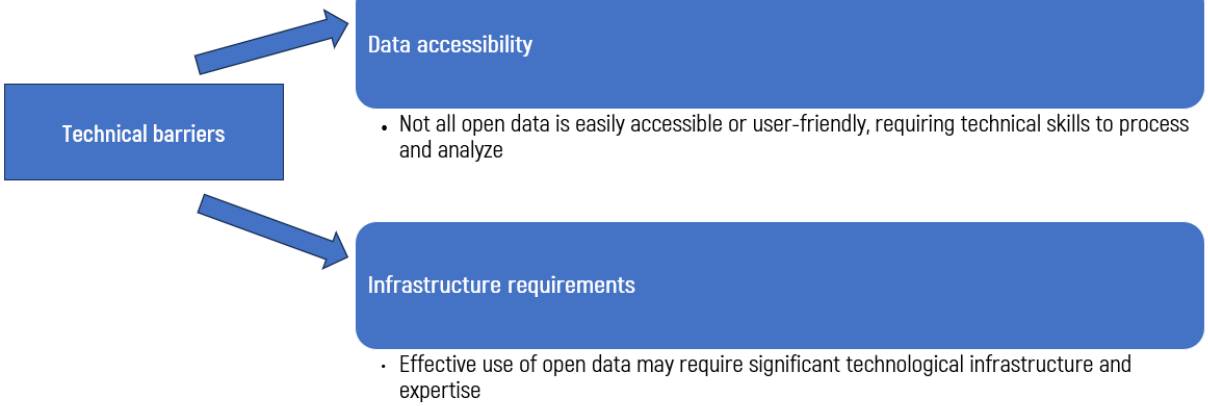

Cons of open data
Misinterpretation and misuse
Misleading analysis
• Without proper context, open data can be misinterpreted, leading to faulty analysis and decisions
Data manipulation
• Data can be intentionally or unintentionally manipulated to support biased viewpoints

For notes:


Cons of open data
Economic and competitive disadvantages
Loss of competitive edge
• Businesses may be reluctant to share data that could diminish their competitive advantage
Cost of data sharing
• The process of preparing and maintaining open data can be resource-intensive and costly

For notes:

Cons of open data



For notes:


Cons of open data
Ethical and legal issues
Intellectual property
Open data can lead to disputes over intellectual property rights and data ownership
Regulatory compliance
Ensuring compliance with various data protection regulations can be challenging

For notes:

Cons of open data

Information overload

Excessive data

- The sheer volume of available open data can be overwhelming, making it difficult to find relevant information

Analysis paralysis

- Too much data can complicate decision-making processes, leading to delays and indecision

For notes:

Cons of open data

Potential for harmful uses

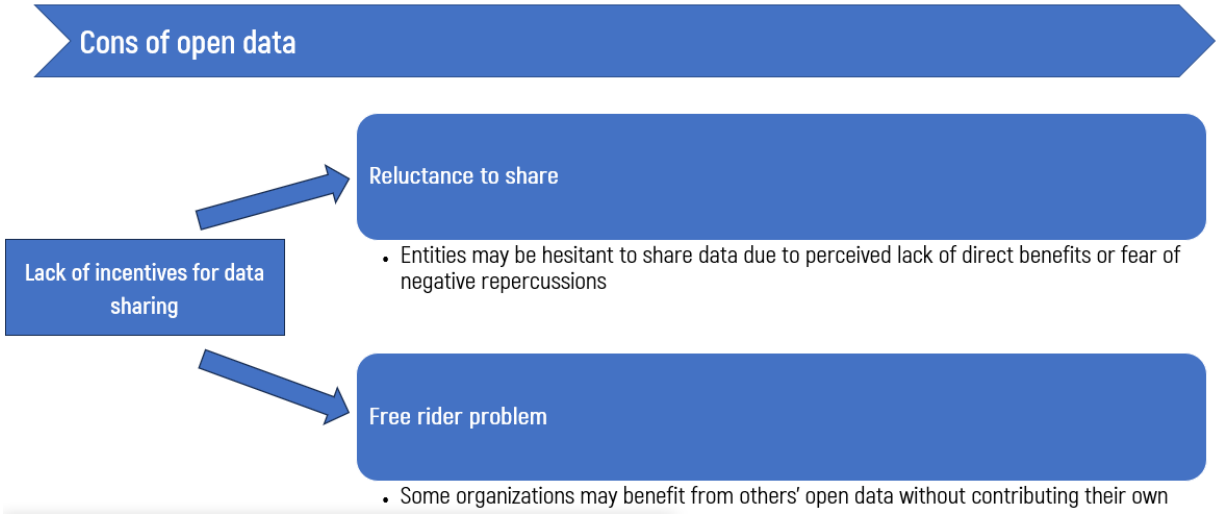
Criminal activities

- Open data can be exploited for malicious purposes, such as cyber-attacks or targeted crimes

Social engineering

- Detailed public data can be used in social engineering schemes to deceive individuals or organizations

For notes:


Cons of open data
Lack of incentives for data sharing
Reluctance to share
• Entities may be hesitant to share data due to perceived lack of direct benefits or fear of negative repercussions
Free rider problem
• Some organizations may benefit from others' open data without contributing their own

For notes:

Where to find open data?

Government portals	International organizations	Academic and research platforms
Search engines for datasets	Academic and research platforms and repositories	Non-governmental and private sector sources
Specialized data repositories	Data marketplaces	Social media APIs

For notes:

How to work with open data?

1. Data cleaning and preparation

- Handle missing values
- Standardize data formats
- Remove duplicates

2. Data analysis

- Use statistical tools (e.g., Python, R)
- Visualization techniques (e.g., charts, graphs)
- Machine learning

3. Data integration

- Combine datasets for comprehensive analysis
- Use APIs for real-time data integration

4. Sharing and collaboration

- Publish findings in open access journals
- Use special platforms for code and data sharing

For notes:

How to use open data effectively?

Understand your objectives

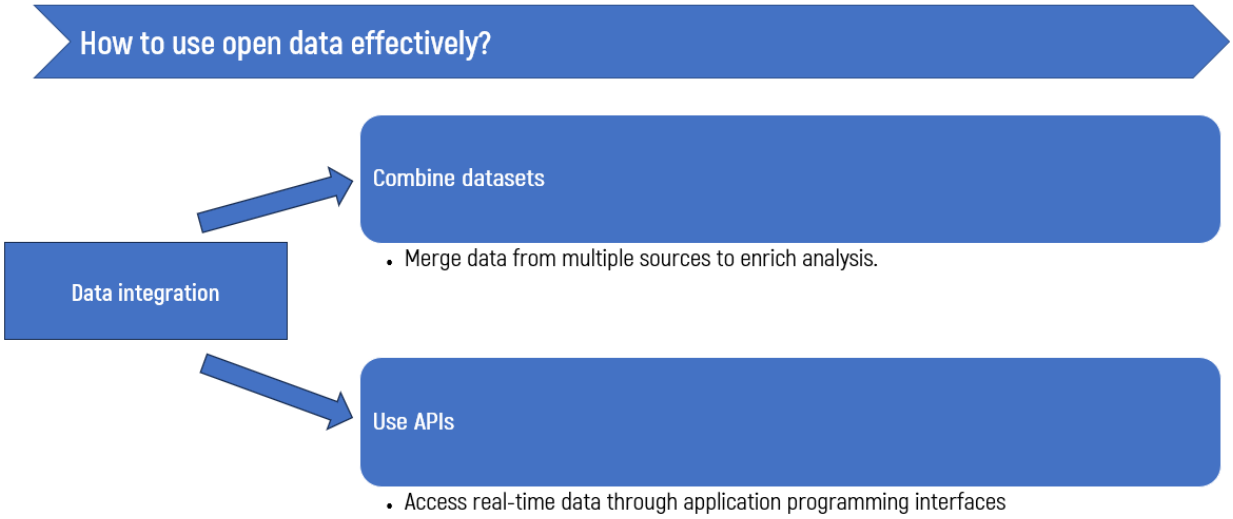
Define clear goals

- Identify what you aim to achieve with the data

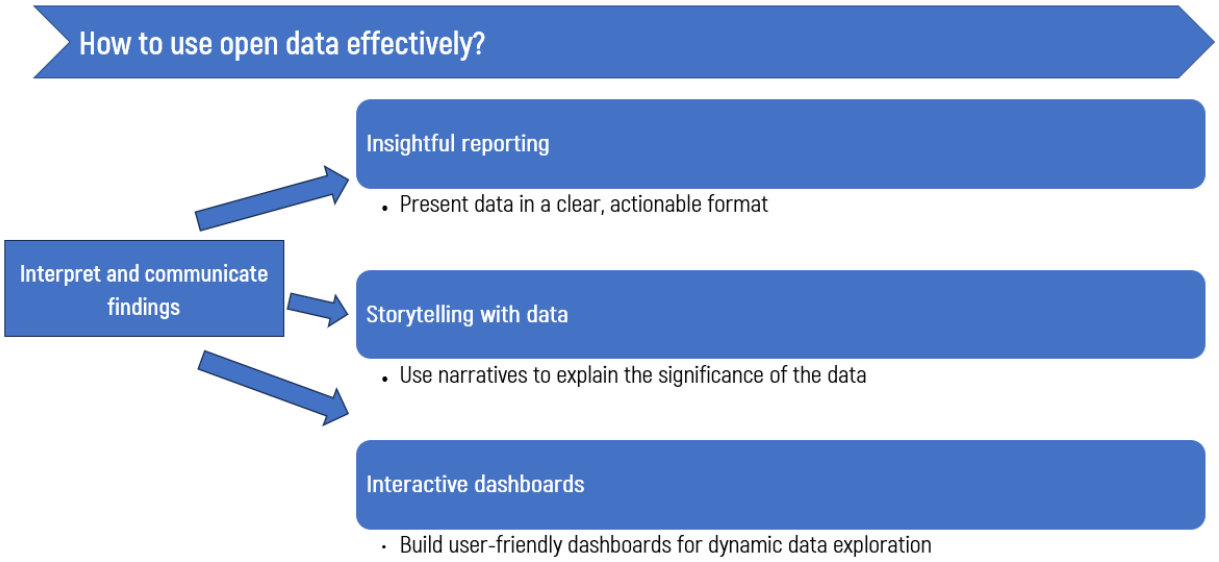
Target audience

- Consider who will use the insights derived from the data

For notes:


How to use open data effectively?
Data integration
Combine datasets
• Merge data from multiple sources to enrich analysis.
Use APIs
• Access real-time data through application programming interfaces

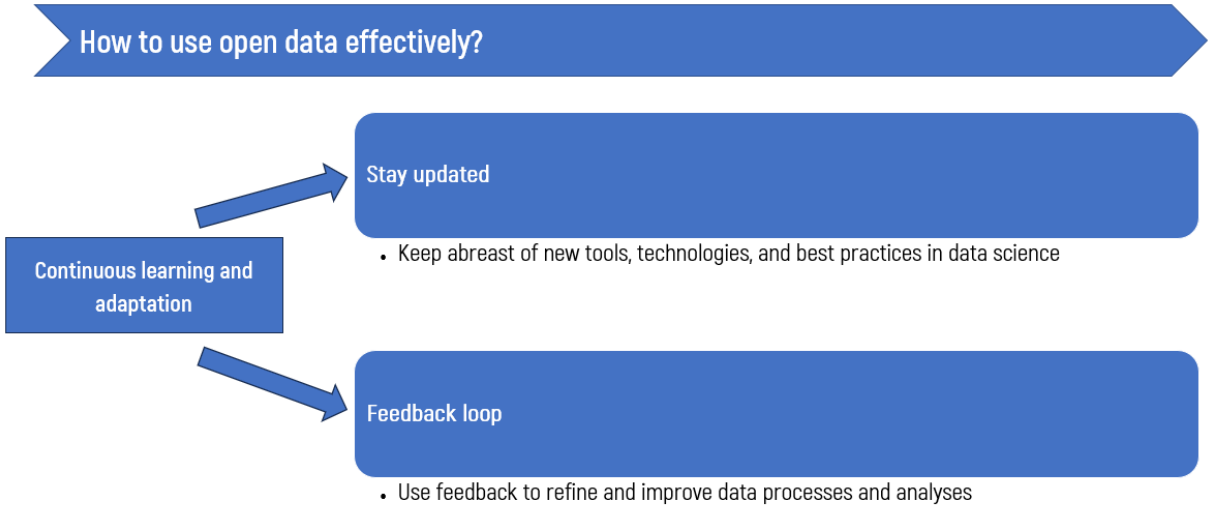
For notes:


How to use open data effectively?
Interpret and communicate findings
Insightful reporting
Present data in a clear, actionable format
Storytelling with data
Use narratives to explain the significance of the data
Interactive dashboards
Build user-friendly dashboards for dynamic data exploration

For notes:

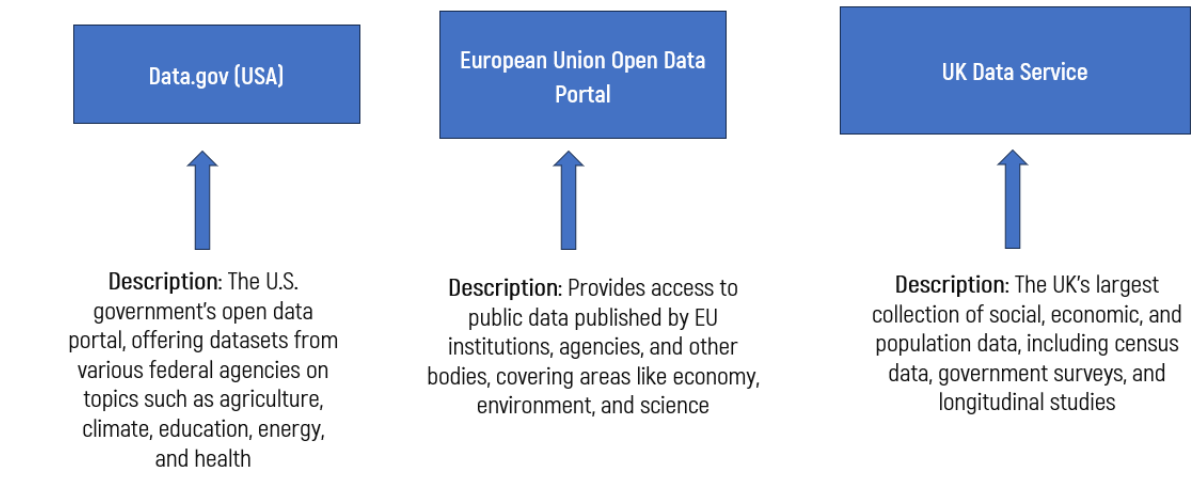

How to use open data effectively?
Ensure data security and privacy
Anonymization
• Remove or mask personal identifiers to protect privacy
Compliance
• Adhere to data protection regulations (e.g., GDPR, HIPAA)

For notes:


How to use open data effectively?
Continuous learning and adaptation
Stay updated
• Keep abreast of new tools, technologies, and best practices in data science
Feedback loop
• Use feedback to refine and improve data processes and analyses

For notes:

List of open data sources: government and public sector data



https://data.gov/
https://data.europa.eu/en
https://ukdataservice.ac.uk/

For notes:

List of open data sources: scientific and research data

NASA Open Data

Description: Access to datasets from NASA's various missions, including climate data, satellite imagery, and research on space and planetary sciences

CERN Open Data Portal

Description: Provides data from the Large Hadron Collider (LHC) experiments, including datasets, software, and documentation for educational and research purposes

National Center for Biotechnology Information (NCBI)

Description: Offers a wide range of biological data, including genomics, proteomics, and biomedical literature

https://data.nasa.gov/
https://opendata.cern.ch/
https://www.ncbi.nlm.nih.gov/

For notes:

List of open data sources: environmental and climate data

NOAA National Centers for Environmental Information (NCEI)

Description: The world's largest archive of environmental data, including climate, weather, and oceanographic data

https://www.ncei.noaa.gov/

Global Biodiversity Information Facility (GBIF)

Description: Provides access to data about all types of life on Earth, shared by a global network of biodiversity information facilities

https://www.gbif.org/

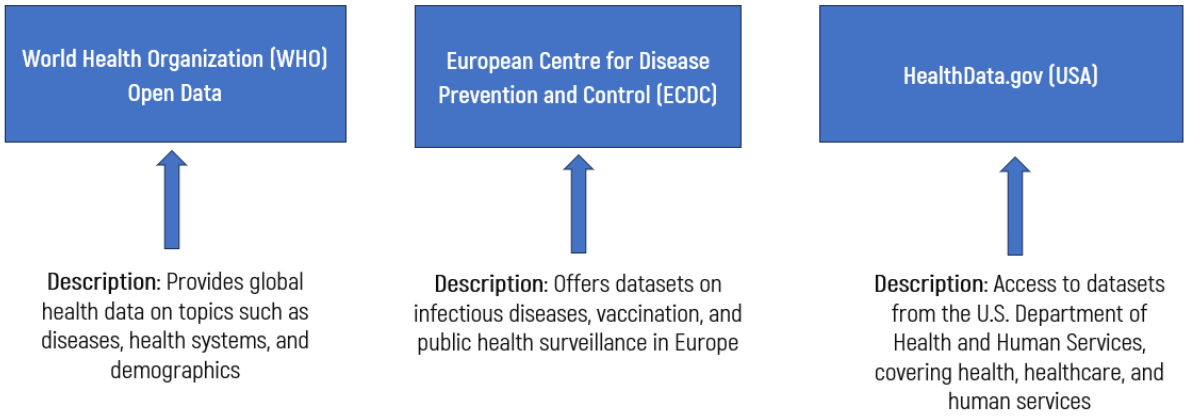
Copernicus Open Access Hub

Description: Offers free access to Sentinel satellite data for monitoring the Earth's environment and climate

https://scihub.copernicus.eu/

For notes:

List of open data sources: health and medical data



https://www.who.int/data
https://www.ecdc.europa.eu/en
https://www.healthdata.gov/

For notes:

List of open data sources: economic and financial data

World Bank Open Data

Description: Offers extensive datasets on global development, including economic indicators, demographics, and social statistics

International Monetary Fund (IMF) Data

Description: Provides access to a wide range of economic and financial data, including the World Economic Outlook and International Financial Statistics

Eurostat

Description: The statistical office of the European Union, offering data on economics, population, and social trends in Europe

https://data.worldbank.org/
https://www.imf.org/en/Data
https://ec.europa.eu/eurostat

For notes:

List of open data sources: social and demographic data

Pew Research Center

Description: Provides datasets on social trends, demographics, public opinion, and media

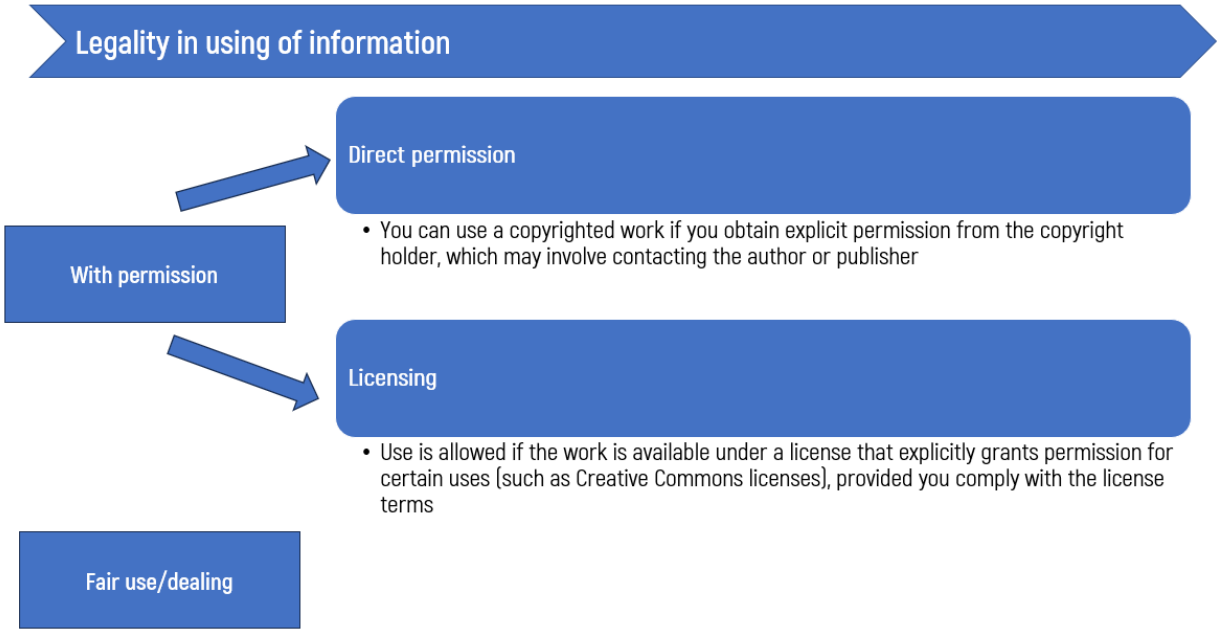
United Nations Data (UNdata)

Description: Offers global data on a wide range of topics, including population, education, trade, and environment

https://www.pewresearch.org/
https://data.un.org/

For notes:

COPYRIGHT AND COPYLEFT: HOW TO FOLLOW THE RULES OF USING INFORMATION


Legality in using of information
With permission
Direct permission
• You can use a copyrighted work if you obtain explicit permission from the copyright holder, which may involve contacting the author or publisher
Licensing
• Use is allowed if the work is available under a license that explicitly grants permission for certain uses (such as Creative Commons licenses), provided you comply with the license terms
Fair use/dealing

For notes:

Fair use/dealing

Personal use

You may make copies of a work for personal, non-commercial use, provided it does not conflict with the normal exploitation of the work or unreasonably prejudice the legitimate interests of the author

Educational and research purposes

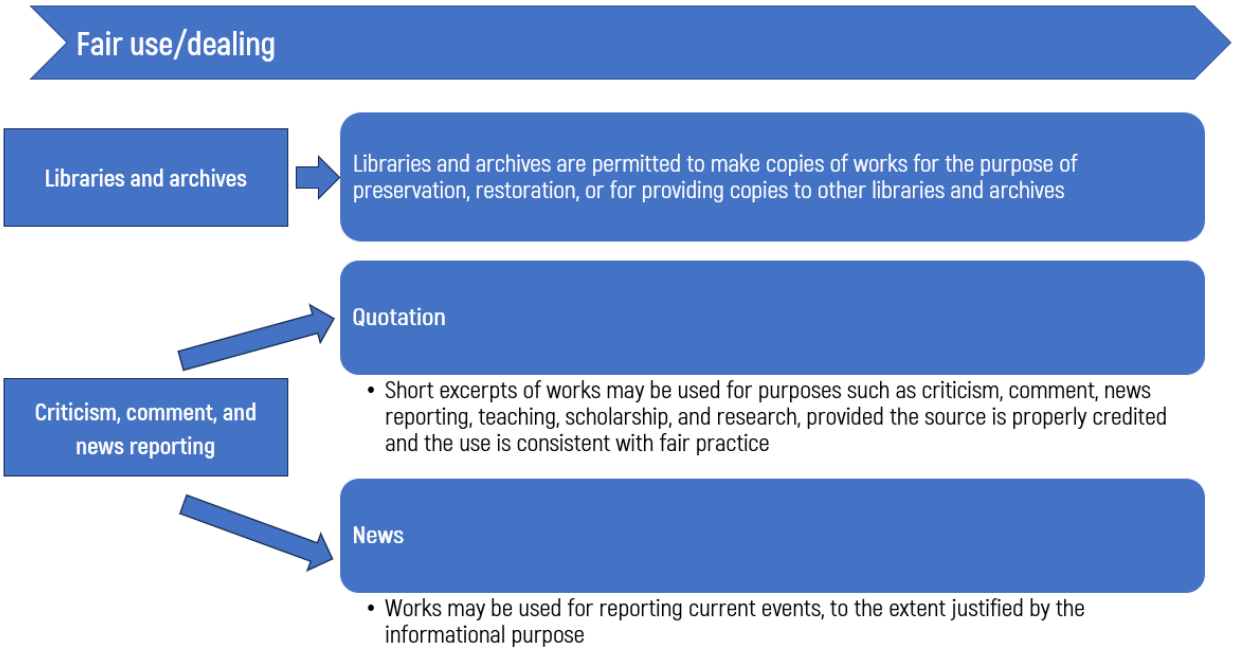
Teaching

- Use of works for educational purposes is allowed, including reproduction by teachers or educational institutions, provided it is for non-commercial purposes and the source is properly credited

Research

- Use of works for research and private study is allowed, provided it is for non-commercial purposes and the source is properly credited

For notes:


Fair use/dealing
Libraries and archives
Libraries and archives are permitted to make copies of works for the purpose of preservation, restoration, or for providing copies to other libraries and archives
Criticism, comment, and news reporting
Quotation
• Short excerpts of works may be used for purposes such as criticism, comment, news reporting, teaching, scholarship, and research, provided the source is properly credited and the use is consistent with fair practice
News
• Works may be used for reporting current events, to the extent justified by the informational purpose

For notes:

Fair use/dealing

Public domain → Works whose copyright has expired or have been explicitly placed in the public domain can be used without permission. In Ukraine, copyright generally lasts for the lifetime of the author plus 70 years

Official documents → The use of official documents (such as legislative, administrative, and legal texts) is not subject to copyright, allowing these documents to be used freely

For notes:

Copyright and CC licenses

this information product (resource) is protected by copyright and its use is possible only with the permission of the copyright holder (with certain exceptions)

a set of permissions that the author wishes to grant to others, as well as a set of conditions that must be met

For notes:

Why do we need a copyright?

Incentive for creation

- Copyright provides creators with exclusive rights to their works, which serves as a strong incentive to produce new creative content

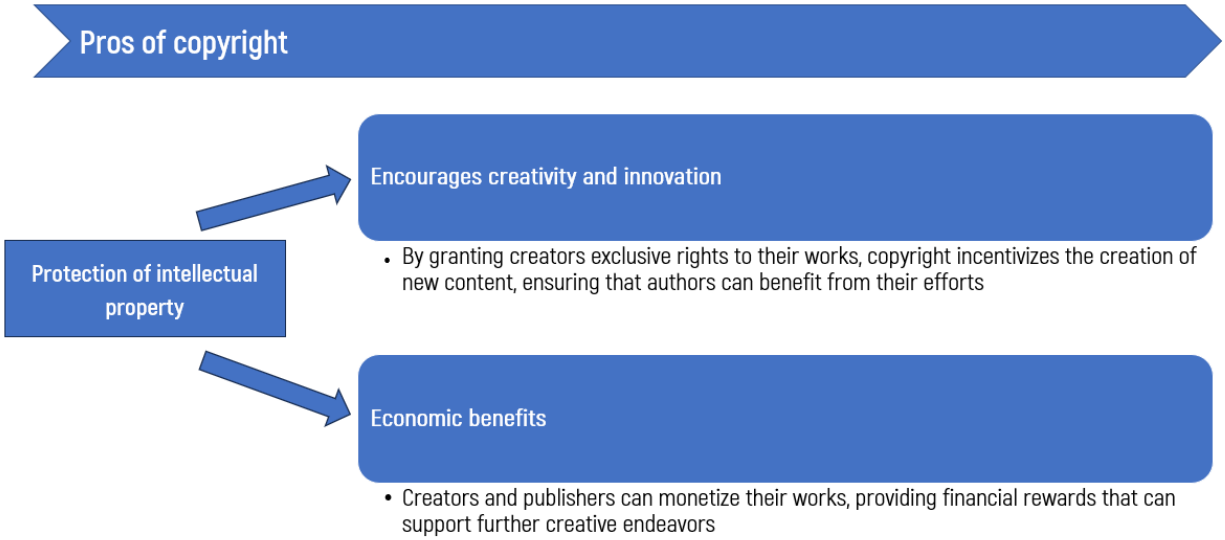
Ownership and control

- Copyright grants creators legal ownership over their original works, allowing them to control how their works are used, distributed, and modified

Revenue generation

- Copyright allows creators to monetize their works through various means, such as sales, licensing, and royalties

For notes:


Pros of copyright
Protection of intellectual property
Encourages creativity and innovation
• By granting creators exclusive rights to their works, copyright incentivizes the creation of new content, ensuring that authors can benefit from their efforts
Economic benefits
• Creators and publishers can monetize their works, providing financial rewards that can support further creative endeavors

For notes:


Pros of copyright
Legal framework
Clear ownership rights
• Copyright provides a clear legal framework for determining ownership and the rights associated with creative works, helping to avoid disputes
Control over use
• Creators have control over how their works are used, allowing them to maintain the integrity of their work and prevent unauthorized exploitation

For notes:

Pros of copyright

Cultural preservation → **Encourages dissemination**

- While copyright grants exclusive rights, it also encourages the dissemination of works through licensing and sales, contributing to cultural preservation and access

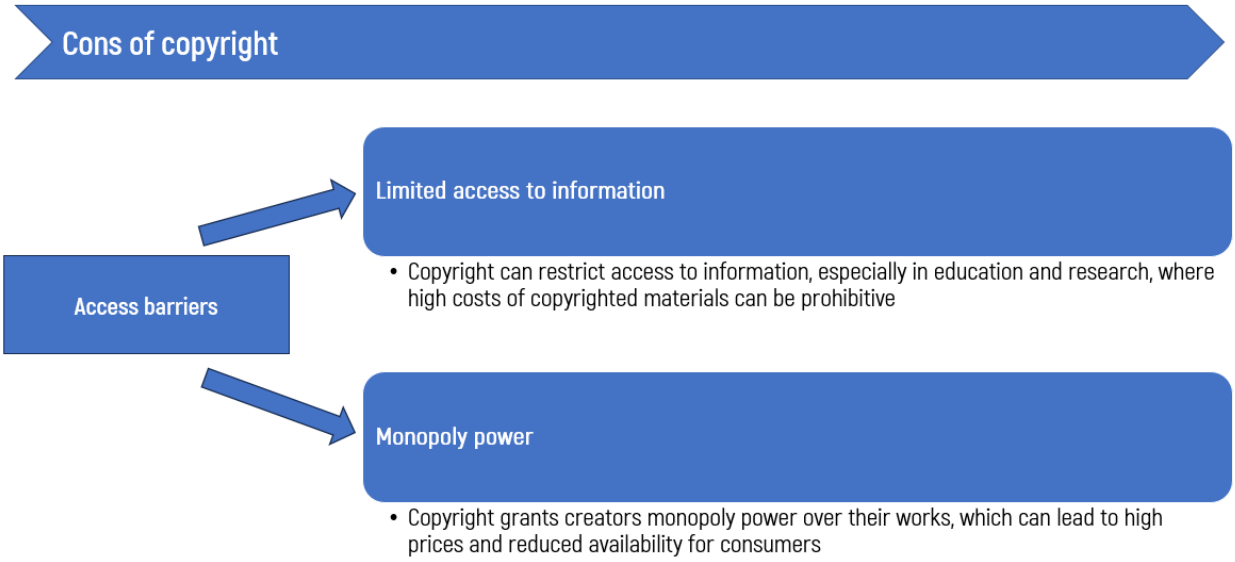
For notes:

Pros of copyright

Economic rowth → **Industry support**

- Copyright supports various industries, including publishing, music, film, and software, fostering economic growth and employment opportunities

For notes:


Cons of copyright
Access barriers
Limited access to information
• Copyright can restrict access to information, especially in education and research, where high costs of copyrighted materials can be prohibitive
Monopoly power
• Copyright grants creators monopoly power over their works, which can lead to high prices and reduced availability for consumers

For notes:

Cons of copyright

Duration → **Extended protection periods**

- The lengthy duration of copyright (life of the author plus 70 years or more) means that many works remain inaccessible to the public for extended periods, hindering cultural and scientific progress

For notes:

Cons of copyright

Fair use ambiguities → **Uncertainty**

- The concept of fair use (or fair dealing in some jurisdictions) is often vague and can lead to legal uncertainties, making it difficult for users to know what is permissible without risking infringement

For notes:

Cons of copyright

Enforcement challenges

Piracy and unauthorized use

- Despite legal protections, enforcing copyright can be challenging, especially with digital content that is easily copied and distributed without authorization

Litigation costs

- Legal disputes over copyright infringement can be costly and time-consuming, often favoring larger entities with more resources

For notes:

Cons of copyright

Impact on derivative works → **Restrictions on creativity**

- Strict copyright laws can limit the creation of derivative works, such as parodies, remixes, and adaptations, which are often valuable forms of cultural expression

For notes:

Cons of copyright

Global disparities → **Access inequality**

- Copyright laws can exacerbate global inequalities, with developing countries often facing greater challenges in accessing educational and cultural materials due to high costs

For notes:

Balancing copyright

The key to addressing the pros and cons of copyright lies in finding a balance that protects the rights of creators while also ensuring public access to information and cultural works. This balance can be achieved through:

Flexible licensing

- Encouraging the use of flexible licensing options, such as Creative Commons, that allow creators to share their works more freely

Fair use provisions

- Clarifying and expanding fair use provisions to ensure that they support educational, research, and transformative uses.

Shortening protection periods

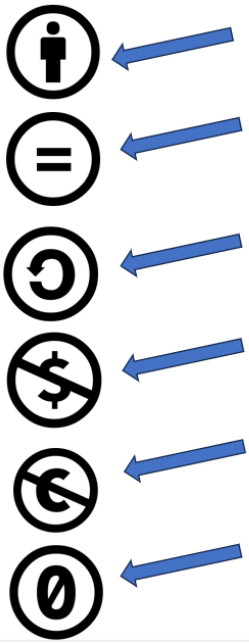
- Considering shorter protection periods that better balance the interests of creators and the public

Enhanced access programs

- Supporting programs and initiatives that provide greater access to copyrighted materials for educational and cultural purposes, especially in underserved regions

For notes:

CC License terms



Attribution, ***"BY"***, which indicates that a user can copy, adapt, remix, display, perform, and distribute your work so long as they credit your name as requested by you.

No Derivative Works, ***"ND"***, which indicates that the work is free to copy, distribute, display, or perform as it is, verbatim with no modifications or adaptations

Share Alike, ***"SA"***, which means that folks can only disseminate the work under the same license chosen by the original author for the work.

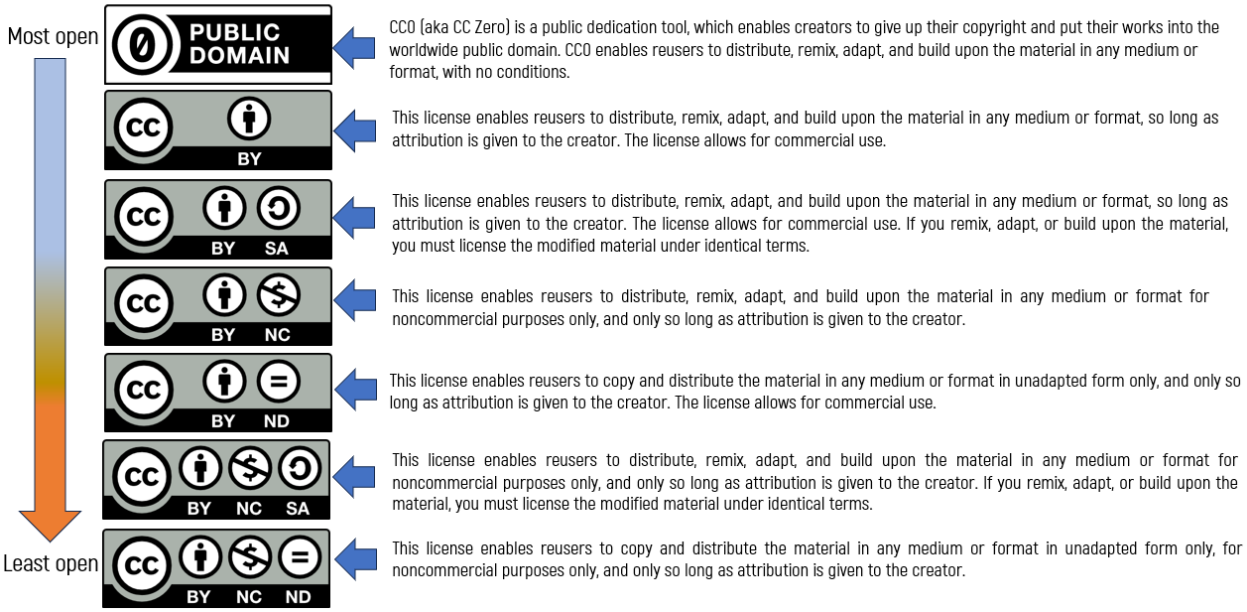
Non-Commercial, ***"NC"***, which indicates that others may copy, distribute, display, perform, or remix the work but only for non-commercial purposes.

Public Domain Mark, which indicates a work is free of known copyright instructions, and therefore is in the public domain.

Public Domain Designation: the creator of the work has relinquished their copyright to the work and released it into the public domain with "no rights reserved."

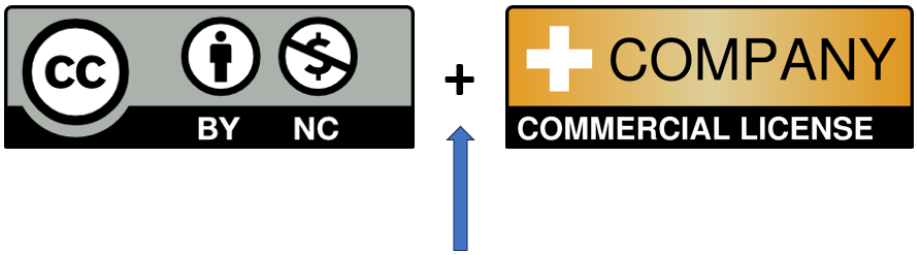
For notes:

CC Licenses: level of openness



For notes:

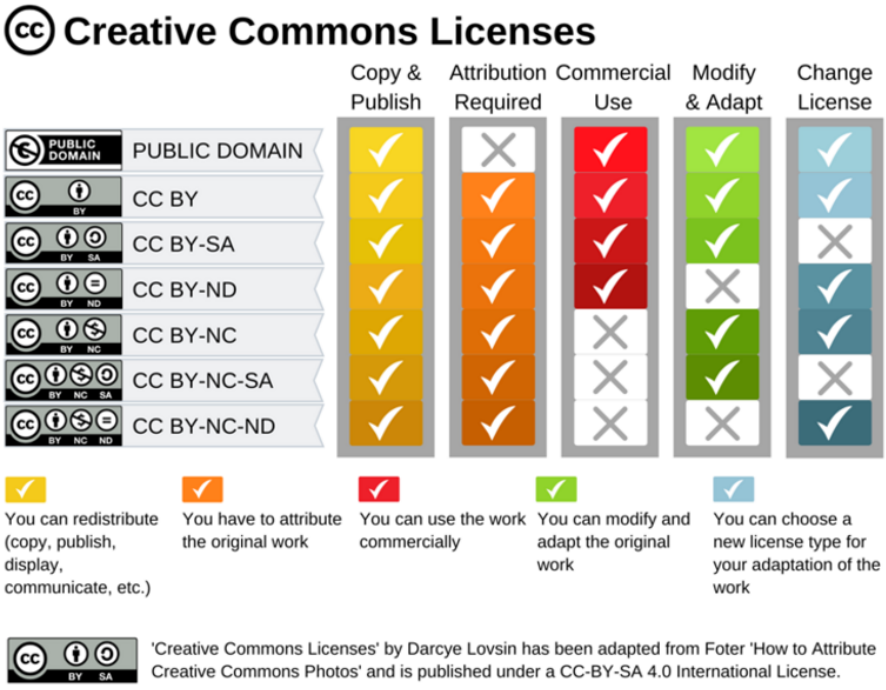
CC+ license



CC+ denotes the combination of a CC official license (unmodified and verbatim) + another separate and independent agreement granting more permissions.

It is not a new or different license or any license at all, but a facilitation of more Permissions beyond any standard CC licenses

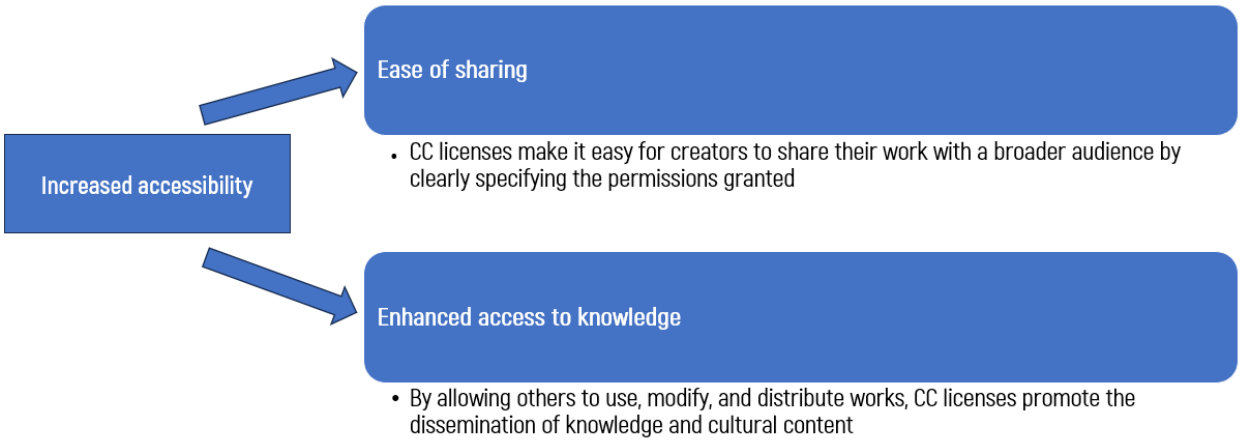
For notes:



https://oercommons.org/courseware/lesson/90999/overview

For notes:

Pros of CC licenses



For notes:

Pros of CC licenses

Flexibility for creators

Customizable licenses

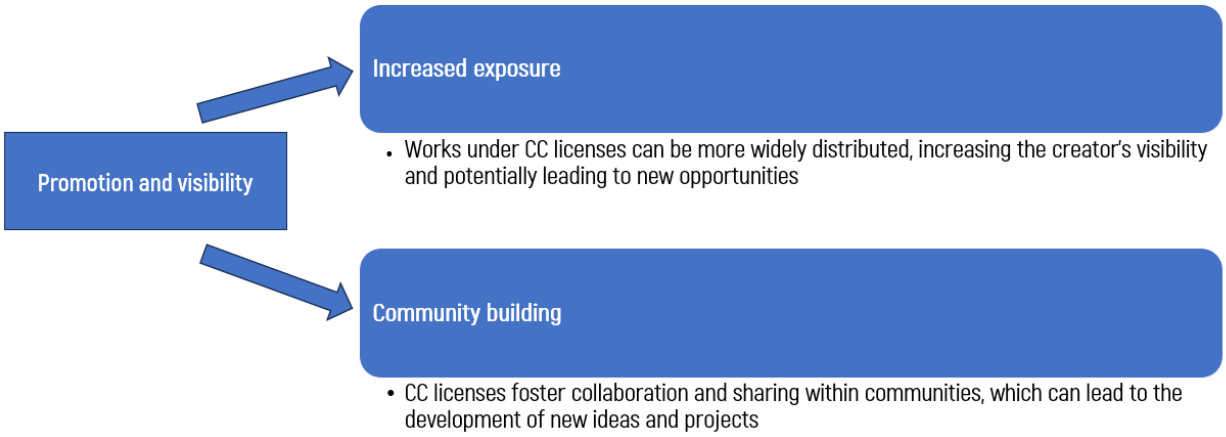
- CC offers a range of licenses that allow creators to choose the level of control they wish to retain over their work

Retaining some rights

- Creators can grant permissions while still maintaining certain rights, offering a balance between openness and control

For notes:

Pros of CC licenses



For notes:

Pros of CC licenses

Support for education and research

Educational resources

- Educators and researchers can freely use, adapt, and distribute educational materials, enhancing learning and academic collaboration

Open access

- CC licenses support the open access movement, making academic research more accessible and fostering innovation

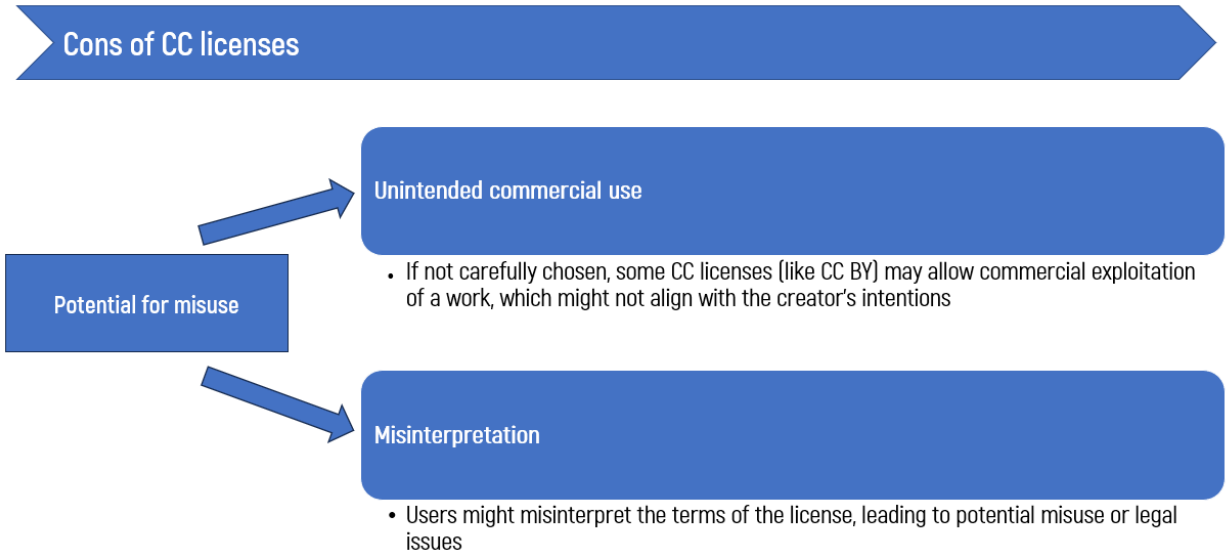
For notes:

Pros of CC licenses

Legal clarity → **Standardized terms**

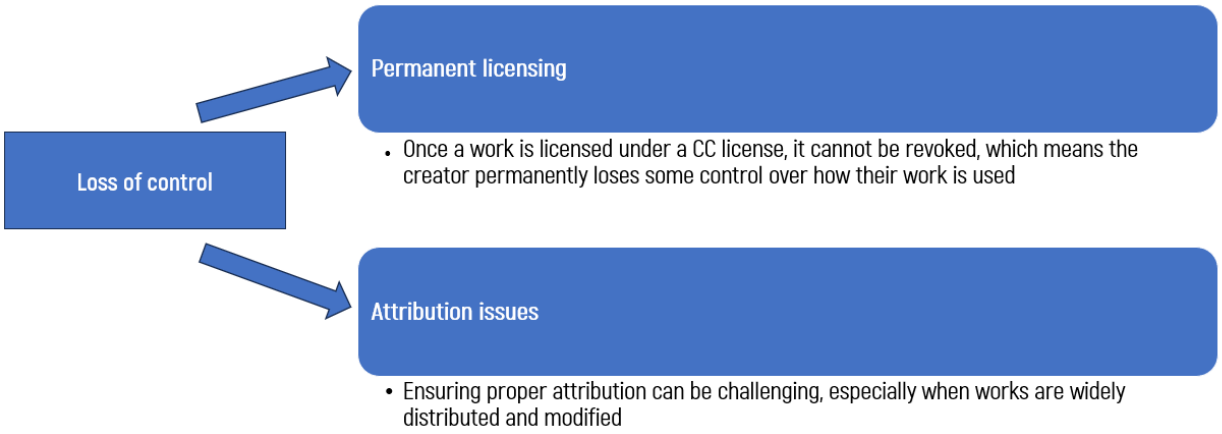
- The clear, standardized terms of CC licenses reduce legal ambiguity, making it easier for users to understand what they can and cannot do with the work

For notes:


Cons of CC licenses
Potential for misuse
Unintended commercial use
• If not carefully chosen, some CC licenses (like CC BY) may allow commercial exploitation of a work, which might not align with the creator's intentions
Misinterpretation
• Users might misinterpret the terms of the license, leading to potential misuse or legal issues

For notes:

Cons of CC licenses



For notes:

Cons of CC licenses

For notes:

Cons of CC licenses

Derivative works

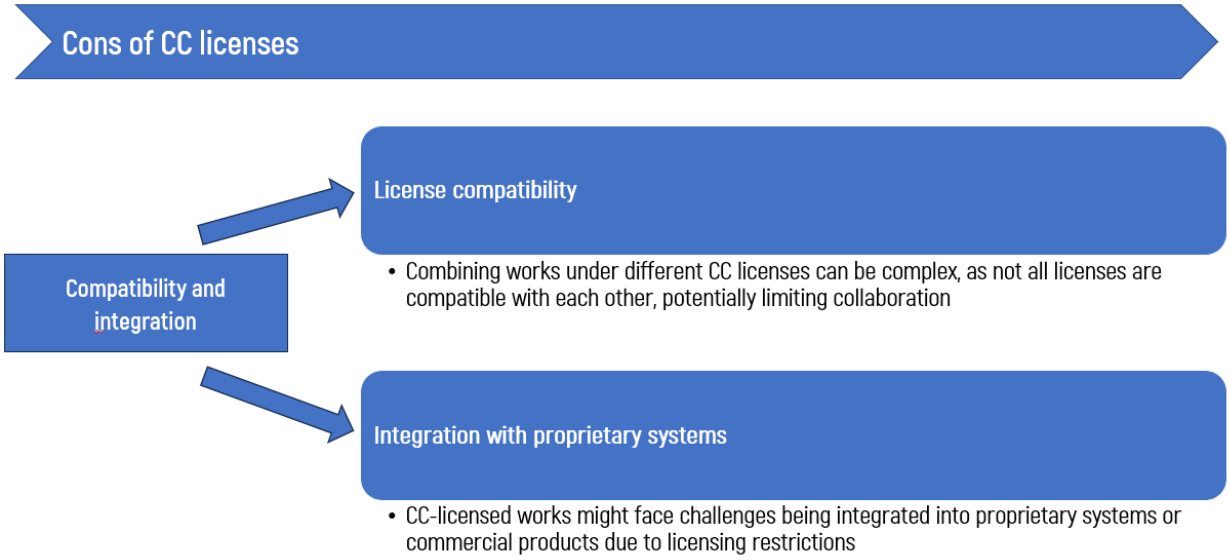
Quality control

- Allowing others to modify a work (as with CC BY-SA) can lead to derivative works that may not meet the original creator's quality standards or intentions

Reputation risk

- Poor-quality derivatives or inappropriate uses can potentially harm the reputation of the original creator

For notes:


Cons of CC licenses
Compatibility and integration
License compatibility
• Combining works under different CC licenses can be complex, as not all licenses are compatible with each other, potentially limiting collaboration
Integration with proprietary systems
• CC-licensed works might face challenges being integrated into proprietary systems or commercial products due to licensing restrictions

For notes:

Balancing CC licenses

To maximize the benefits and minimize the drawbacks of CC licenses, creators and users should consider the following:

Careful license selection

- Creators should choose the license that best aligns with their goals and intentions, paying close attention to the permissions and restrictions each license entails

Clear attribution practices

- Both creators and users should ensure that proper attribution is given to maintain the integrity and recognition of the original work

Understanding license terms

- Users should thoroughly understand the terms of the CC license before using, modifying, or distributing the work to avoid unintentional misuse

Monitoring use

- Creators should monitor how their works are used to ensure compliance with the license terms and address any misuse or misattribution promptly

For notes:

Practical tips (copyright and CC licenses)

Check the copyright status

Determine whether the work is still under copyright or has entered the public domain

Verify licenses

If the work is licensed (e.g., Creative Commons), ensure you comply with the terms of the license

Request permission

When in doubt or if your intended use does not clearly fall within an exception, seek permission from the copyright holder

Acknowledge sources

Always credit the source appropriately, especially when using works under exceptions like education, research, or criticism

For notes:

CITIZEN SCIENCE: AN INEXHAUSTIBLE WELL OF OPEN KNOWLEDGE

Citizen science is...

- research conducted with participation from the general public, or amateur/nonprofessional researchers or participants for many areas
- scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions
- any activity that involves the public in scientific research
- when the public voluntarily helps conduct scientific research

For notes:

The values of citizen science

For notes:

Why do we need citizen science? Pros of citizen science

Enhanced data collection and coverage

Increased scale and scope

- Citizen scientists can collect data over large geographical areas and extended periods, which would be challenging for professional scientists alone. This increased scale allows for more comprehensive datasets

Access to remote areas

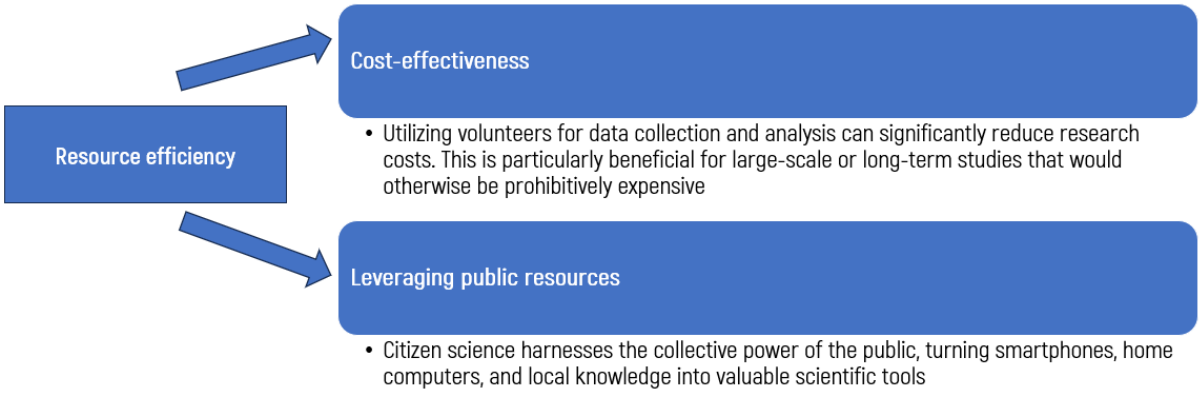
- Local participants can access areas that are difficult or expensive for researchers to reach, providing valuable data from diverse and often under-studied locations

For notes:

Why do we need citizen science? Pros of citizen science

For notes:

Why do we need citizen science? Pros of citizen science



For notes:

Why do we need citizen science? Pros of citizen science

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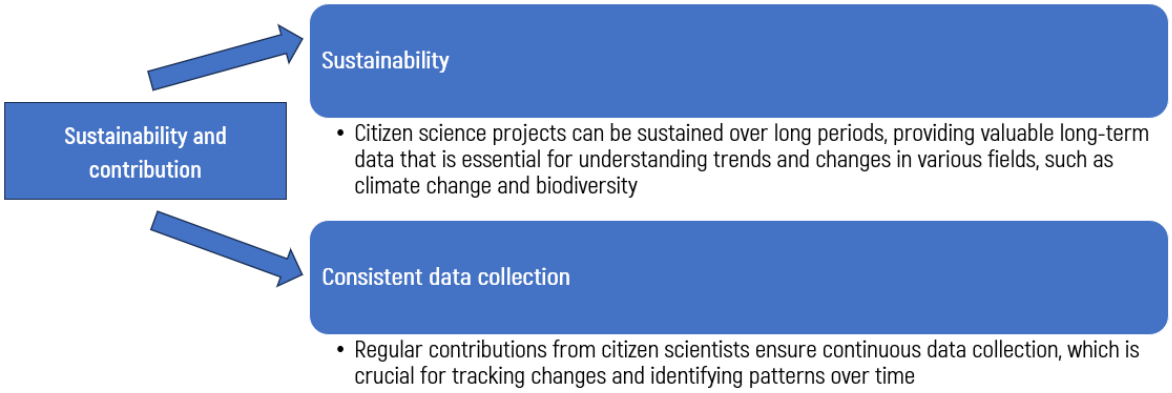

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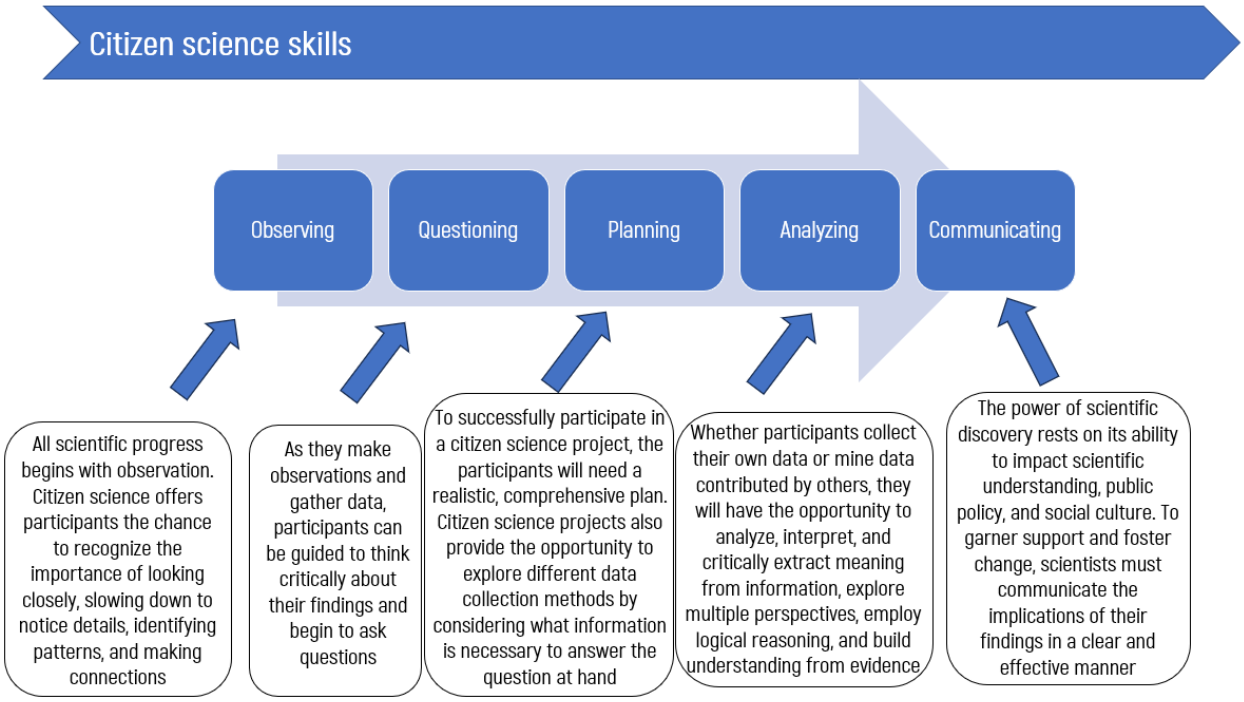

Citizen science skills
Observing
Questioning
Planning
Analyzing
Communicating
All scientific progress begins with observation. Citizen science offers participants the chance to recognize the importance of looking closely, slowing down to notice details, identifying patterns, and making connections
As they make observations and gather data, participants can be guided to think critically about their findings and begin to ask questions
To successfully participate in a citizen science project, the participants will need a realistic, comprehensive plan. Citizen science projects also provide the opportunity to explore different data collection methods by considering what information is necessary to answer the question at hand
Whether participants collect their own data or mine data contributed by others, they will have the opportunity to analyze, interpret, and critically extract meaning from information, explore multiple perspectives, employ logical reasoning, and build understanding from evidence
The power of scientific discovery rests on its ability to impact scientific understanding, public policy, and social culture. To garner support and foster change, scientists must communicate the implications of their findings in a clear and effective manner

For notes:

What does it mean to be a citizen scientist?

Participation in scientific research

Data collection

- Citizen scientists gather data for research projects, which can involve observing natural phenomena, recording measurements, taking photographs, or using sensors and other tools

Data analysis

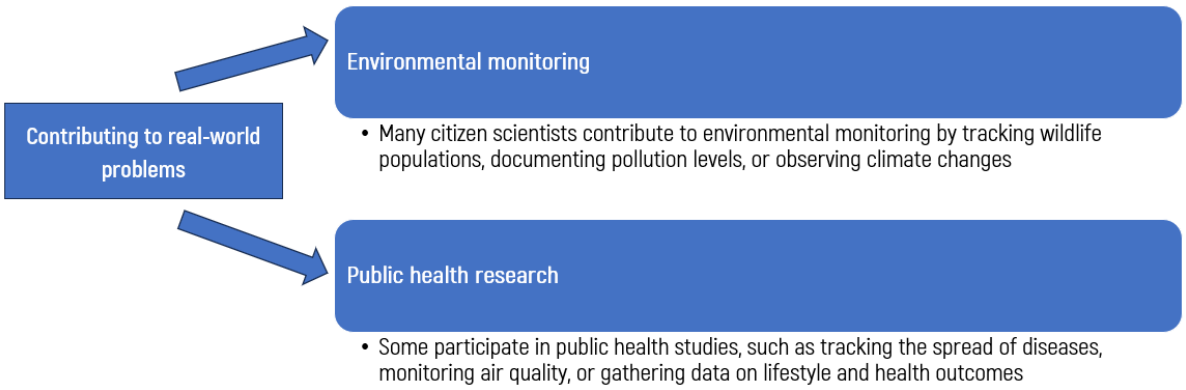
- They may also help analyze data, identifying patterns or trends, and sometimes even assist in the interpretation of results

For notes:

What does it mean to be a citizen scientist?

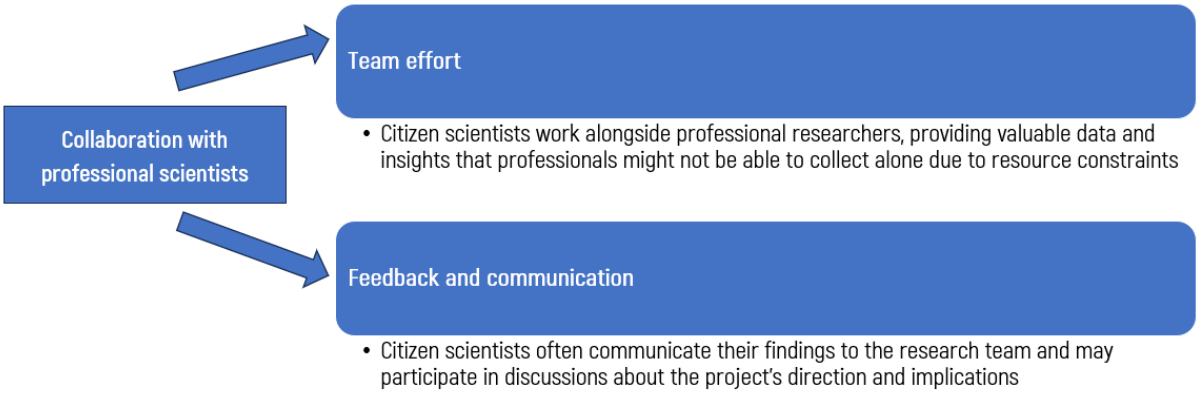
For notes:

What does it mean to be a citizen scientist?



For notes:

What does it mean to be a citizen scientist?



For notes:

What does it mean to be a citizen scientist?

For notes:

What does it mean to be a citizen scientist?

For notes:

Benefits of being a citizen scientist

Contributing to scientific knowledge

- Citizen scientists help expand the body of scientific knowledge, contributing to discoveries and advancements

Community and collaboration

- Citizen scientists become part of a community of like-minded individuals, working together towards common goals

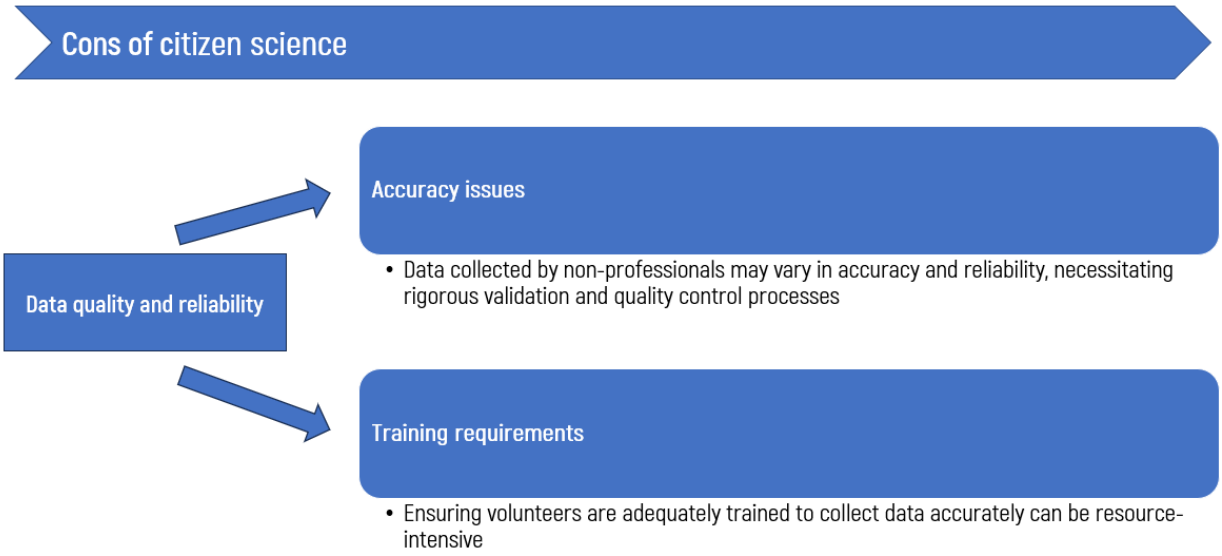
Impact on policy and conservation

- The data collected can influence policy decisions, conservation efforts, and public health initiatives

Personal enrichment

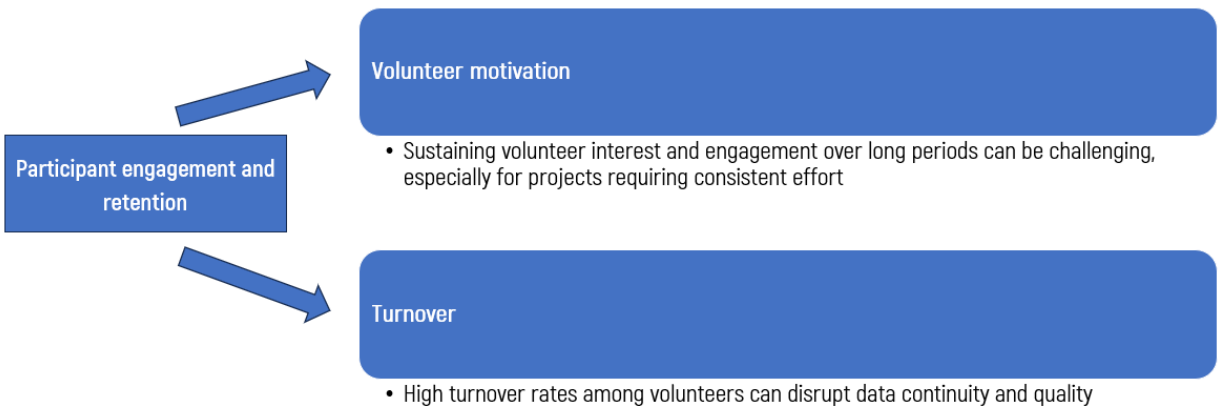
- Engaging in scientific research enriches participants' lives through education, skill development, and personal fulfillment

For notes:


Cons of citizen science
Data quality and reliability
Accuracy issues
• Data collected by non-professionals may vary in accuracy and reliability, necessitating rigorous validation and quality control processes
Training requirements
• Ensuring volunteers are adequately trained to collect data accurately can be resource-intensive

For notes:

Cons of citizen science



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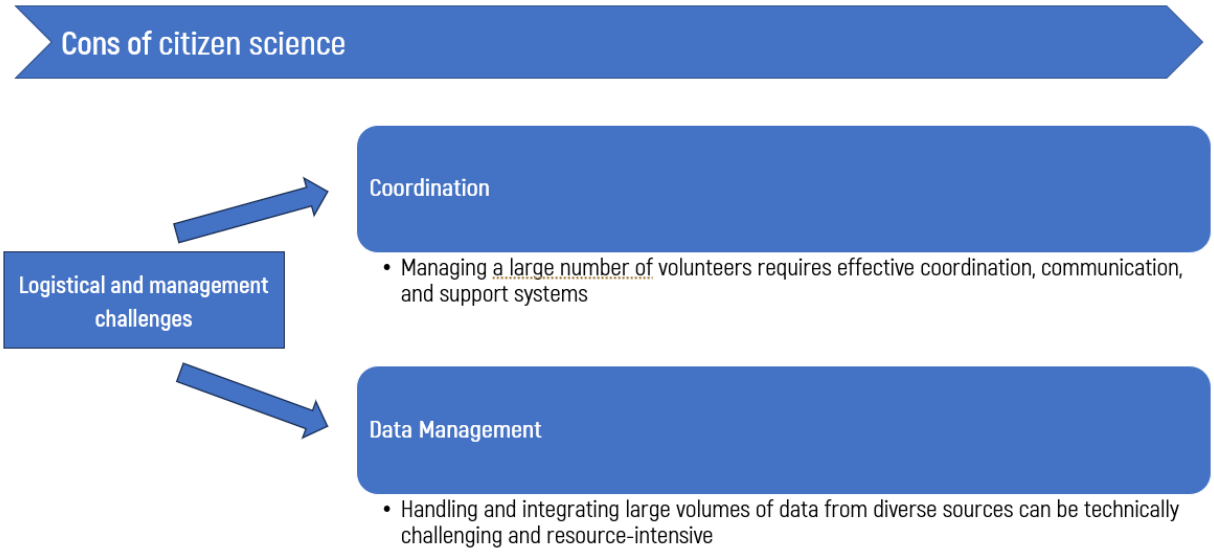

Cons of citizen science
Logistical and management challenges
Coordination
• Managing a large number of volunteers requires effective coordination, communication, and support systems
Data Management
• Handling and integrating large volumes of data from diverse sources can be technically challenging and resource-intensive

For notes:

Cons of citizen science

Ethical and legal considerations

Privacy concerns

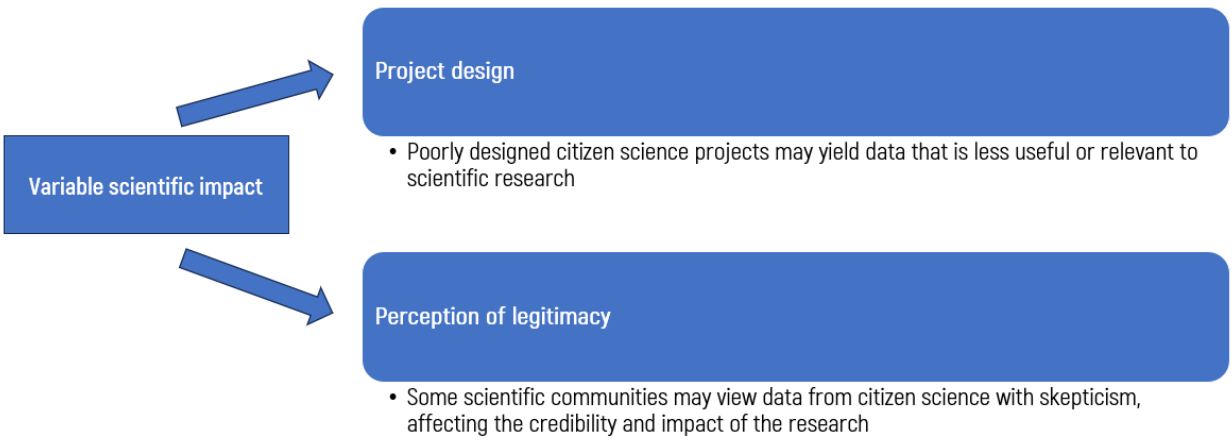
- Projects must address privacy issues, especially when collecting personal or sensitive data

Intellectual property

- Clarifying ownership of data and findings can be complex, especially when contributions come from a large number of volunteers

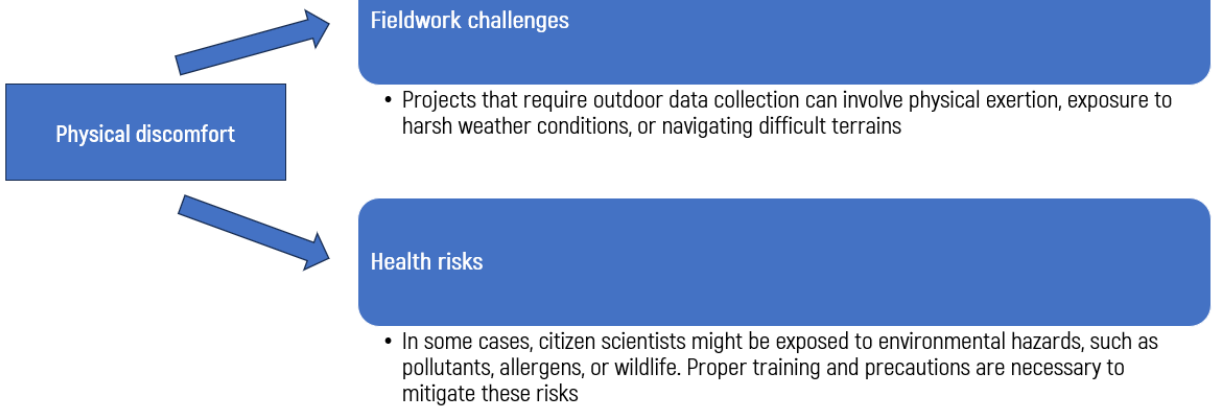
For notes:

Cons of citizen science



For notes:

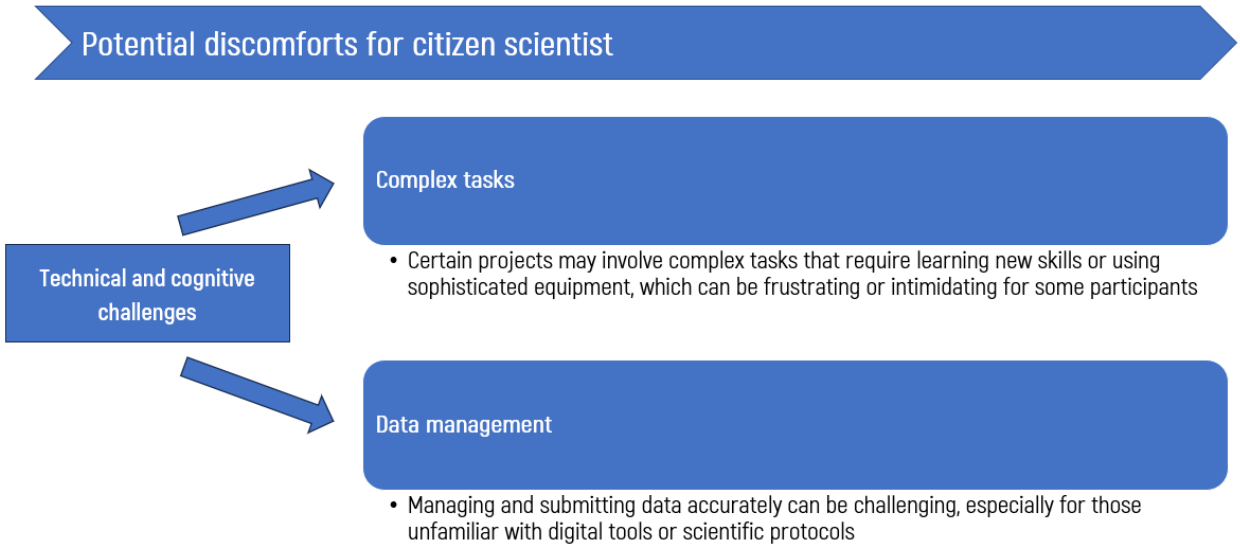
Potential discomforts for citizen scientist



For notes:


Potential discomforts for citizen scientist
Time commitment
Demanding schedules
• Some projects require significant time commitments, which can be challenging to balance with personal and professional responsibilities
Long-term engagement
• Maintaining consistent participation over extended periods can be difficult, especially for long-term monitoring projects

For notes:


Potential discomforts for citizen scientist
Technical and cognitive challenges
Complex tasks
• Certain projects may involve complex tasks that require learning new skills or using sophisticated equipment, which can be frustrating or intimidating for some participants
Data management
• Managing and submitting data accurately can be challenging, especially for those unfamiliar with digital tools or scientific protocols

For notes:

Potential discomforts for citizen scientist

Emotional and psychological discomfort

Stress and anxiety

- The responsibility of contributing to scientific research can cause stress or anxiety, particularly if participants worry about making mistakes or not meeting project expectations

Dealing with uncertainty

- Scientific research often involves dealing with uncertainties and ambiguities, which can be frustrating for individuals who prefer clear and immediate results

For notes:

Potential discomforts for citizen scientist

Social and collaborative challenges

Communication barriers

- Effective communication with professional scientists and other volunteers is crucial but can sometimes be challenging, especially in large, diverse teams

Conflict resolution

- Differences in opinions or approaches among participants can lead to conflicts, which need to be managed diplomatically

For notes:

Potential discomforts for citizen scientist

Recognition and validation

Lack of recognition

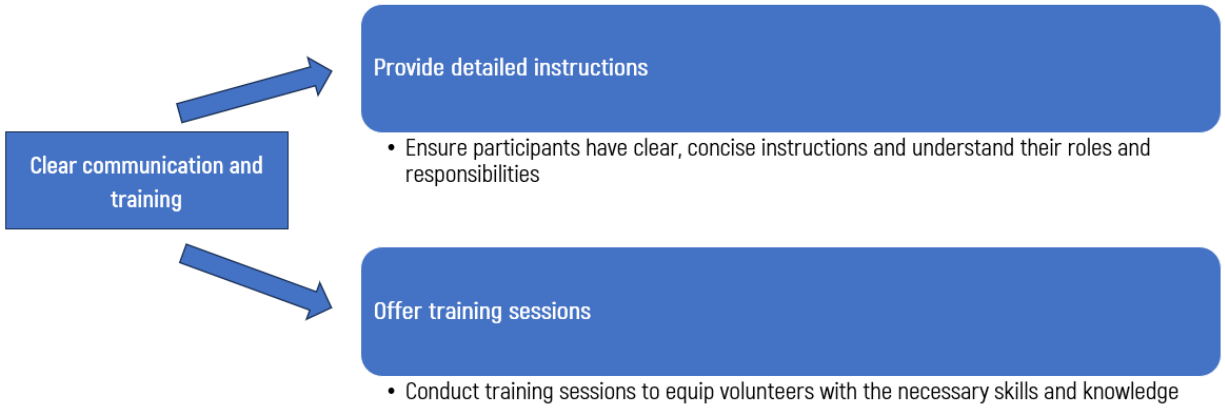
- Citizen scientists might feel underappreciated or overlooked if their contributions are not adequately recognized or if they do not see the direct impact of their work

Expectation vs. reality

- Participants might have high expectations about their contributions leading to significant scientific breakthroughs or policy changes, which might not always happen

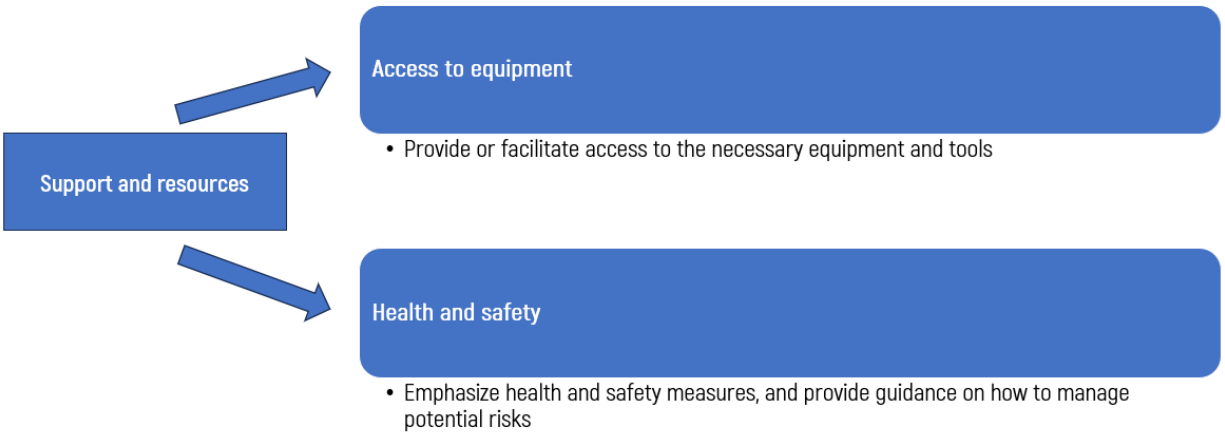
For notes:

Mitigating discomforts for citizen scientist: actions



For notes:

Mitigating discomforts for citizen scientist: actions



For notes:

Mitigating discomforts for citizen scientist: actions

Flexibility and accessibility

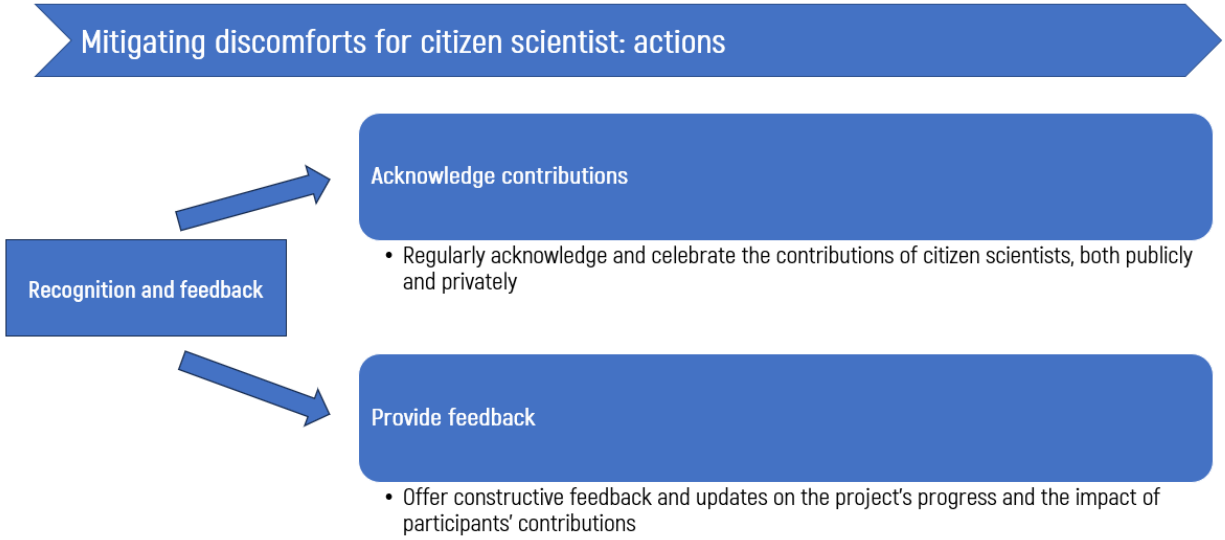
Flexible participation options

- Allow for flexible participation schedules and different levels of involvement to accommodate varying availability and commitment levels

Accessibility considerations

- Design projects that are inclusive and accessible to individuals with different abilities and resources

For notes:


Mitigating discomforts for citizen scientist: actions
Recognition and feedback
Acknowledge contributions
• Regularly acknowledge and celebrate the contributions of citizen scientists, both publicly and privately
Provide feedback
• Offer constructive feedback and updates on the project's progress and the impact of participants' contributions

For notes:


Mitigating discomforts for citizen scientist: actions
Community building
Foster a supportive community
• Create opportunities for volunteers to connect, share experiences, and support each other
Conflict resolution
• Have mechanisms in place to address and resolve conflicts or issues that arise among participants

For notes:

Examples of citizen scientist's activities: environmental monitoring

eBird

Activity: Bird watchers record and report their sightings using the eBird platform
Impact: Data contributes to the study of bird populations, migration patterns, and conservation efforts globally

The Great Backyard Bird Count

Activity: Participants count and report birds in their backyards over a specific period
Impact: Provides a snapshot of bird distribution and abundance, helping scientists track long-term trends in bird populations

https://ebird.org/home
https://www.birdcount.org/

For notes:

Examples of citizen scientist's activities: astronomy

Galaxy Zoo

Activity: Volunteers classify images of galaxies taken by telescopes
Impact: Helps astronomers understand the structure and evolution of galaxies, contributing to research on the universe's formation

Zooniverse

Activity: A platform hosting various projects, such as classifying stars, discovering exoplanets, and identifying solar storms.
Impact: Facilitates a wide range of astronomical research, making large datasets manageable and more accessible to scientists

https://www.zooniverse.org/projects/zookeeper/galaxy-zoo/
https://www.zooniverse.org/

For notes:

Examples of citizen scientist's activities: climate and weather monitoring

CoCoRaHS

Activity: Volunteers measure and report precipitation in their local areas
Impact: Provides high-resolution precipitation data used for weather forecasting, climate studies, and water resource management

Globe Observer

Activity: Participants report observations on clouds, mosquito habitats, and land cover using a smartphone app
Impact: Enhances NASA's Earth science research by providing ground-truth data to validate satellite observations

https://www.cocorahs.org/
https://observer.globe.gov/

For notes:

Examples of citizen scientist's activities: biological and ecological research

iNaturalist

Activity: Users record observations of plants and animals, sharing photos and location data
Impact: Creates a comprehensive database of global biodiversity, aiding in species identification, distribution studies, and conservation efforts

Monarch Watch

Activity: Participants tag monarch butterflies and report sightings to track their migration
Impact: Provides valuable data on monarch migration patterns, aiding in the conservation of this iconic species

https://www.inaturalist.org/
https://monarchwatch.org/

For notes:

Examples of citizen scientist's activities: health and medicine

Foldit

Activity: Participants play an online puzzle game to fold proteins into optimal shapes
Impact: Contributes to research on protein folding, which is crucial for understanding diseases like Alzheimer's and developing new treatments

Flu Near You

Activity: Volunteers report flu symptoms to track the spread of influenza in real-time
Impact: Helps public health officials monitor flu outbreaks and allocate resources effectively

https://fold.it/
https://endingpandemics.org/projects/flu-near-you/

For notes:

Examples of citizen scientist's activities: marine and coastal research

Seafloor Explorer

Activity: Volunteers identify and classify images of the seafloor taken by underwater robots
Impact: Enhances understanding of marine ecosystems, aiding in marine conservation and resource management

https://www.seafloorexplorer.org/

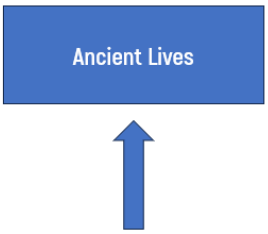
Marine Debris Tracker

Activity: Participants log sightings of marine debris using a smartphone app.
Impact: Helps researchers understand the distribution and impact of marine litter, supporting efforts to combat ocean pollution

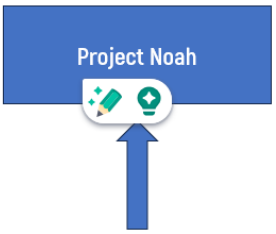
https://debristracker.org/

For notes:

Examples of citizen scientist's activities: archaeology and history



Activity: Volunteers transcribe and translate ancient Greek papyri
Impact: Contributes to the understanding of ancient civilizations, providing insights into their culture, language, and daily life



Activity: Participants document and share photos of wildlife and plant species in their local area
Impact: Supports biodiversity research and education by creating a global database of species observations

https://www.ancientlives.org/
https://www.projectnoah.org/

For notes:

ACADEMIC INTEGRITY, OPEN SCIENCE AND ARTIFICIAL INTELLIGENCE: MEETING AT THE CROSSROADS

Six pillars of academic integrity

Honesty

- The quality of being honest, free from fraud or deception, legitimate, truthful

Trust

- The assured reliance on the character, ability, strength, or truth of someone or something

Fairness

- The quality or state of being fair, especially fair or impartial treatment, lack of favoritism toward one side or another

Respect

- High or special regard, esteem; the quality or state of being esteemed

Responsibility

- The quality or state of being responsible; moral, legal or mental accountability; reliability, trustworthiness

Courage

- The mental or moral strength to venture, persevere, and withstand danger, fear, or difficulty

For notes:

Promoting transparency and reproducibility

Open science principles emphasize transparency, reproducibility, and accessibility in research processes and outcomes. GenAI can facilitate the creation of transparent and reproducible research artifacts, such as code, data, and models, by automating documentation and version control tasks. This promotes greater transparency in research practices and enhances the reproducibility of scientific findings, leading to more robust and reliable knowledge

For notes:

The intersection of academic integrity, open science and GenAI

Advancing collaborative research

GenAI tools can enhance collaboration among researchers by automating routine tasks, facilitating data sharing and synthesis, and enabling interdisciplinary collaboration. By integrating generative AI into open science initiatives, researchers can leverage AI-generated insights and resources to accelerate the pace of scientific discovery and innovation. This fosters greater collaboration and knowledge exchange within and across disciplinary boundaries, leading to more impactful research outcomes

For notes:

The intersection of academic integrity, open science and GenAI

Facilitating access to knowledge

Open science aims to make scientific knowledge freely available to all, regardless of geographic location or institutional affiliation. GenAI can contribute to this goal by automating the creation of open-access educational materials, such as textbooks, articles, and multimedia resources. By leveraging generative AI, educators can produce high-quality, accessible content at scale, thereby democratizing access to knowledge and promoting lifelong learning for all

For notes:

Empowering innovation and creativity

GenAI enables researchers and educators to explore new research frontiers, generate novel insights, and unlock creative possibilities in research and education. By integrating generative AI into open science practices, researchers can leverage AI-generated content, simulations, and models to address complex scientific challenges and develop innovative solutions. This fosters a culture of innovation and creativity, driving scientific progress and societal impact

For notes:

Eight ethical challenges for GenAI: fairness and bias

Challenge:

Defining and enforcing fairness in the context of GenAI is complex due to the open-ended nature of its content generation. Traditional machine learning models are easier to audit for fairness, but the same isn't true for Large Language Models (LLMs).

Action:

Develop targeted definitions of fairness and employ training algorithms that can enforce these definitions. This includes ensuring balanced representation across various demographic groups in the generated content. That said, it will not always be clear in which contexts these definitions should be enforced.

For notes:

Eight ethical challenges for GenAI: privacy concerns

Challenge

The broad capabilities of GenAI raise concerns beyond traditional data leaks to encompass issues such as the subtle copying of training data, which can potentially infringe on privacy.

Action

Curate training data to exclude private information and employ techniques to detect and mitigate replication of sensitive content. However, this approach may not detect subtler forms of replication, such as when GenAI reproduces the "style" of content in its training data.

For notes:

Eight ethical challenges for GenAI: toxicity and inappropriate content

Challenge

GenAI can produce content that may be offensive, disturbing or inappropriate. Furthermore, the line between restriction and censorship is thin and often dependent on context and culture, posing an additional challenge

Action

Implement "guardrail" models that filter out unwanted content in the training data, input prompts and generated outputs, and employ human-annotated training data to guide these models. It is easier to control the output of a generative model than it is to curate the training data and prompts, given the general nature of the tasks the AI addresses

For notes:

Eight ethical challenges for GenAI: hallucinations and factual inaccuracies

Challenge

GenAI can produce plausible but incorrect information, known as hallucinations. These are assertions or claims that sound plausible but are verifiably incorrect. For instance, current LLMs have been known to often create nonexistent scientific citations

Action

Educate users about the capabilities and limitations of GenAI. When questioned about citations, some LLMs will inform the user that they are just language models and don't verify their content with external sources. Such disclaimers should be clear and more frequent. LLMs could also be integrated with verified databases and sources for fact-checking

For notes:

Eight ethical challenges for GenAI: intellectual property and creativity issues

Challenge

There's a fine line between inspiration and imitation, raising concerns about intellectual property rights with GenAI reproducing styles and content

Action

Employ techniques to reduce or remove the influence of protected content on generative outputs. Over time, however, concerns over intellectual property will be addressed by a combination of technology, policy and legal mechanisms

For notes:

Eight ethical challenges for GenAI: plagiarism and academic integrity

Challenge

The use of GenAI for writing essays and other academic or professional works raises concerns about plagiarism and originality. The challenge lies in being able to verify that a piece of content was authored by a person

Action

Develop detection models that differentiate between human and AI-generated content, though this might lead to an arms race between generative models and detection methods. Furthermore, since the purpose of GenAI is to produce high-quality content plausibly generated by a human, such detection methods may not work in the long term

For notes:

Eight ethical challenges for GenAI: disruption to traditional work

Challenge

The efficiency of GenAI in performing tasks that previously required human intelligence could disrupt job markets and certain professions. While such concerns may be premature, it seems that generative AI will have a transformative effect on many aspects of work, allowing numerous tasks to be delegated to the technology

Action

There are no obvious technical actions to this issue, and there is still much speculation over how this scenario will unfold. However, GenAI could open up existing occupations to more people, as well as create new job roles such as "prompt engineers"

For notes:

Eight ethical challenges for GenAI: open-ended nature of AI

Challenge

The broad and open-ended nature of GenAI applications is the key source of the challenges highlighted above, complicating the establishment of guidelines and responsible use

Action

The development of more specialized applications of GenAI, where goals and expectations are clear, can lead to more effective and ethical use. Moreover, end-user education and training will also be critical in using GenAI safely and productively. As the potential uses and dangers of the technology become more widely understood, users will enhance some of the defenses and solutions highlighted above

For notes:

Eight pillars of open science

- FAIR data
- Research integrity
- Next generation metrics
- Future of scholarly communication
- Citizen science
- Education and skills
- Rewards and initiatives
- European open science cloud

For notes:

Modern student

Academic integrity

Modern students understand the importance of originality and ethical conduct in their academic work. Modern students adhere to citation standards, avoid plagiarism, and uphold principles of honesty and fairness in their research and assignments. They actively seek resources and support to improve their understanding of academic integrity and strive to maintain high ethical standards in all academic endeavors

Open science

Modern students embrace the principles of open science and actively participate in collaborative and transparent research practices. They contribute to open-access journals, share their research findings in open repositories, and engage in open discussions and peer review processes. They recognize the value of sharing knowledge and data openly to advance scientific progress and promote innovation across disciplines

Artificial intelligence

Modern students leverage AI technologies to enhance their learning experiences and academic performance. Modern students utilize AI-powered tools for personalized learning, adaptive tutoring, and intelligent assistance in areas such as study planning, information retrieval, and problem-solving. They engage with AI-driven educational platforms and resources to supplement their learning and develop essential skills for the digital age

Digitalization

Modern students are proficient in navigating digital platforms and resources to access information, collaborate with peers, and engage with course materials. They utilize digital tools such as e-books, online databases, multimedia content, and learning management systems to support their studies and research projects. They embrace digital communication and collaboration tools to connect with classmates, participate in virtual discussions, and collaborate on group assignments regardless of geographical boundaries

For notes:

Modern student

https://hotpot.ai/art-generator

A modern student demonstrates a commitment to ethical conduct, collaboration, technological proficiency, and innovation in their academic journey. They leverage digital resources and AI technologies to enhance their learning experiences, contribute to open scientific inquiry, and uphold principles of academic integrity and transparency

For notes:

Modern educator

Academic integrity

Modern educators prioritize instilling values of honesty, originality, and ethical behavior in their students. They teach about proper citation practices, plagiarism prevention, and the importance of intellectual integrity in research and academic work. Moreover, they create a culture of trust and accountability in the classroom or academic environment

Open science

Modern educators promote open access to knowledge and encourage collaboration and sharing within the scientific community. They support initiatives such as open-access journals, preprint repositories, and open data repositories. By embracing open science practices, they contribute to accelerating the pace of discovery and innovation while ensuring the accessibility and reproducibility of research findings

Artificial intelligence

Modern educators integrate AI technologies into their teaching methodologies to personalize learning experiences, provide targeted feedback, and optimize educational outcomes. They leverage AI-powered tools for adaptive learning, intelligent tutoring systems, and data-driven insights to enhance student engagement and achievement. Additionally, they educate students about the ethical implications of AI and promote responsible AI use in education

Digitalization

Modern educators harness digital technologies to create interactive and immersive learning environments. They utilize digital resources such as e-books, multimedia content, simulations, and virtual reality to make learning more engaging and accessible. Moreover, they empower students with digital literacy skills, teaching them how to critically evaluate online information, collaborate effectively in digital spaces, and leverage technology for lifelong learning

For notes:

Modern educator

https://hotpot.ai/art-generator

A modern educator embraces ethical conduct, promotes transparency and collaboration, leverages AI technologies responsibly, and harnesses digital tools to enrich the teaching and learning experience

For notes:

Challenges for open science in terms of academic integrity

Data quality and misuse

Open science encourages the sharing of research data, but ensuring the quality and integrity of this data can be challenging. Without proper validation and verification mechanisms, there is a risk of using flawed or manipulated data, which can undermine the reliability of research outcomes

For notes:

Challenges for open science in terms of academic integrity

Plagiarism and attribution

Open access to research materials increases the risk of plagiarism, unauthorized reuse, and improper attribution of intellectual property. Researchers may face challenges in properly citing and attributing sources, especially when dealing with large datasets or collaborative projects involving multiple contributors

For notes:

Challenges for open science in terms of academic integrity

Reproducibility and replicability

Open science emphasizes the importance of reproducibility and replicability in research, but achieving these goals can be difficult due to issues such as incomplete documentation, lack of standardized protocols, and variations in experimental conditions. Without robust replication studies, there is a risk of erroneous or exaggerated findings being perpetuated in the scientific literature

For notes:

Challenges for open science in terms of academic integrity

Publication bias and selective reporting

Open access publishing platforms may be susceptible to publication bias, where positive results are more likely to be published than negative or inconclusive results. This can distort the scientific record and lead to biased conclusions if researchers selectively report only favorable outcomes

For notes:

Challenges for open science in terms of academic integrity

Ethical considerations and informed consent

Open science initiatives must navigate ethical considerations related to the sharing of sensitive or proprietary data, particularly in fields such as medical research or social sciences. Ensuring informed consent from research participants and safeguarding privacy rights while promoting data sharing can be complex and challenging

For notes:

Challenges for open science in terms of academic integrity

Community norms and practices

Open science requires a cultural shift in research practices and norms, which may not always align with traditional academic incentives and reward structures. Researchers may face resistance or skepticism from colleagues or institutions that prioritize individual recognition and competition over collaboration and transparency

For notes:

Challenges for open science in terms of GenAI

Ethical concerns

GenAI can produce synthetic data, text, images, and even academic papers that closely mimic real data or scholarly work. However, there are ethical implications regarding the use of AI-generated content, including issues related to authorship, intellectual property rights, and potential misuse for deception or manipulation. Addressing these ethical concerns and ensuring responsible AI use is essential for maintaining academic integrity in open science

For notes:

Challenges for open science in terms of GenAI

Quality and validity of AI-generated content

The quality and validity of AI-generated content can vary widely depending on the training data, algorithms, and model architectures used. Ensuring the accuracy, reliability, and relevance of AI-generated content poses challenges, particularly in fields where rigorous validation and verification are critical, such as biomedical research or climate science. Researchers must develop robust methodologies for evaluating and validating AI-generated content to maintain the integrity of open science practices

For notes:

Challenges for open science in terms of GenAI

Bias and fairness

GenAI models are susceptible to biases present in the training data, which can result in biased or unfair outputs. Biases in AI-generated content can perpetuate existing inequalities, reinforce stereotypes, and undermine the inclusivity and diversity goals of open science initiatives. Addressing bias and ensuring fairness in AI-generated content requires careful consideration of the training data, algorithmic design, and evaluation metrics to mitigate potential harms and promote equitable outcomes

For notes:

Challenges for open science in terms of GenAI

Transparency and interpretability

GenAI models are often complex and opaque, making it challenging to understand how they generate outputs and assess their reliability. Lack of transparency and interpretability in AI-generated content can hinder reproducibility, peer review, and validation efforts in open science. Researchers must develop methods for transparently documenting AI model architectures, training procedures, and decision-making processes to enhance trust and accountability in AI-generated content

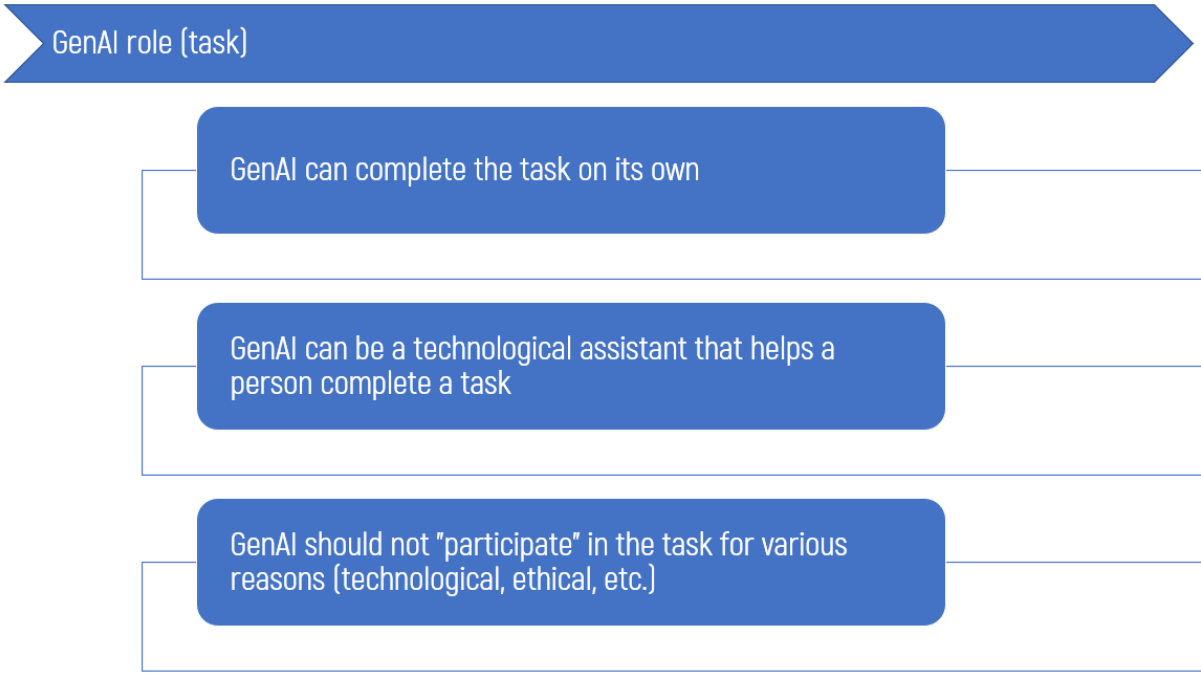
For notes:

Challenges for open science in terms of GenAI

Security and privacy risks

AI-generated content can pose security and privacy risks, particularly if it contains sensitive or personal information. There is a risk of unintentionally disclosing sensitive data or vulnerabilities through AI-generated content, leading to privacy breaches or security threats. Protecting against security risks and ensuring data privacy are essential considerations when integrating GenAI technologies into open science practices

For notes:


GenAI role (task)
GenAI can complete the task on its own
GenAI can be a technological assistant that helps a person complete a task
GenAI should not "participate" in the task for various reasons (technological, ethical, etc.)

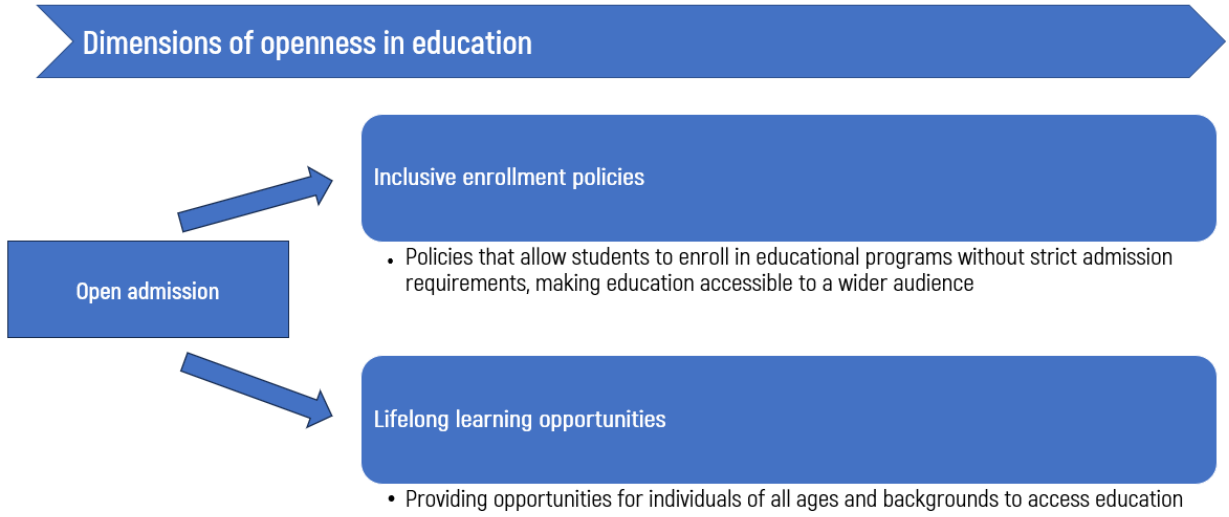
For notes:

Integrity at various stages of the GenAI application

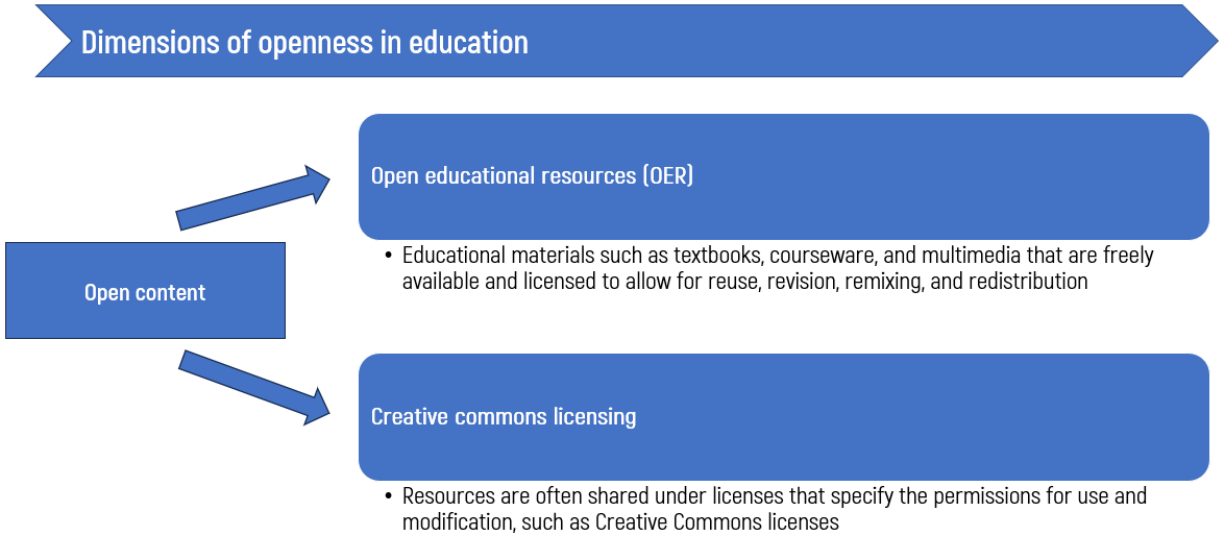
- Choosing the purpose of use: GenAI can be used as a ghostwriting tool and actually becomes a paper mill
- Usage process: GenAI may receive an incorrect question from the user, which will cause it to generate content with falsifications
- The "product" of GenAI may contain violations of academic integrity
- Using the "product" of the GenAI to commit violations of academic integrity (cheats for exams, online answers during the performance of assessment tasks, unauthorized collaboration, etc.)

For notes:

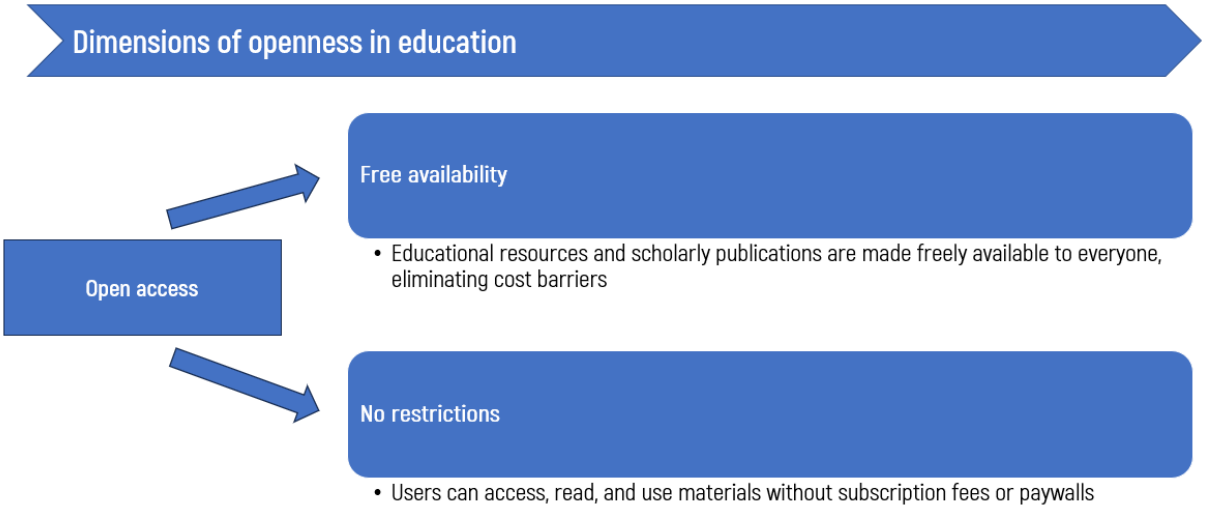
OPEN EDUCATIONAL RESOURCES: EVERYTHING BETTER IS HERE AND NOW


Dimensions of openness in education
Open admission
Inclusive enrollment policies
• Policies that allow students to enroll in educational programs without strict admission requirements, making education accessible to a wider audience
Lifelong learning opportunities
• Providing opportunities for individuals of all ages and backgrounds to access education

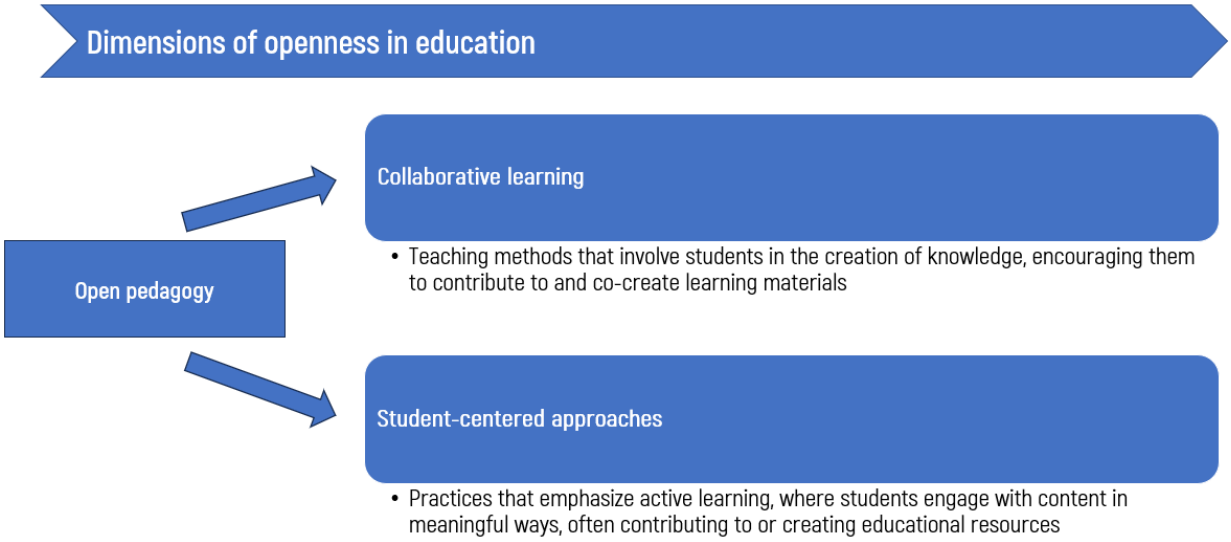
For notes:


Dimensions of openness in education
Open content
Open educational resources (OER)
• Educational materials such as textbooks, courseware, and multimedia that are freely available and licensed to allow for reuse, revision, remixing, and redistribution
Creative commons licensing
• Resources are often shared under licenses that specify the permissions for use and modification, such as Creative Commons licenses

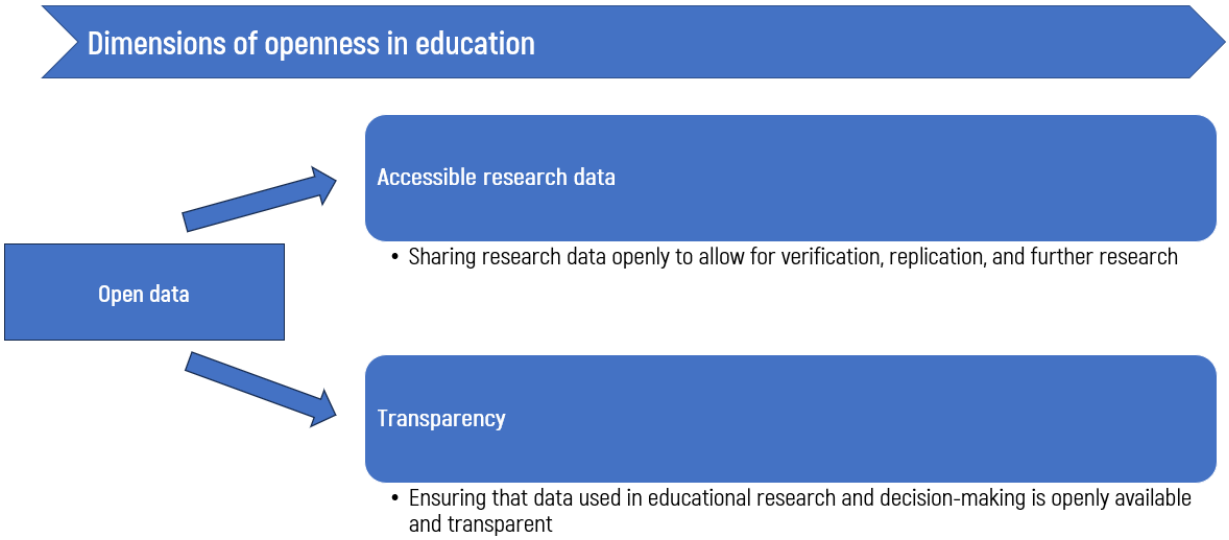
For notes:


Dimensions of openness in education
Open access
Free availability
• Educational resources and scholarly publications are made freely available to everyone, eliminating cost barriers
No restrictions
• Users can access, read, and use materials without subscription fees or paywalls

For notes:

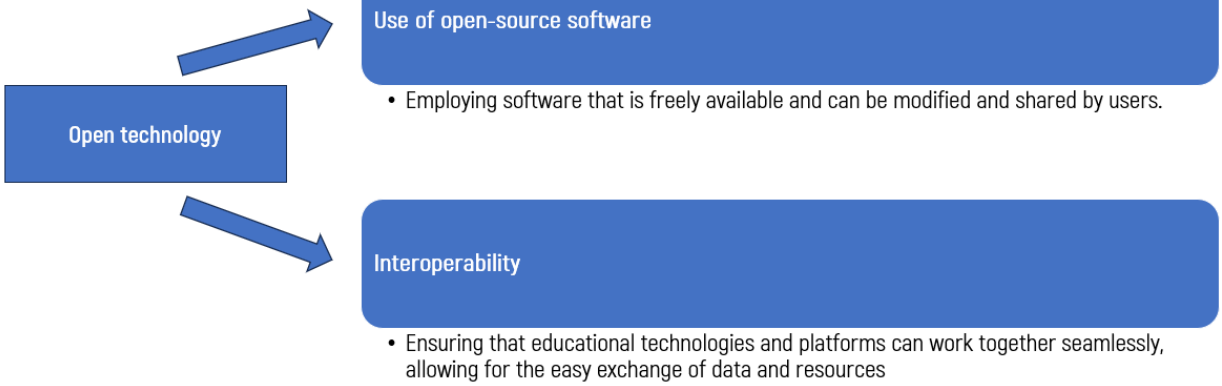

Dimensions of openness in education
Open pedagogy
Collaborative learning
• Teaching methods that involve students in the creation of knowledge, encouraging them to contribute to and co-create learning materials
Student-centered approaches
• Practices that emphasize active learning, where students engage with content in meaningful ways, often contributing to or creating educational resources

For notes:


Dimensions of openness in education
Open data
Accessible research data
• Sharing research data openly to allow for verification, replication, and further research
Transparency
• Ensuring that data used in educational research and decision-making is openly available and transparent

For notes:

Dimensions of openness in education



For notes:


Dimensions of openness in education
Open policy
Supportive policies
• Developing and implementing policies that encourage and support the creation, adoption, and sharing of open educational resources and practices
Institutional commitment
• Institutions committing to openness through strategic plans and resource allocation

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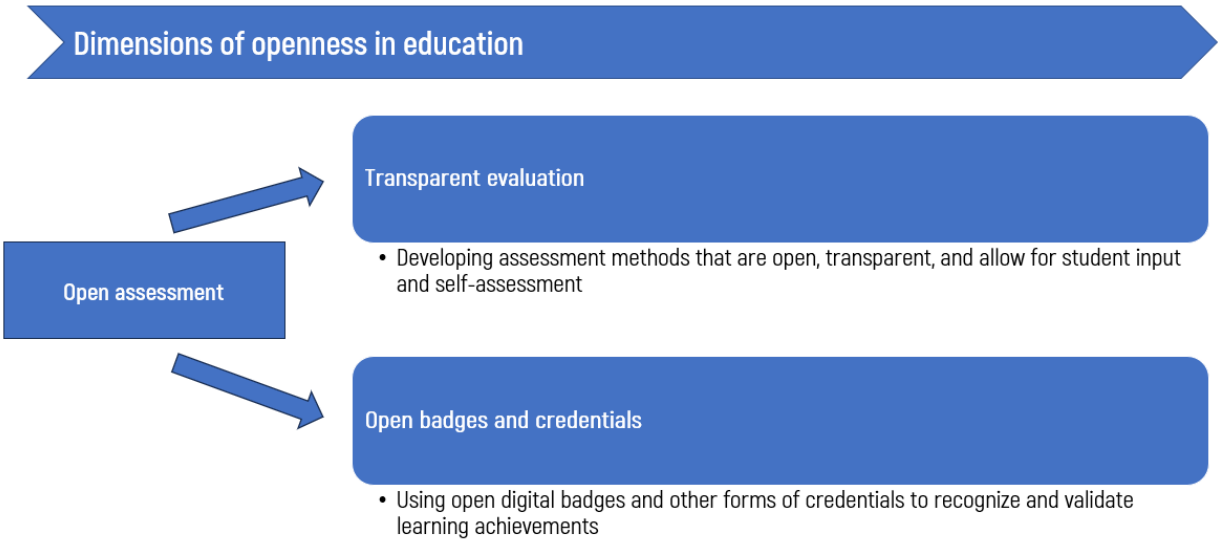
Dimensions of openness in education
Open assessment
Transparent evaluation
• Developing assessment methods that are open, transparent, and allow for student input and self-assessment
Open badges and credentials
• Using open digital badges and other forms of credentials to recognize and validate learning achievements

For notes:


Dimensions of openness in education
Open collaboration
Global partnerships
• Forming partnerships and collaborations across institutions and countries to share resources, knowledge, and best practices
Community involvement
• Engaging with communities to co-create and share educational resources

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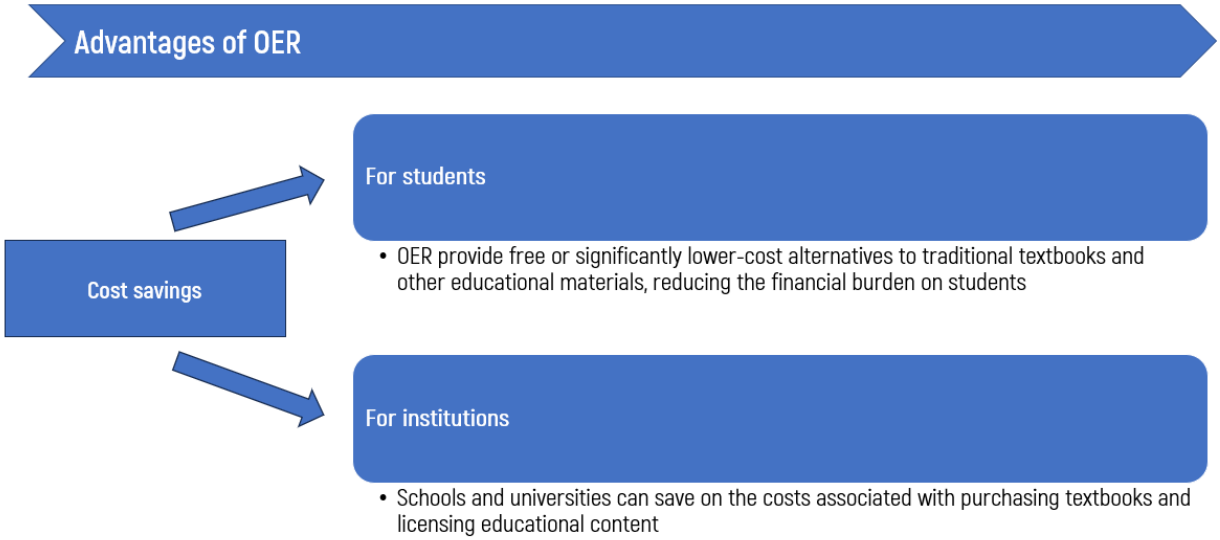
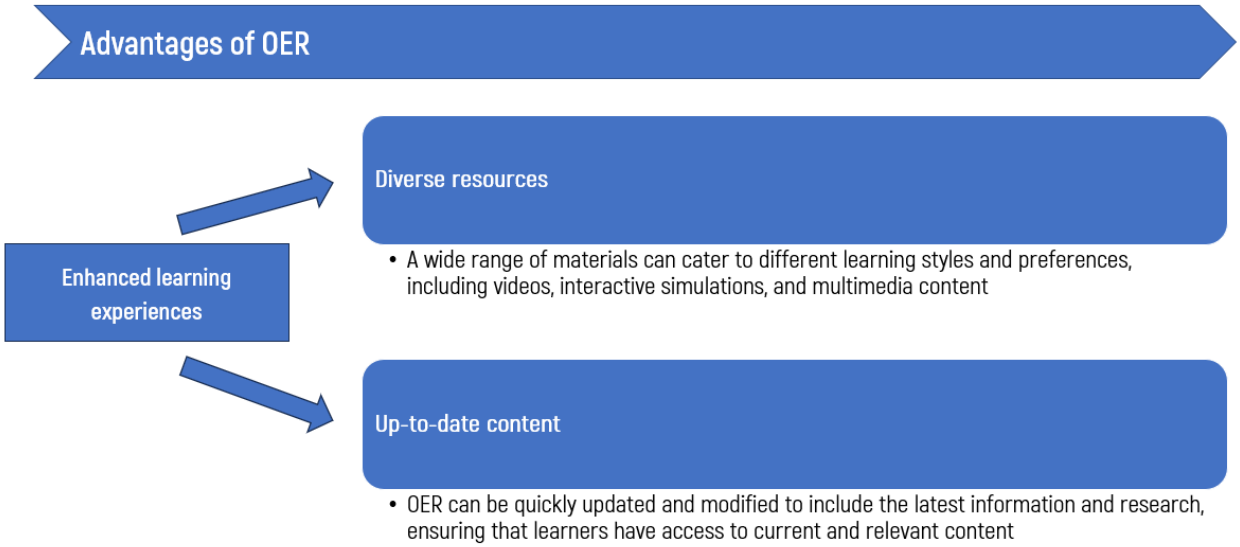

Advantages of OER
Cost savings
For students
• OER provide free or significantly lower-cost alternatives to traditional textbooks and other educational materials, reducing the financial burden on students
For institutions
• Schools and universities can save on the costs associated with purchasing textbooks and licensing educational content

For notes:


Advantages of OER
Increased ccess to education
Global reach
• OER can be accessed by anyone with an internet connection, breaking down geographical and economic barriers to education
Inclusivity
• They support lifelong learning and provide educational opportunities for non-traditional students, including adult learners, working professionals, and individuals in remote areas

For notes:


Advantages of OER
Enhanced learning experiences
Diverse resources
• A wide range of materials can cater to different learning styles and preferences, including videos, interactive simulations, and multimedia content
Up-to-date content
• OER can be quickly updated and modified to include the latest information and research, ensuring that learners have access to current and relevant content

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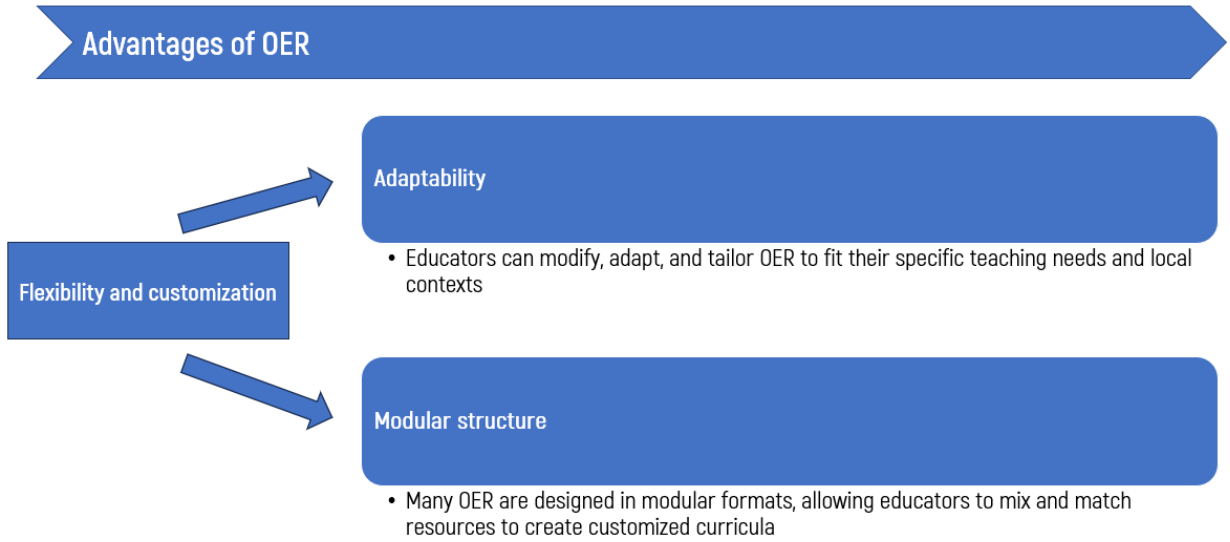
Advantages of OER
Flexibility and customization
Adaptability
• Educators can modify, adapt, and tailor OER to fit their specific teaching needs and local contexts
Modular structure
• Many OER are designed in modular formats, allowing educators to mix and match resources to create customized curricula

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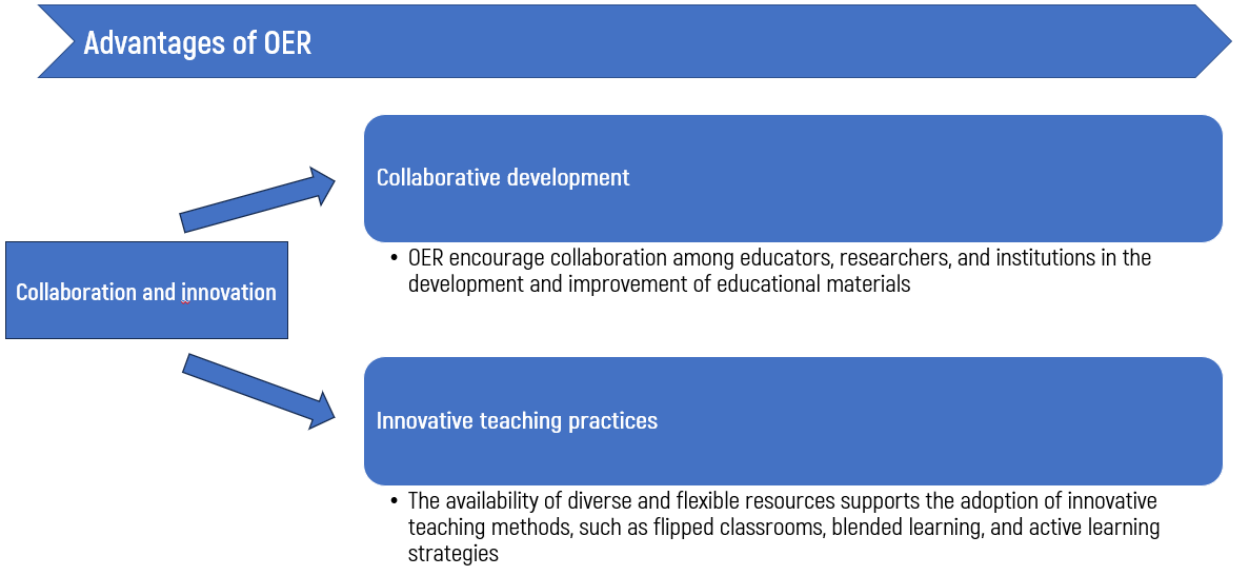
Advantages of OER
Collaboration and innovation
Collaborative development
• OER encourage collaboration among educators, researchers, and institutions in the development and improvement of educational materials
Innovative teaching practices
• The availability of diverse and flexible resources supports the adoption of innovative teaching methods, such as flipped classrooms, blended learning, and active learning strategies

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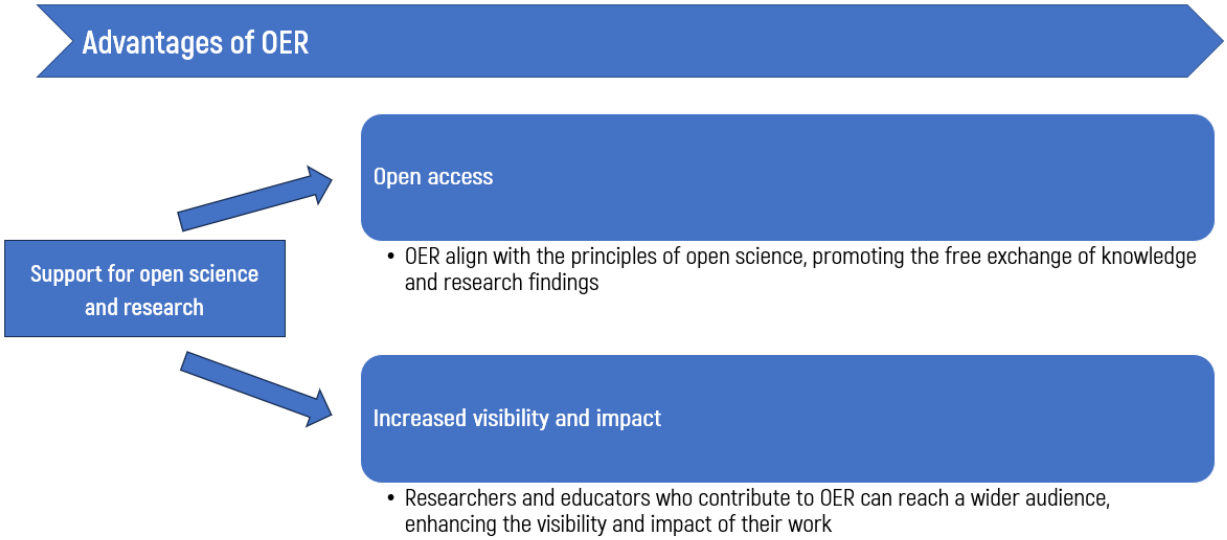
Advantages of OER
Support for open science and research
Open access
• OER align with the principles of open science, promoting the free exchange of knowledge and research findings
Increased visibility and impact
• Researchers and educators who contribute to OER can reach a wider audience, enhancing the visibility and impact of their work

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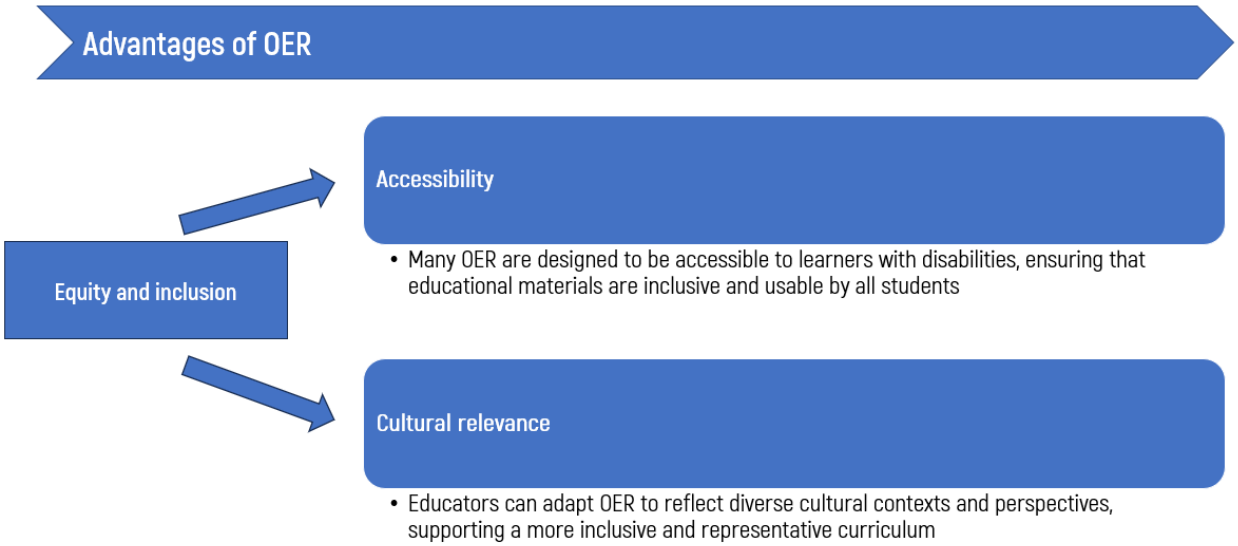
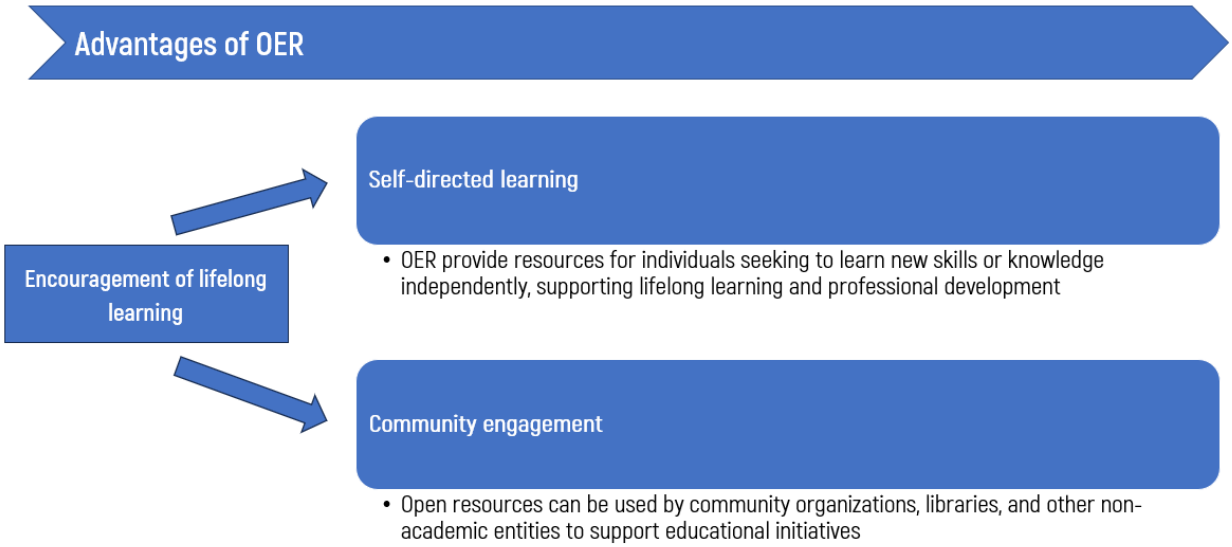

Advantages of OER
Equity and inclusion
Accessibility
• Many OER are designed to be accessible to learners with disabilities, ensuring that educational materials are inclusive and usable by all students
Cultural relevance
• Educators can adapt OER to reflect diverse cultural contexts and perspectives, supporting a more inclusive and representative curriculum

For notes:


Advantages of OER
Encouragement of lifelong learning
Self-directed learning
• OER provide resources for individuals seeking to learn new skills or knowledge independently, supporting lifelong learning and professional development
Community engagement
• Open resources can be used by community organizations, libraries, and other non-academic entities to support educational initiatives

For notes:

Challenges for OER

Quality and credibility

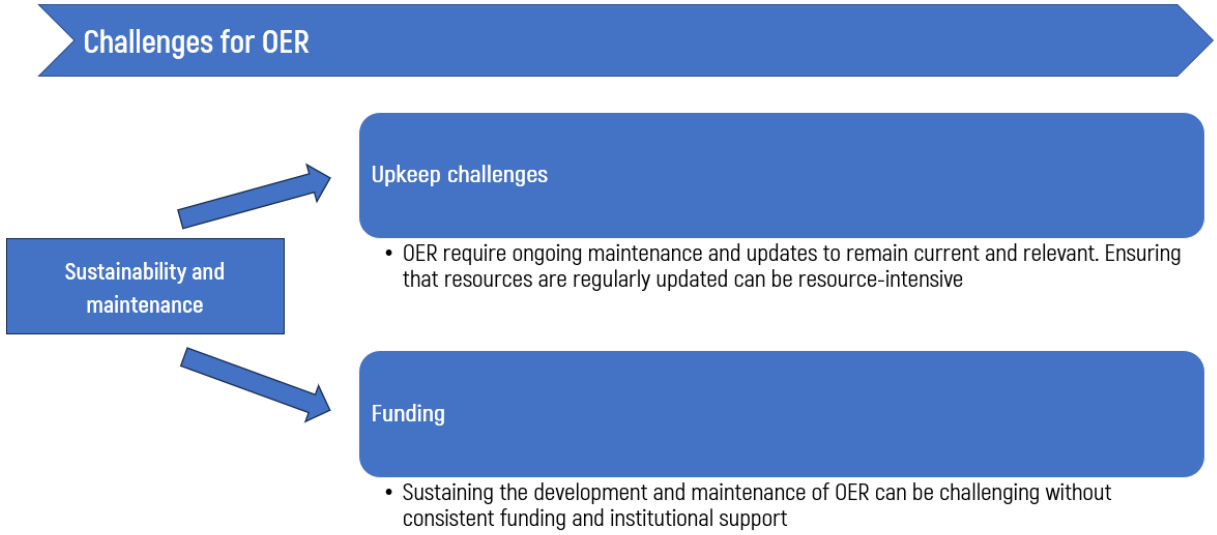
Variable quality

- The quality of OER can be inconsistent, with some resources lacking rigor, accuracy, or comprehensive coverage of topics

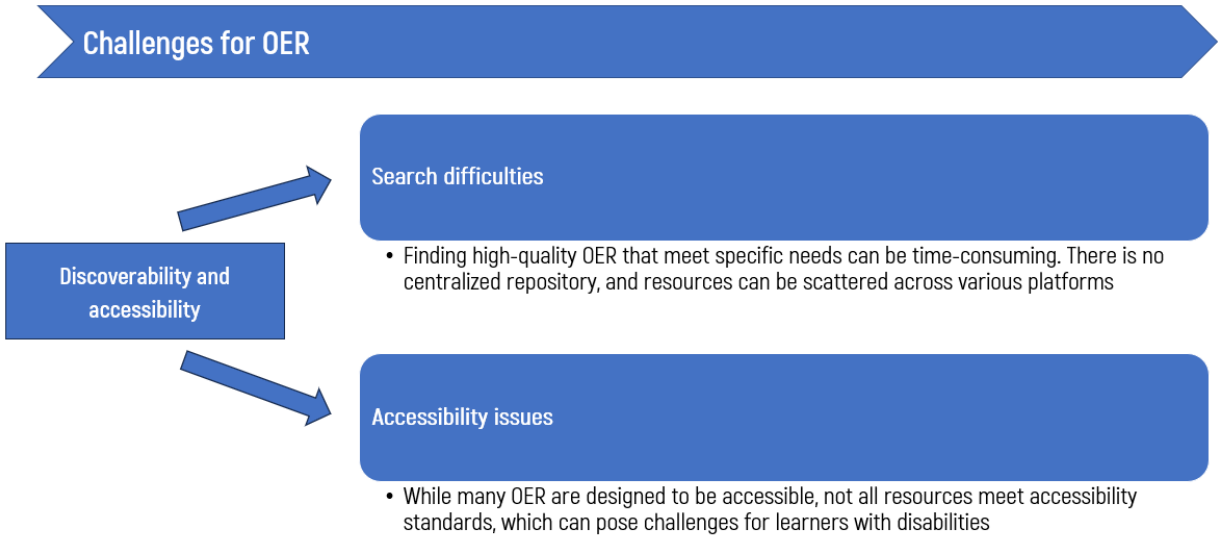
Lack of peer review

- Not all OER undergo the same level of peer review as traditional textbooks and academic materials, which can raise concerns about their reliability and academic integrity

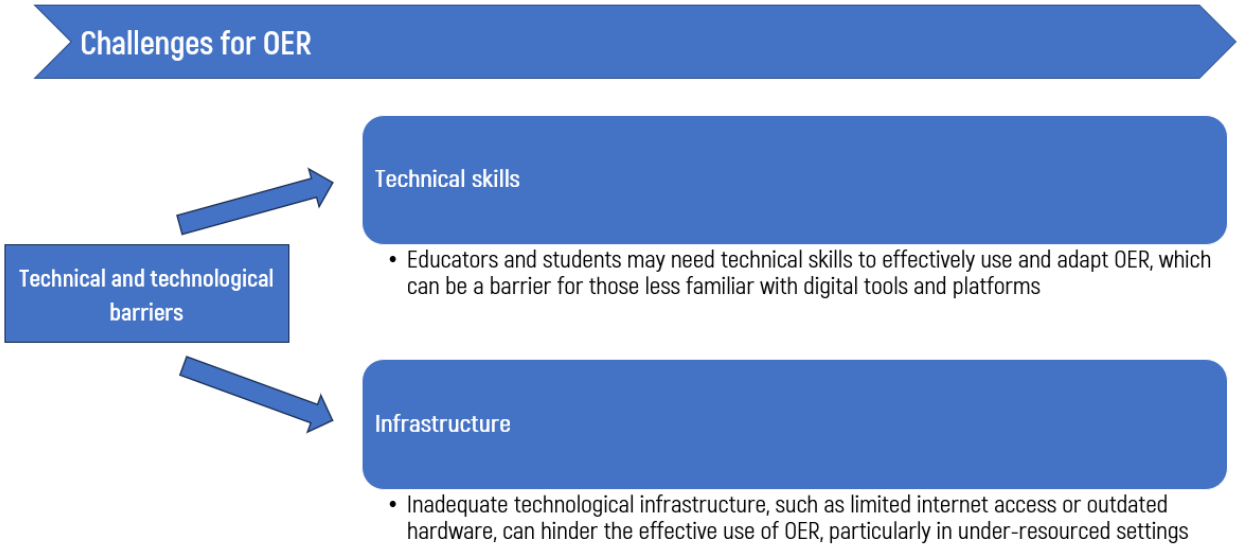
For notes:


Challenges for OER
Sustainability and maintenance
Upkeep challenges
• OER require ongoing maintenance and updates to remain current and relevant. Ensuring that resources are regularly updated can be resource-intensive
Funding
• Sustaining the development and maintenance of OER can be challenging without consistent funding and institutional support

For notes:


Challenges for OER
Discoverability and accessibility
Search difficulties
• Finding high-quality OER that meet specific needs can be time-consuming. There is no centralized repository, and resources can be scattered across various platforms
Accessibility issues
• While many OER are designed to be accessible, not all resources meet accessibility standards, which can pose challenges for learners with disabilities

For notes:


Challenges for OER
Technical and technological barriers
Technical skills
• Educators and students may need technical skills to effectively use and adapt OER, which can be a barrier for those less familiar with digital tools and platforms
Infrastructure
• Inadequate technological infrastructure, such as limited internet access or outdated hardware, can hinder the effective use of OER, particularly in under-resourced settings

For notes:


Challenges for OER
Legal and licensing issues
Licensing confusion
Understanding and adhering to the various open licenses (e.g., Creative Commons) can be complex and confusing, leading to potential misuse or misinterpretation of licensing terms
Intellectual property
Properly attributing and respecting intellectual property rights when modifying and sharing OER can be challenging

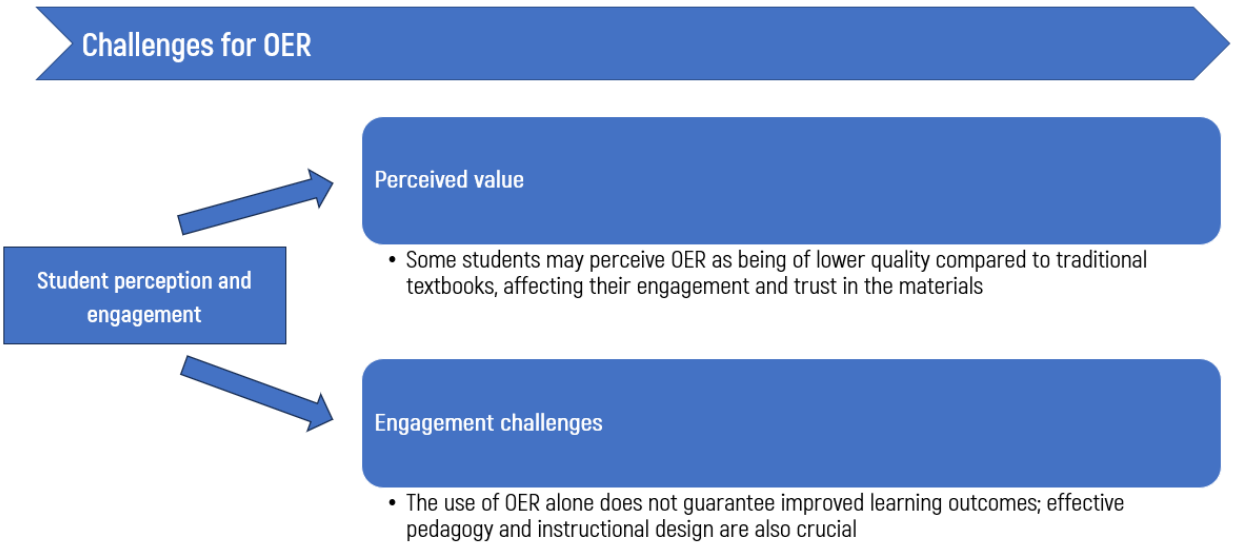
For notes:


Challenges for OER
Lack of institutional support
Recognition and incentives
• Institutions may not recognize or incentivize the creation and use of OER, leading to a lack of motivation among educators to develop and adopt open resources
Professional development
• Limited training and professional development opportunities can hinder educators' ability to effectively integrate OER into their teaching practices

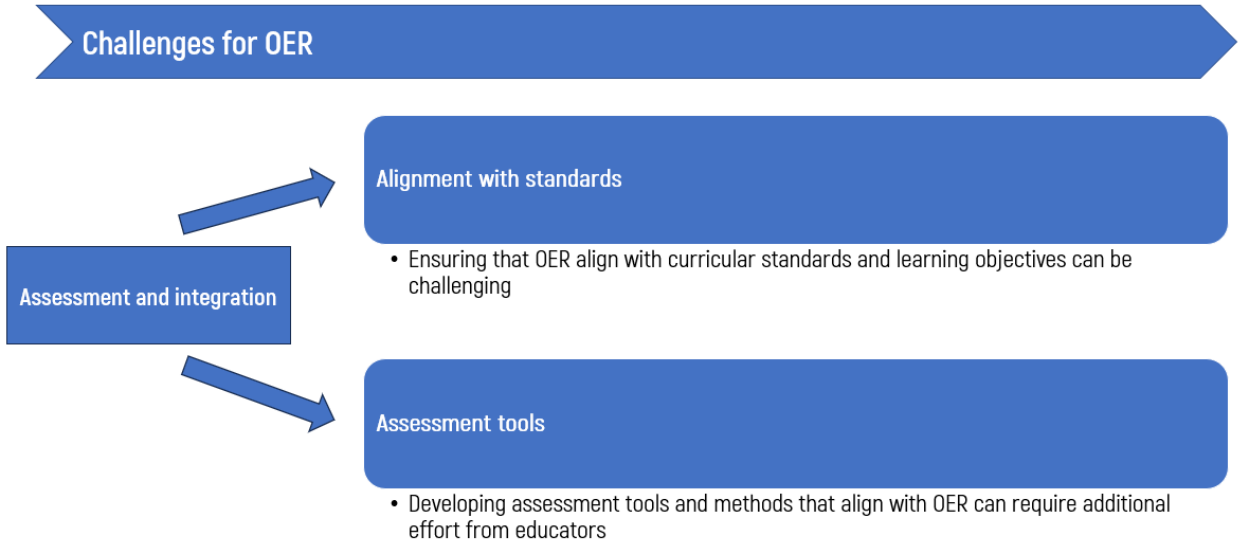
For notes:


Challenges for OER
Cultural and contextual relevance
Cultural bias
• Some OER may reflect cultural biases or lack relevance to certain contexts, making it necessary to adapt resources to suit local needs and perspectives
Localization efforts
• Adapting and localizing OER to ensure cultural relevance and appropriateness can be time-consuming and require significant effort

For notes:


Challenges for OER
Student perception and engagement
Perceived value
• Some students may perceive OER as being of lower quality compared to traditional textbooks, affecting their engagement and trust in the materials
Engagement challenges
• The use of OER alone does not guarantee improved learning outcomes; effective pedagogy and instructional design are also crucial

For notes:


Challenges for OER
Assessment and integration
Alignment with standards
• Ensuring that OER align with curricular standards and learning objectives can be challenging
Assessment tools
• Developing assessment tools and methods that align with OER can require additional effort from educators

For notes:

Advantages of OER usage: students' pragmatic approach

Free materials

Students can access educational resources without financial burdens, making learning more affordable

Permanent access to resources

OER provides students with ongoing access to materials, allowing them to review and use resources whenever needed, even after the course ends

Ability to thoroughly cover a topic

Open educational resources often include comprehensive materials that allow students to explore subjects in depth, enhancing their understanding and mastery of the topic

Ability to learn for personal knowledge or enjoyment

Students can use OER to pursue learning beyond their formal studies, satisfying personal interests and intellectual curiosity

Easy access to materials

With OER available online, students can quickly and conveniently access the materials they need from anywhere, at any time, using various devices

For notes:

Obstacles of OER usage: students' pragmatic approach

Lack of need

Students may not feel the need to seek out OER if their current resources are sufficient

Lack of awareness of OER availability

Many students are unaware that OER exist or do not know where to find them

Satisfactory alternative resources

Existing textbooks and resources may already meet their needs, reducing the incentive to look for OER

Indifference to specific OER

Students may not be particularly interested in or motivated by the specific OER available to them.

Unattractiveness of OER

Some OER may lack the visual appeal or engaging design that students expect from educational materials

Use of other resources

Students might already be using other resources, such as library books, paid subscriptions, or other digital content

Never considered it

The idea of using OER might simply never have occurred to them

For notes:

OER and MOOC: are there differences?

	OER	MOOC
Definition	OER are freely accessible, openly licensed text, media, and other digital assets used for teaching, learning, and research	MOOCs are online courses designed for large-scale participation and open access via the internet
Components	OER can include textbooks, curricula, syllabi, lecture notes, assignments, tests, projects, audio, video, and any other materials used to support education	Typically include course materials, video lectures, readings, assignments, quizzes, and forums for discussion
Accessibility	OER are available for free and can be accessed by anyone, anywhere	MOOCs are generally free to access, but some may charge for certificates of completion or additional features
Licensing	Typically shared under Creative Commons licenses, allowing users to freely use, adapt, and distribute the materials	Not all MOOCs are openly licensed. While many materials within MOOCs can be open, the course itself may have specific usage rights
Purpose	Primarily focused on providing resources that can be used and adapted by educators and students. Encourages the reuse, redistribution, revision, and remixing of educational materials	Designed to provide structured learning experiences, often mirroring the structure of traditional courses. Aims to provide access to high-quality education from universities and institutions to a global audience.
Format	Often individual resources or collections of resources that can be used independently or as part of a course	Delivered as complete courses, often with a start and end date, and structured around a syllabus. May include interactive elements such as peer assessments, online forums, and virtual classrooms

For notes:

OER and MOOC: are there differences?

	OER	MOOC
Structure	Individual resources that can be used independently or integrated into a variety of educational settings	Complete courses designed to be taken as a whole, often following a set schedule
Interactivity	Primarily static resources, though they can include interactive elements	Highly interactive, with forums, peer assessments, and sometimes live interactions
Usage	Used by educators to create and supplement their courses, or by learners independently	Enrolled in by learners as a full course, often with the goal of completing it for personal or professional development
Certification	Typically, do not offer certificates of completion	Often offer certificates of completion, sometimes for a fee

For notes:

OER and OCW: are there differences?

	OER	OCW
Content structure	Can be any educational material and is often modular and standalone	Comprises full course packages that include all materials for a specific course as offered by an institution
Creation and source	Created by various educators, institutions, and organizations around the world; not necessarily tied to a specific course	Created and published by educational institutions, reflecting their actual courses
Use case	Used flexibly by educators to create or supplement courses and by learners for various educational purposes	Typically used by learners for self-study or by educators as a reference or model for designing their own courses

For notes:

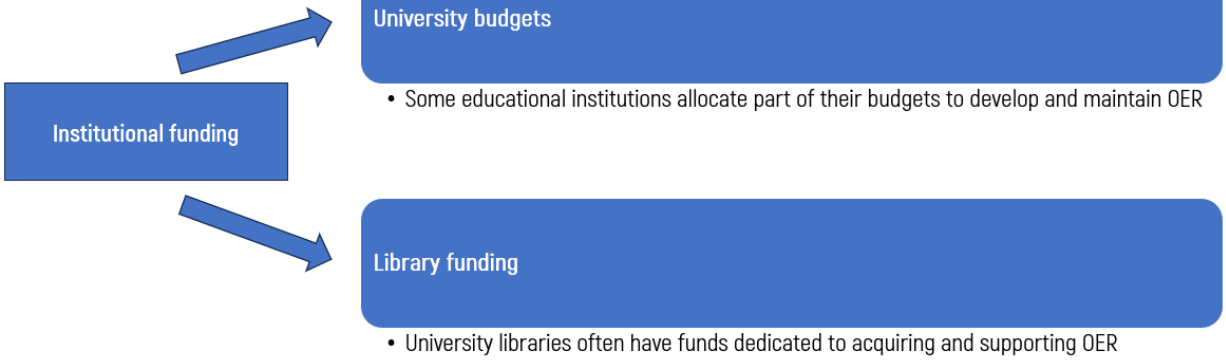
OER financial support models (free for you, but someone must pay ☺)

For notes:


OER financial support models (free for you, but someone must pay ☺)
Foundation and philanthropic support
Grants from foundations
• Various foundations offer grants specifically for OER projects
Philanthropic donations
• Donations from philanthropists and charitable organizations can provide substantial financial support for OER initiatives

For notes:

OER financial support models (free for you, but someone must pay ☺)



For notes:


OER financial support models (free for you, but someone must pay ☺)
Consortia and partnerships
Collaborative funding
• Groups of institutions form consortia to pool resources and share the costs of developing and maintaining OER
Public-private partnerships
• Collaborations between educational institutions and private sector companies can provide funding and resources for OER projects

For notes:


OER financial support models (free for you, but someone must pay ☺)
Revenue-generating activities
Freemium models
• Offering basic OER content for free while charging for additional features, services, or premium content
Content licensing
• Licensing OER content to other institutions or organizations for a fee
Advertising and sponsorships
• Generating revenue through advertisements on OER platforms or securing sponsorships from companies

For notes:


OER financial support models (free for you, but someone must pay ☺)
Crowdfunding and community support
Crowdfunding campaigns
• Platforms like Kickstarter or GoFundMe can be used to raise funds from the public to support OER projects
Alumni and community donations
• Alumni and community members can contribute financially to support OER development

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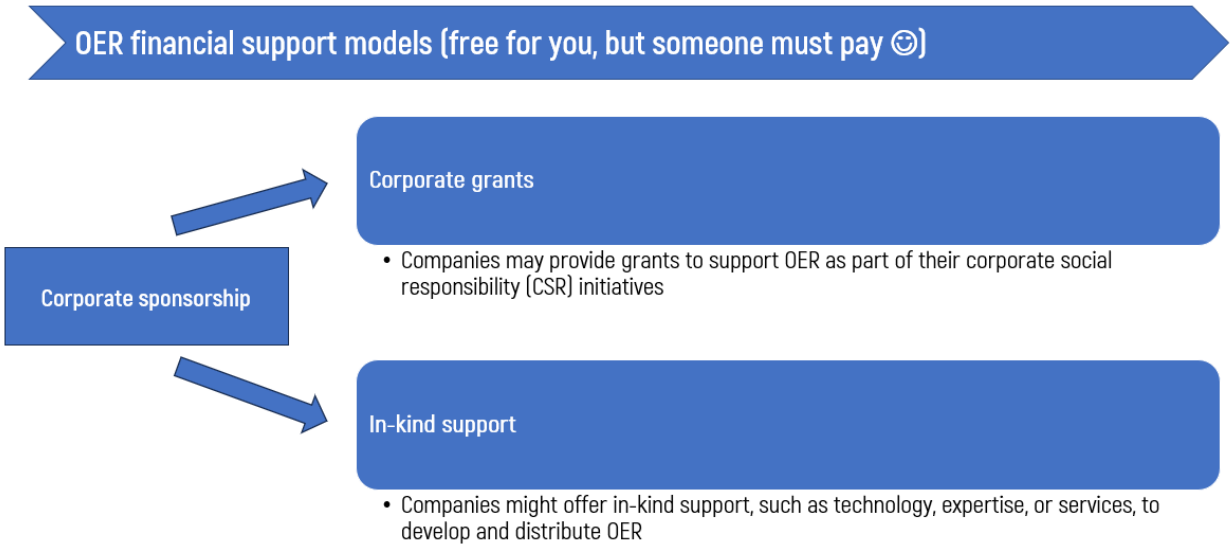
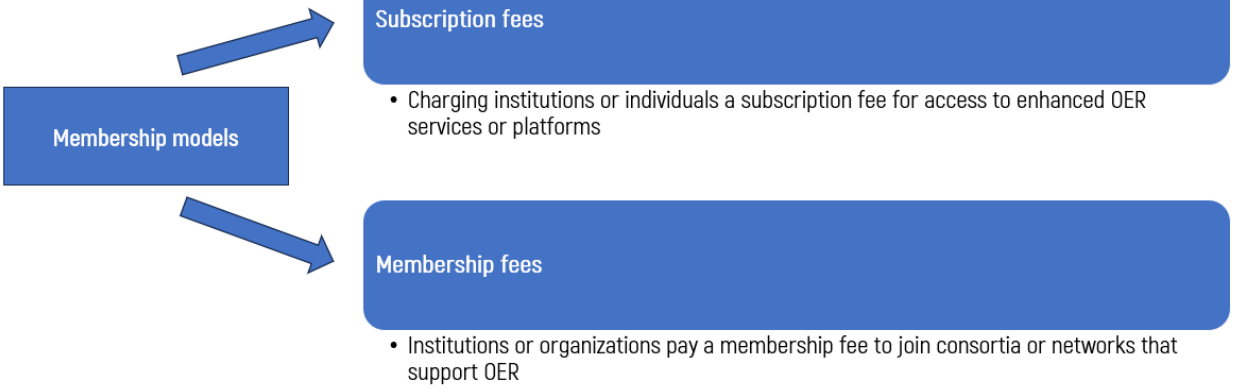

OER financial support models (free for you, but someone must pay ☺)
Corporate sponsorship
Corporate grants
• Companies may provide grants to support OER as part of their corporate social responsibility (CSR) initiatives
In-kind support
• Companies might offer in-kind support, such as technology, expertise, or services, to develop and distribute OER

For notes:

OER financial support models (free for you, but someone must pay ☺)

For notes:

OER financial support models (free for you, but someone must pay ☺)



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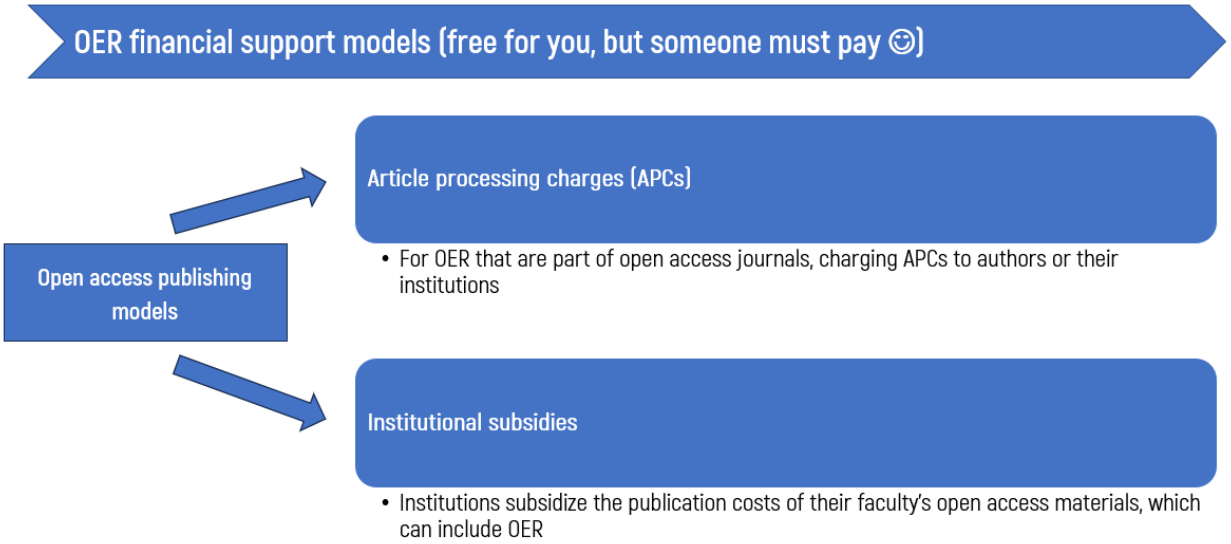
OER financial support models (free for you, but someone must pay ☺)
Open access publishing models
Article processing charges (APCs)
• For OER that are part of open access journals, charging APCs to authors or their institutions
Institutional subsidies
• Institutions subsidize the publication costs of their faculty's open access materials, which can include OER

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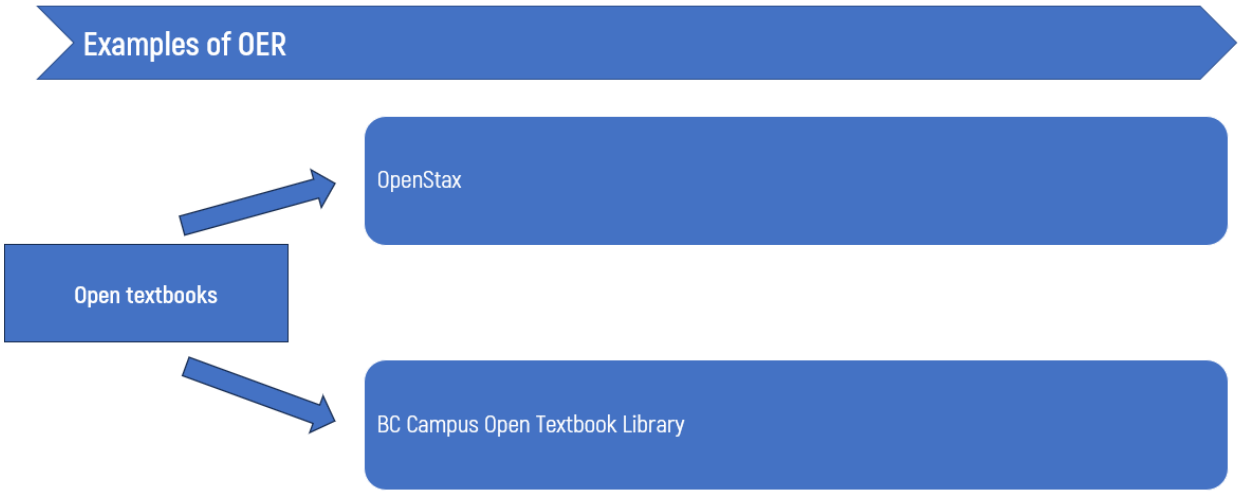

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https://open.bccampus.ca/

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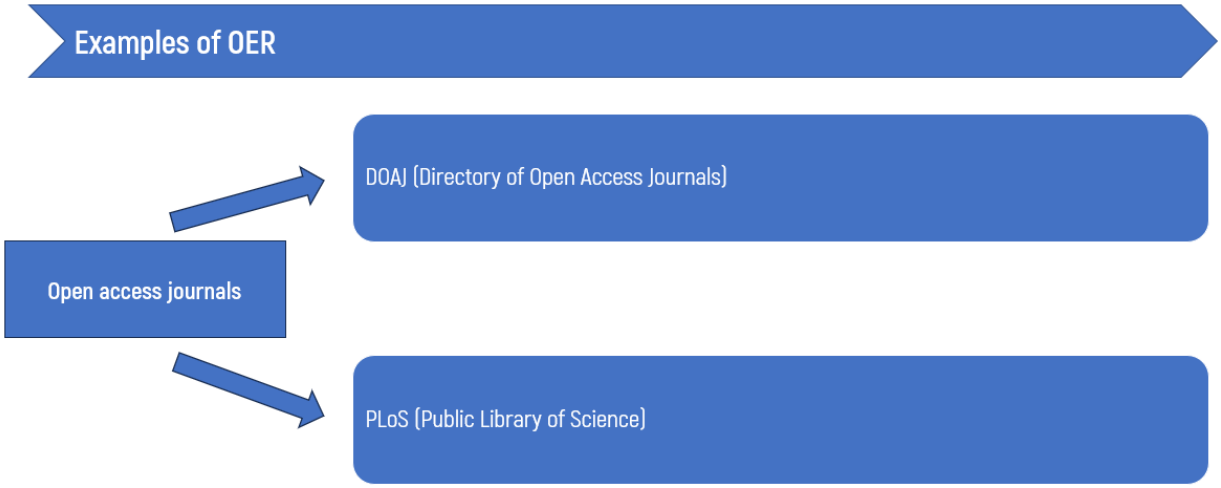

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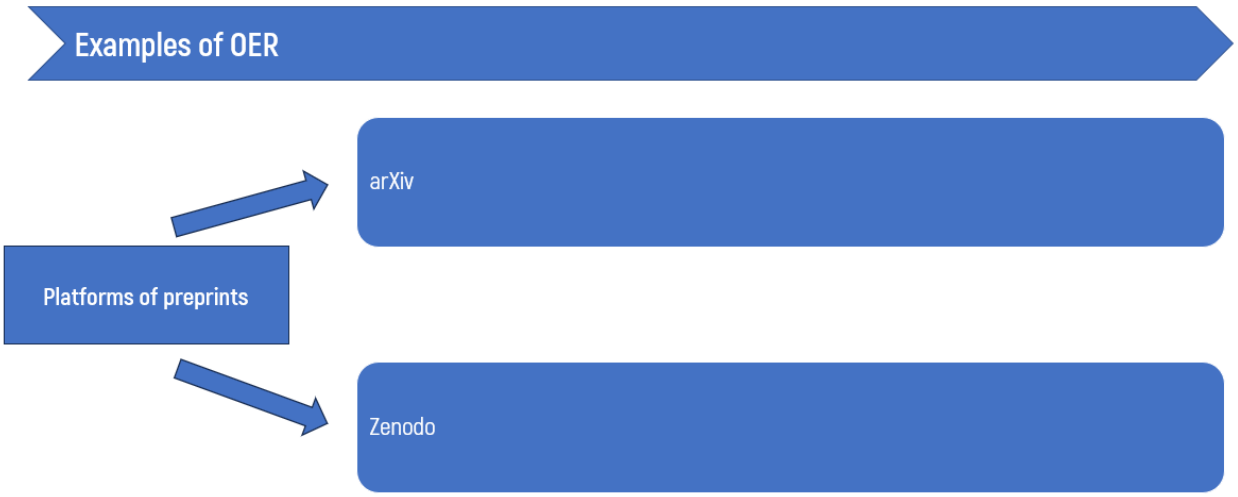

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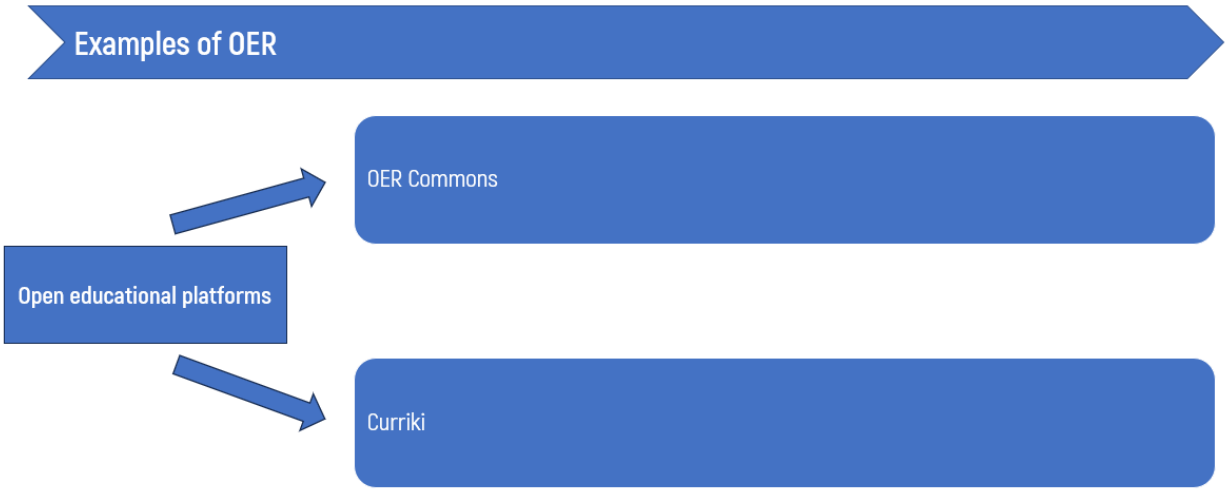

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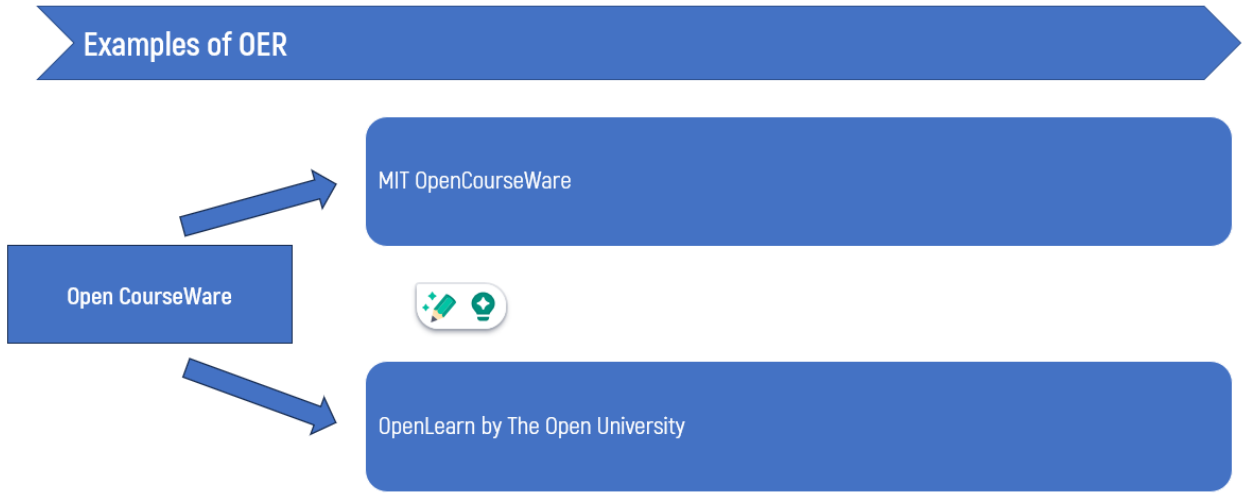

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https://www.open.edu/openlearn/

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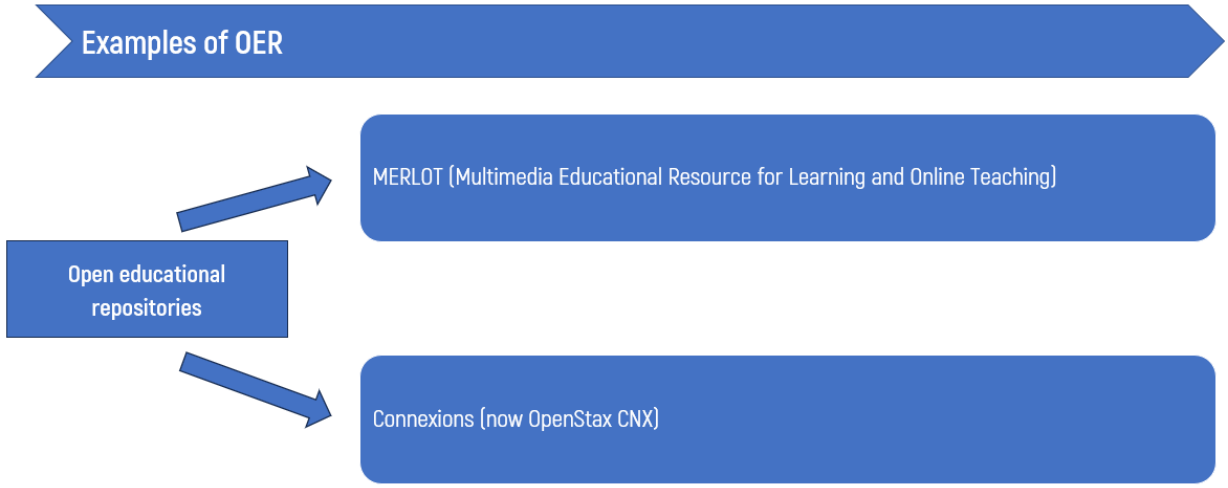

https://www.merlot.org/
https://cnx.org/

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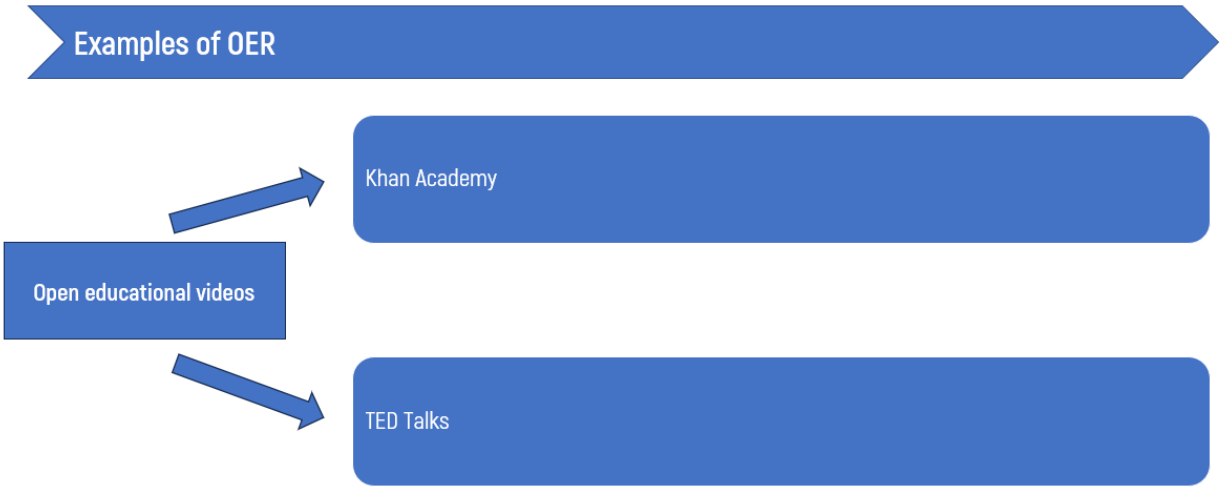

https://www.khanacademy.org/
https://www.ted.com/

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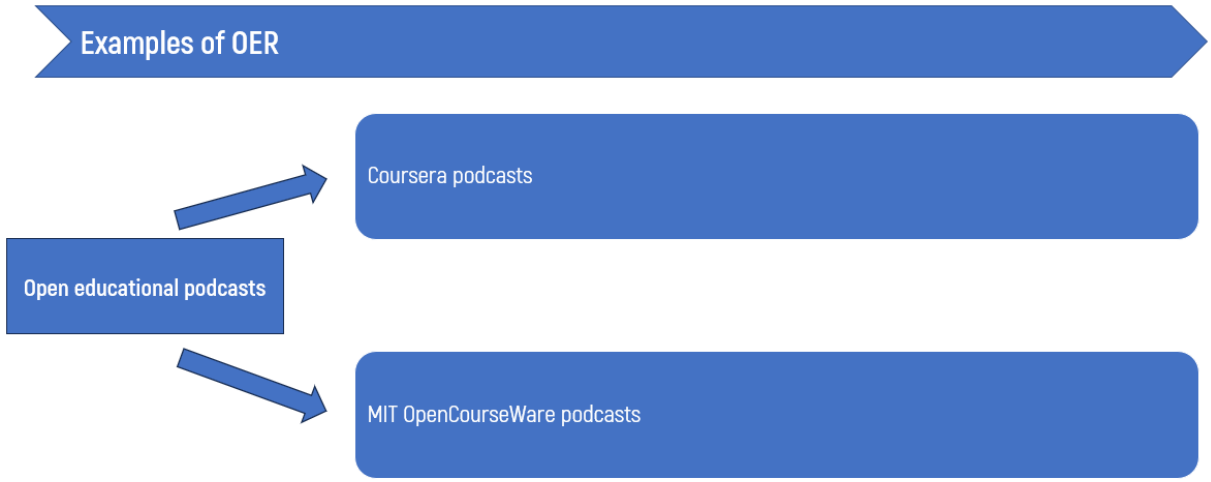

https://www.youtube.com/playlist?list=PLVext98k2eviCkVIIAD7gzD3RRQ_mXcOe
https://open.mit.edu/podcasts/

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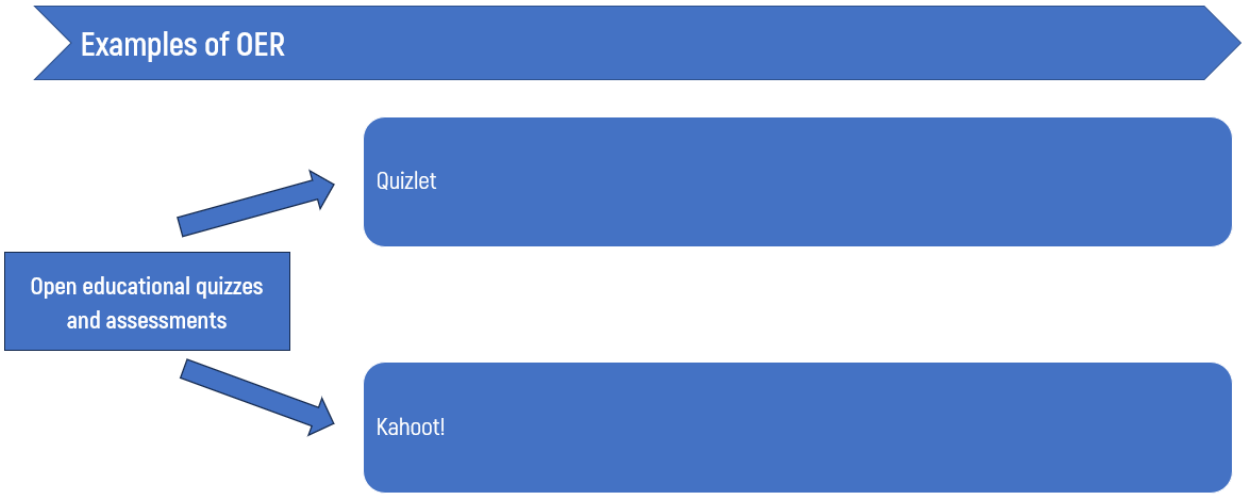
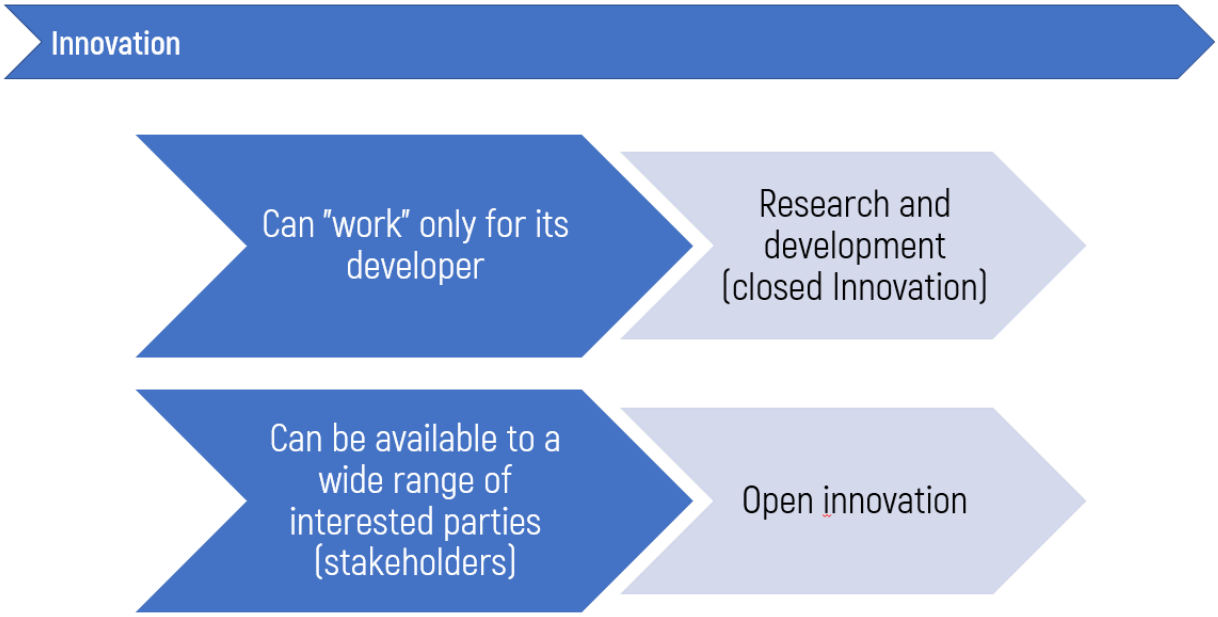


https://quizlet.com/
https://kahoot.com/

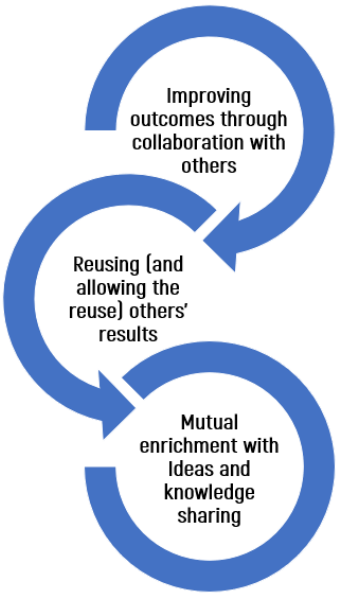
For notes:

OPEN INNOVATION: SYNERGISTIC EFFECT OF SCIENCE AND BUSINESS ACTIVITIES


Innovation
Can "work" only for its developer
Research and development (closed Innovation)
Can be available to a wide range of interested parties (stakeholders)
Open innovation

For notes:

Open innovation



The use of targeted inflow and outflow of knowledge to accelerate internal innovations and expand markets for external use of innovations accordingly

For notes:

Open innovation definitions

Henry Chesbrough's definition

Open innovation is a paradigm that assumes firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. This definition emphasizes the blending of external and internal knowledge to drive technological advancement and market growth

Collaborative innovation

Open innovation is the practice of sourcing ideas, technologies, and knowledge from external sources, such as customers, suppliers, universities, and other partners, to enhance the innovation process within an organization. This definition highlights the role of external collaboration in enhancing innovation

Market expansion

Open innovation is the strategy of leveraging external research, development, and commercialization to accelerate internal innovation and expand markets for external use of innovations. This perspective focuses on how open innovation can accelerate internal processes and create new market opportunities

For notes:

Open innovation definitions

Knowledge exchange

Open innovation is the systematic encouragement and exploration of a wide range of internal and external sources for innovation opportunities, intentionally sharing and integrating knowledge across organizational boundaries. This definition underscores the importance of knowledge sharing and integration across different entities

Ecosystem approach

Open innovation involves creating an innovation ecosystem where multiple stakeholders, including companies, researchers, and entrepreneurs, contribute to and benefit from shared innovation resources and outcomes. This approach emphasizes the ecosystem nature of open innovation, where multiple parties contribute and benefit

For notes:

Open Innovation "directions"

For notes:

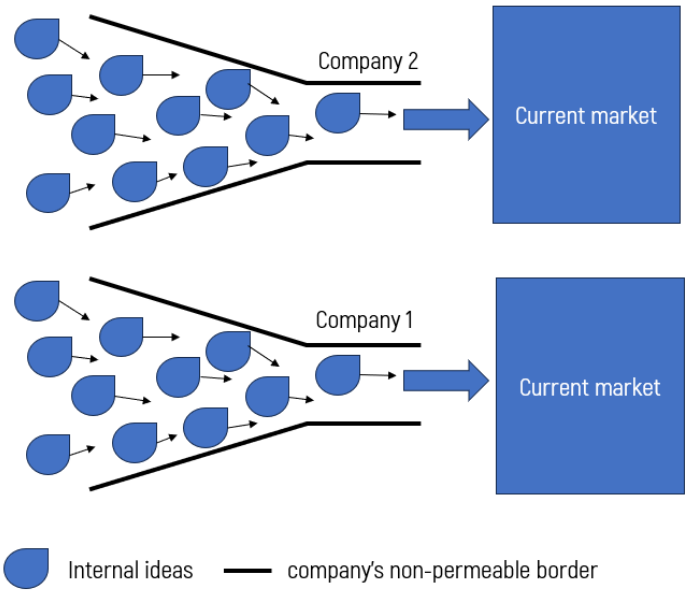
Closed innovation vs open innovation

Closed innovation companies operate under the belief that innovations are created by the company's staff, from idea generation to development and marketing. The innovation process occurs exclusively within the company. Closed innovation companies cannot open up to external information if they continue to use this model. All technologies, know-how, intellectual property, and processes remain under the control of the closed innovation company. To implement successful closed innovation, the company must consider certain factors, such as the high demands that closed innovation places on employees

Open innovation companies take the innovation process beyond the four walls of the business, extending the company's boundaries to the outside world to enhance innovation potential through active and strategic use of the surrounding environment. Innovations in open innovation companies occur through the combination of internal and external ideas, processes, technologies, and distribution channels to create the most innovative services, products, and/or business models. Customers, suppliers, employees, competitors, and companies from other industries can influence the idea creation processes of an open innovation company

For notes:

Closed innovation



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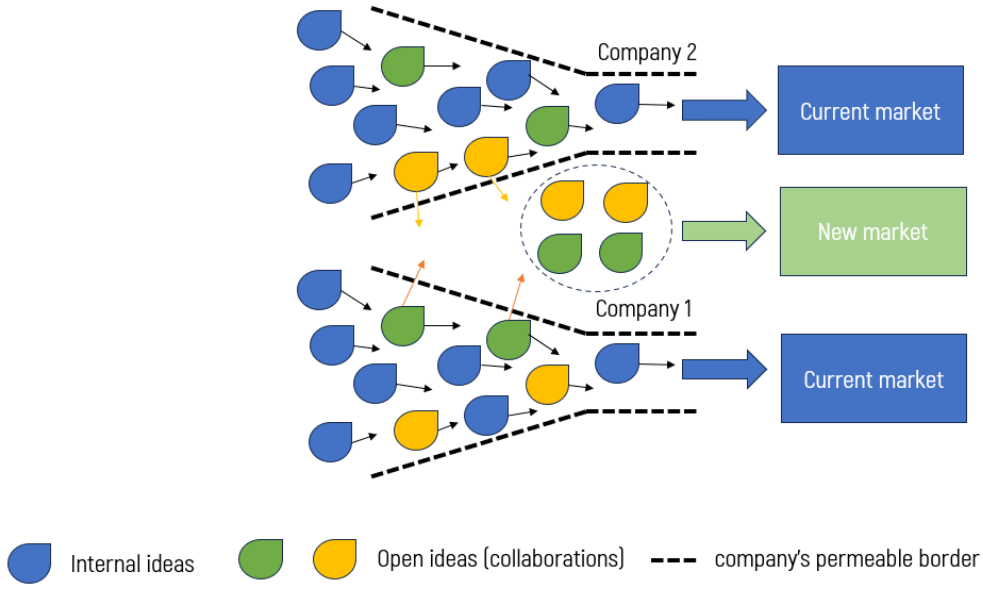
For notes:

Open innovation



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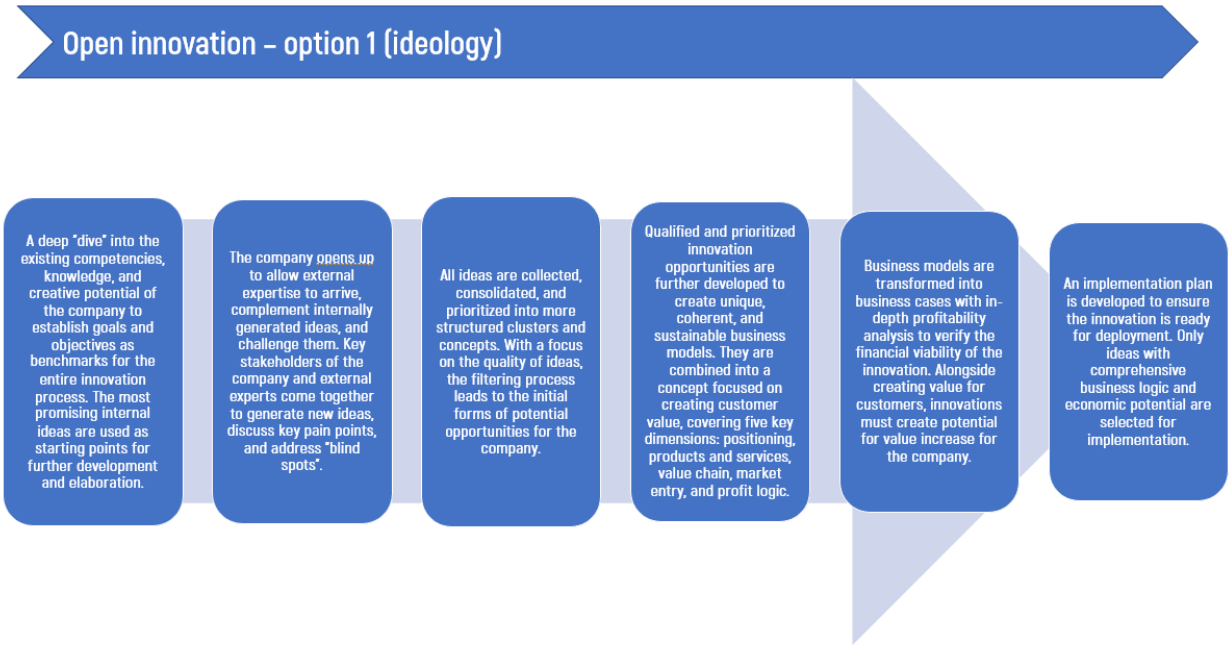

Open innovation – option 1 (ideology)
A deep "dive" into the existing competencies, knowledge, and creative potential of the company to establish goals and objectives as benchmarks for the entire innovation process. The most promising internal ideas are used as starting points for further development and elaboration.
The company opens up to allow external expertise to arrive, complement internally generated ideas, and challenge them. Key stakeholders of the company and external experts come together to generate new ideas, discuss key pain points, and address "blind spots".
All ideas are collected, consolidated, and prioritized into more structured clusters and concepts. With a focus on the quality of ideas, the filtering process leads to the initial forms of potential opportunities for the company.
Qualified and prioritized innovation opportunities are further developed to create unique, coherent, and sustainable business models. They are combined into a concept focused on creating customer value, covering five key dimensions: positioning, products and services, value chain, market entry, and profit logic.
Business models are transformed into business cases with in-depth profitability analysis to verify the financial viability of the innovation. Alongside creating value for customers, innovations must create potential for value increase for the company.
An implementation plan is developed to ensure the innovation is ready for deployment. Only ideas with comprehensive business logic and economic potential are selected for implementation.

For notes:

Open innovation – option 2 (technology)

1. Define objectives and strategy

- **Set clear goals**: determine what the organization aims to achieve with open innovation, such as improving product development, entering new markets, or enhancing operational efficiency
- **Align with business strategy**: ensure that open innovation efforts are aligned with the overall business strategy and objectives

2. Identify opportunities and needs

- **Internal assessment**: conduct an internal review to identify gaps, needs, and areas where external input could be beneficial
- **Market and technology scouting**: explore external sources for potential ideas, technologies, and partners. This can include monitoring market trends, academic research, and emerging technologies

3. Engage with external sources

- **Form partnerships**: establish collaborations with external entities such as universities, research institutions, startups, suppliers, customers, and other companies
- **Use crowdsourcing**: leverage crowdsourcing platforms to gather ideas and solutions from a broad audience
- **Participate in innovation networks**: join innovation networks and consortia to share knowledge and gain access to a wider pool of resources and expertise

4. Integrate external knowledge

- **Open innovation platforms**: utilize digital platforms that facilitate the integration of external ideas and technologies into the company's innovation process
- **Collaborative R&D**: engage in joint research and development projects with external partners

5. Intellectual property management

- **IP strategy**: develop a strategy for managing intellectual property that balances protection with openness. This might include licensing agreements, patents, and shared IP arrangements
- **IP negotiations**: negotiate terms with partners to ensure fair and mutually beneficial agreements regarding the use of IP

For notes:

Open innovation – option 2 (technology)

6. Develop and prototype

- **Collaborative development**: work closely with external partners to develop and prototype new products, services, or processes
- **Rapid prototyping**: use rapid prototyping techniques to quickly test and iterate on new ideas

7. Test and validate

- **Pilot programs**: implement pilot programs to test innovations in real-world settings
- **Gather feedback**: collect feedback from stakeholders, including customers, partners, and internal teams, to refine and improve the innovation

8. Commercialize and scale

- **Market introduction**: introduce the innovation to the market, leveraging external networks and partners for marketing and distribution
- **Scale up**: scale successful innovations, ensuring the necessary resources and capabilities are in place for large-scale production and deployment

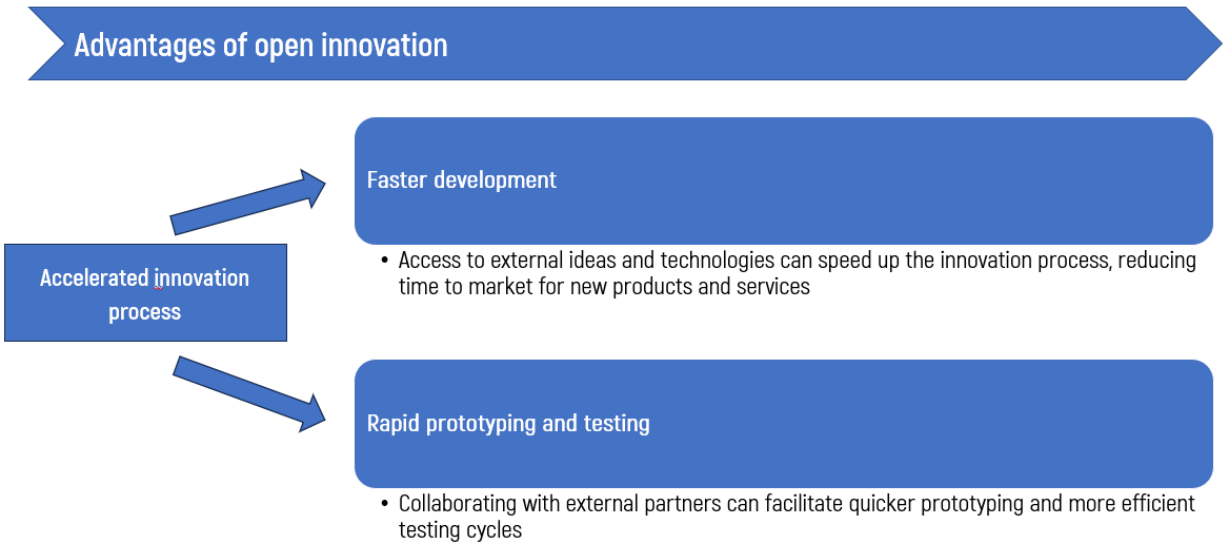
9. Monitor and evaluate

- **Performance metrics**: establish metrics to evaluate the performance and impact of open innovation efforts
- **Continuous improvement**: regularly review and refine the open innovation process based on feedback and performance data

10. Cultivate an open innovation culture

- **Encourage collaboration**: foster a culture that encourages collaboration and openness both within the organization and with external partners
- **Training and development**: provide training and development programs to equip employees with the skills needed for effective open innovation

For notes:


Advantages of open innovation
Accelerated innovation process
Faster development
• Access to external ideas and technologies can speed up the innovation process, reducing time to market for new products and services
Rapid prototyping and testing
• Collaborating with external partners can facilitate quicker prototyping and more efficient testing cycles

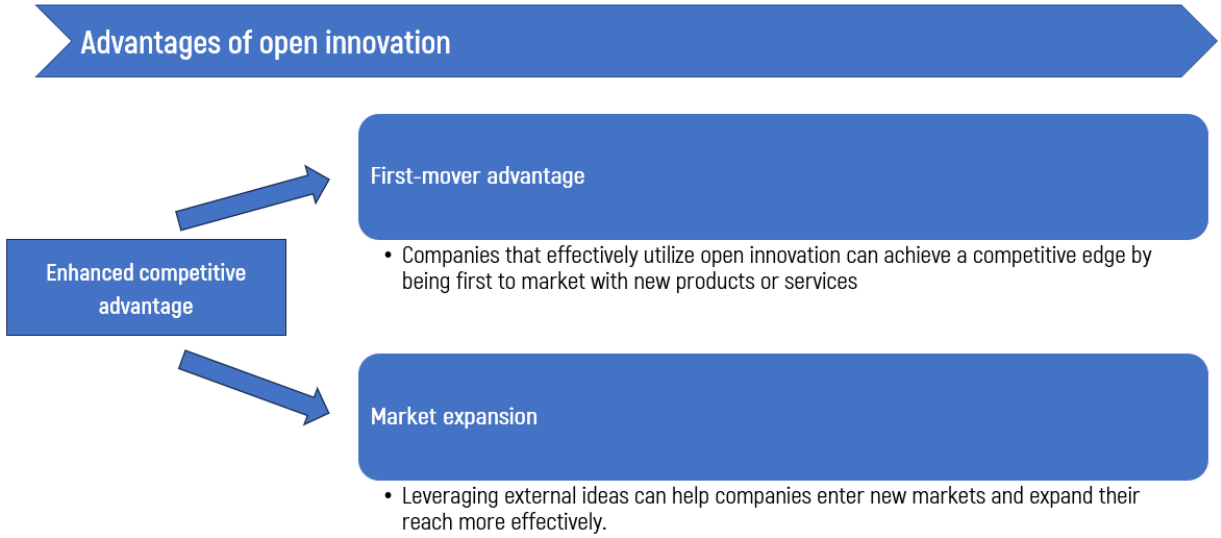
For notes:


Advantages of open innovation
Cost efficiency
Reduced R&D costs
• By utilizing external resources and ideas, companies can lower their research and development expenses
Shared risks
• Collaborative efforts allow for risk-sharing with partners, minimizing the financial burden on a single entity

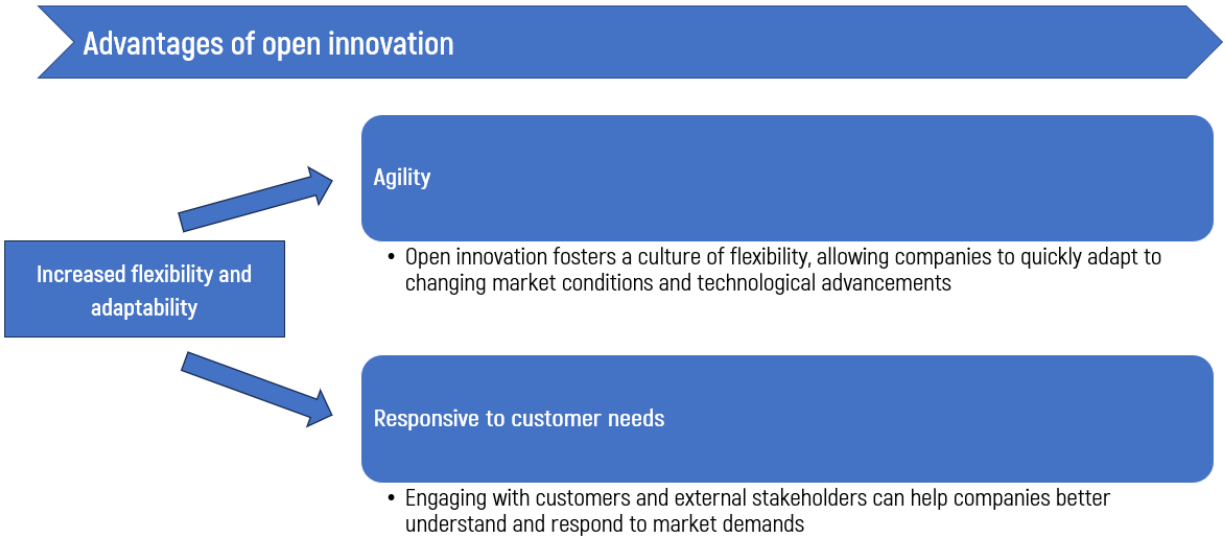
For notes:


Advantages of open innovation
Access to a broader talent pool
Diverse expertise
• Engaging with external experts, startups, universities, and other entities brings diverse skills and perspectives that might not be available internally
Innovative ideas
• External collaboration often introduces fresh, innovative ideas that can drive breakthrough innovations

For notes:


Advantages of open innovation
Enhanced competitive advantage
First-mover advantage
• Companies that effectively utilize open innovation can achieve a competitive edge by being first to market with new products or services
Market expansion
• Leveraging external ideas can help companies enter new markets and expand their reach more effectively.

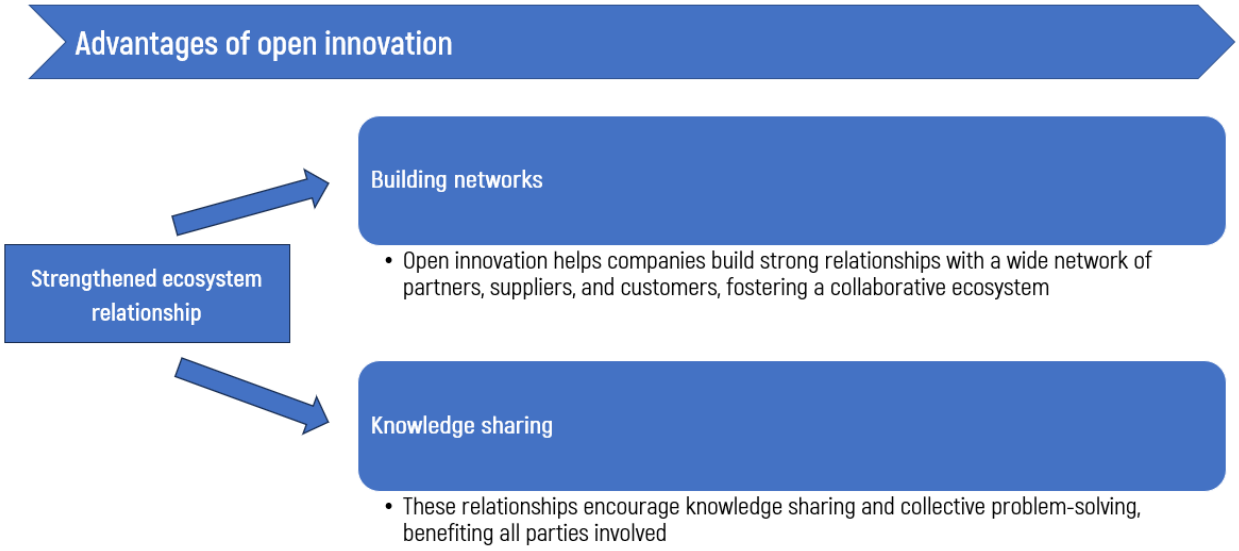
For notes:


Advantages of open innovation
Increased flexibility and adaptability
Agility
• Open innovation fosters a culture of flexibility, allowing companies to quickly adapt to changing market conditions and technological advancements
Responsive to customer needs
• Engaging with customers and external stakeholders can help companies better understand and respond to market demands

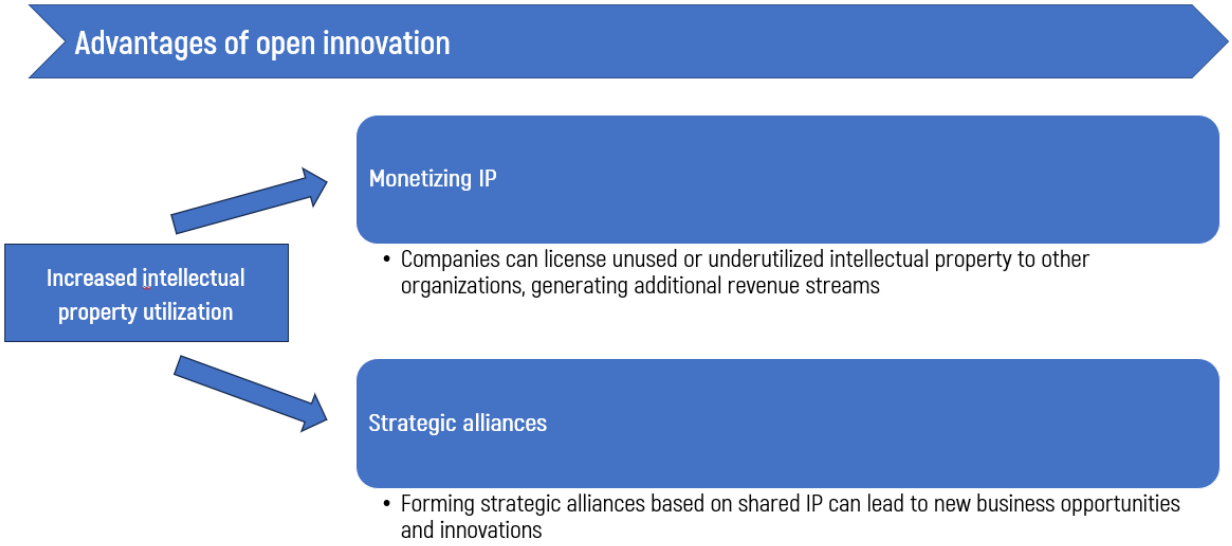
For notes:


Advantages of open innovation
Improved problem-solving
Collaborative solutions
• Working with external partners can lead to more innovative and effective solutions to complex problems
Access to cutting-edge technologies
• Partnerships with research institutions and tech companies provide access to the latest technologies and methodologies

For notes:


Advantages of open innovation
Strengthened ecosystem relationship
Building networks
• Open innovation helps companies build strong relationships with a wide network of partners, suppliers, and customers, fostering a collaborative ecosystem
Knowledge sharing
• These relationships encourage knowledge sharing and collective problem-solving, benefiting all parties involved

For notes:


Advantages of open innovation
Increased intellectual property utilization
Monetizing IP
• Companies can license unused or underutilized intellectual property to other organizations, generating additional revenue streams
Strategic alliances
• Forming strategic alliances based on shared IP can lead to new business opportunities and innovations

For notes:


Advantages of open innovation
Enhanced organizational learning
Continuous learning
• Engaging with external partners promotes a culture of continuous learning and improvement within the organization
Adopting best practices
• Exposure to different methodologies and practices from external partners can lead to the adoption of best practices

For notes:

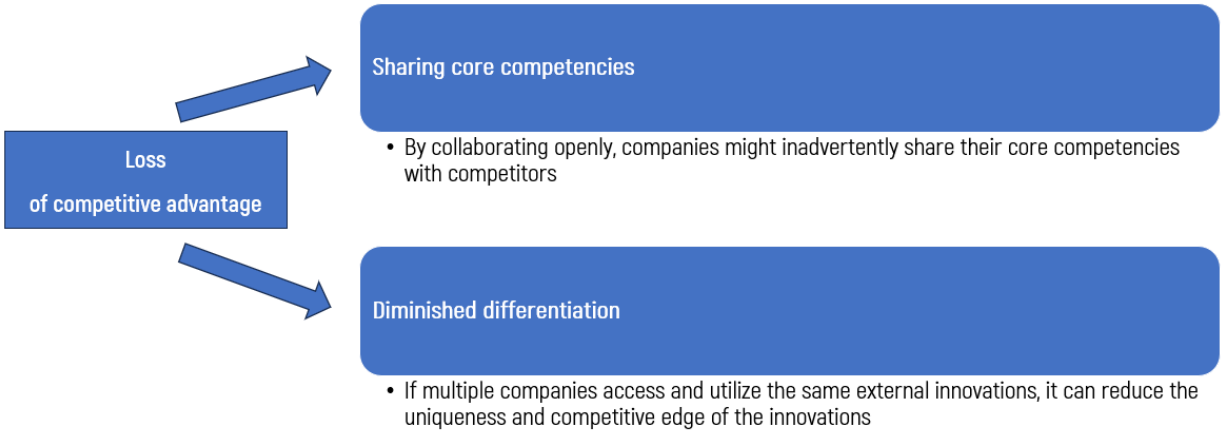
Advantages of open innovation

For notes:


Challenges for open innovations
Intellectual property risks
IP leakage
• Sharing ideas and collaborating with external partners can lead to unintentional loss or theft of intellectual property
Complex IP management
• Managing IP rights and ensuring proper protection and ownership can be complex and legally challenging

For notes:

Challenges for open innovations



For notes:


Challenges for open innovations
Coordination and integration challenges
Complex collaboration
• Coordinating and managing collaborations with multiple external partners can be complex and resource-intensive
Integration issues
• Integrating external ideas and technologies into existing processes and systems can be challenging and may require significant adaptation

For notes:

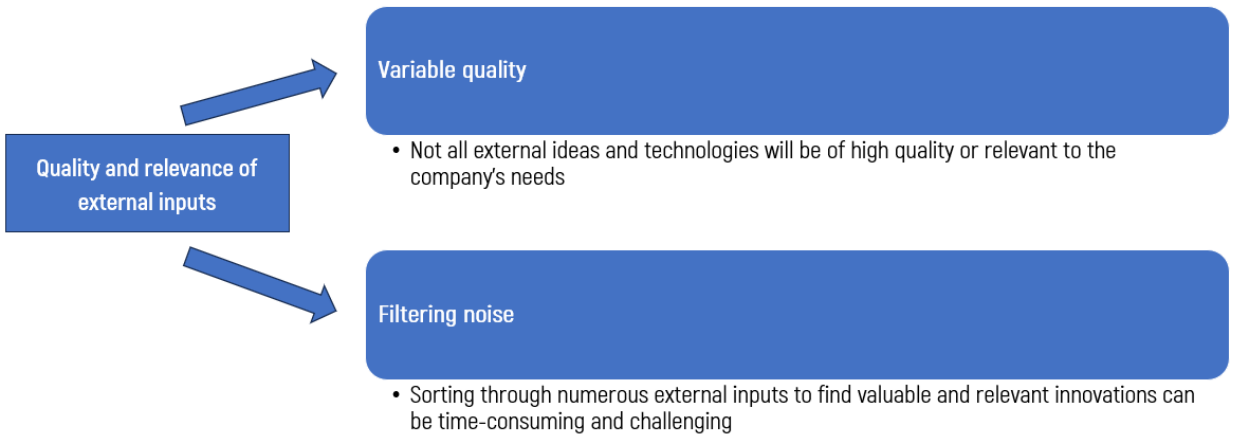
Challenges for open innovations

For notes:


Challenges for open innovations
Cultural and organizational barriers
Resistance to change
• Internal resistance to adopting external ideas and changes can hinder the open innovation process
Cultural misalignment
• Differences in organizational culture between collaborating entities can lead to misunderstandings and conflicts

For notes:

Challenges for open innovations



For notes:

Challenges for open innovations

For notes:

Challenges for open innovations

Short-term focus → **Immediate gains over long-term goals**

- Companies might prioritize short-term gains from external collaborations over long-term strategic goals, potentially undermining sustained innovation efforts

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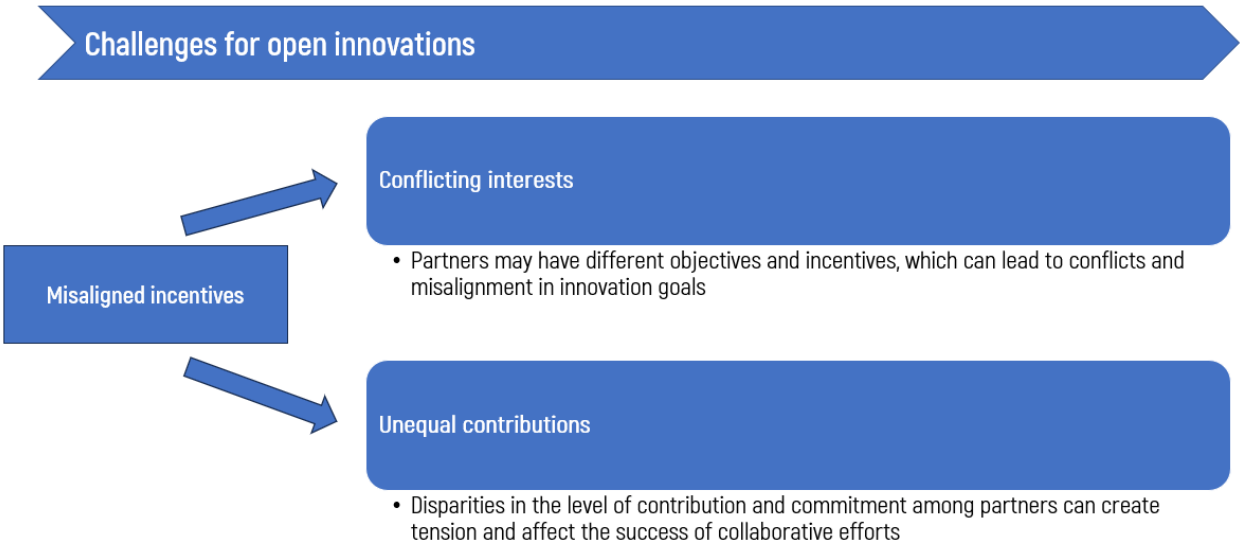
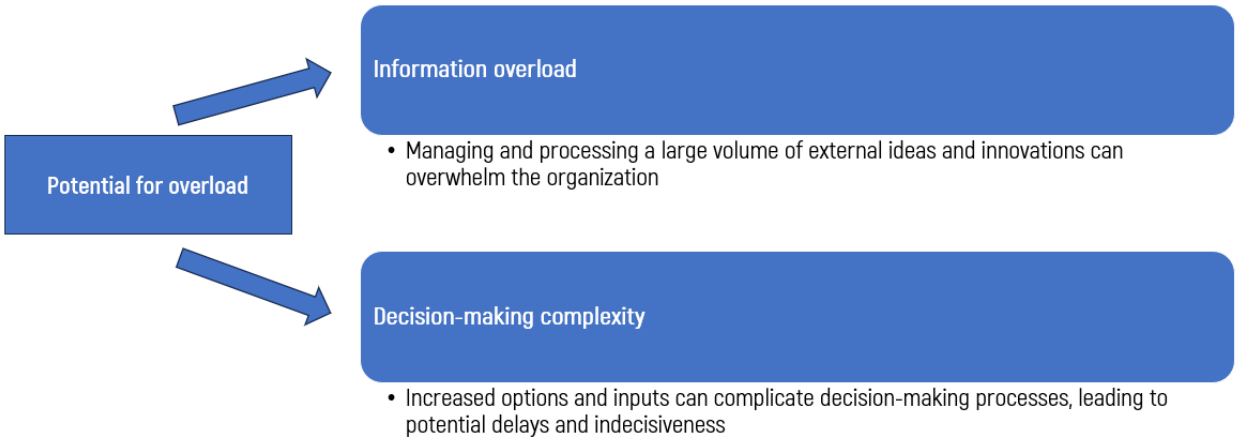

Challenges for open innovations
Misaligned incentives
Conflicting interests
• Partners may have different objectives and incentives, which can lead to conflicts and misalignment in innovation goals
Unequal contributions
• Disparities in the level of contribution and commitment among partners can create tension and affect the success of collaborative efforts

For notes:

Challenges for open innovations



For notes:

Open innovations: models of development

Open innovation challenge

An event where entrepreneurs, researchers, and specialist teams compete to solve defined problems in the industry

Open innovation partnerships

Crowdsourcing, where a corporation partners with an accelerator to source innovation. This model reduces R&D costs and production time by maintaining open communication channels with the audience

Co-creation

Involving customers in early stages of product development to ensure final products align with customer needs. This approach helps build brand awareness and social proof

Hybrid funding models

Alternative or hybrid models of funding, such as equity, revenue sharing, or social impact bonds, that offer more flexibility and sustainability for open innovation initiatives

For notes:

Open innovations: models of development

Crowdfunding

Platforms that allow companies to raise funds from a large number of people, often through small contributions. This model can be used for various projects and initiatives

Innovation competitions

Challenges that encourage innovation and entrepreneurship, such as the AT&T Accelerator Challenge, which aims to enhance engineering capabilities

Collaborative research and development

Partnerships between companies, universities, and research institutions to develop new technologies and solutions. This model can provide access to the latest industry talent and infrastructure

For notes:

Examples of open innovation

LEGO

LEGO launched the LEGO Ideas platform, where fans can submit their own designs for LEGO sets. The designs are then voted on by the community, and those that receive enough support are considered for production as official LEGO sets

NASA

NASA has embraced open innovation through various initiatives. The NASA Tournament Lab hosts challenges and competitions, inviting participants from around the world to solve complex problems. The agency also released a catalog of its patents, making them available for licensing and commercialization by external partners

Procter & Gamble (P&G)

P&G established the Connect + Develop program, which aims to source innovation externally. P&G actively seeks partnerships with external inventors, startups, and suppliers to develop new products and technologies. For instance, the development of the Swiffer cleaning system involved collaboration with an external inventor

IBM

IBM has a history of open innovation, exemplified by its collaboration with universities and researchers. One notable initiative is the IBM Quantum Network, where IBM collaborates with academic institutions, startups, and research organizations to advance quantum computing technology and applications

Mozilla

Mozilla, the organization behind the Firefox web browser, engages in open innovation through its Mozilla Open Innovation Program. It invites developers and users to contribute ideas and collaborate on new features and product innovation. This approach allows Mozilla to harness the collective intelligence of its community

For notes:

Examples of open innovation

General Electric (GE)

GE launched the GE Appliances' FirstBuild initiative, an open innovation platform that engages with makers, designers, and engineers to co-create innovative home appliances. Community members can submit ideas, collaborate on projects, and provide feedback, leading to the development of new products

Facebook

Facebook nurtures innovation on the inside with company hackathons, which help Facebook surface some of its best ideas from within its own ranks. These events give employees the opportunity to discuss and develop initial versions of product ideas they might have before product teams take on the task

Philips

Philips is an early adopter of open innovation, as the company made a shift in that direction back in 1998 when it opened the R & D ecosystem now known as the High Tech Campus Eindhoven. The campus is home to over 200 companies, with entrepreneurs, researchers, and product developers from all over the world coming together to create new ventures

Samsung

Samsung is another intercompany example of open innovation. The Samsung Accelerator program brings together entrepreneurs, designers, innovators, and experts, and offers them office spaces, capital, and product support to yield exciting new solutions

Quirky

Quirky is a community-led invention platform that crowdsources product ideas to be manufactured. The concept behind Quirky is that you can put your product idea up on Quirky and others within the Quirky community can develop it further. The best products on the platform are chosen by Quirky for manufacturing and sold at the Quirky store

For notes:

Examples of open innovation platforms

Viima (now HYPE Boards)

Viima is an open innovation platform that helps organizations collect, develop, and implement ideas from both internal and external stakeholder

IdeaScale

IdeaScale is an open innovation platform that enables organizations to crowdsource ideas, collaborate on solutions, and implement new ideas

https://www.viima.com/
https://ideascale.com/

For notes:

Examples of open innovation platforms

https://www.innocentive.com/
https://www.wazoku.com/

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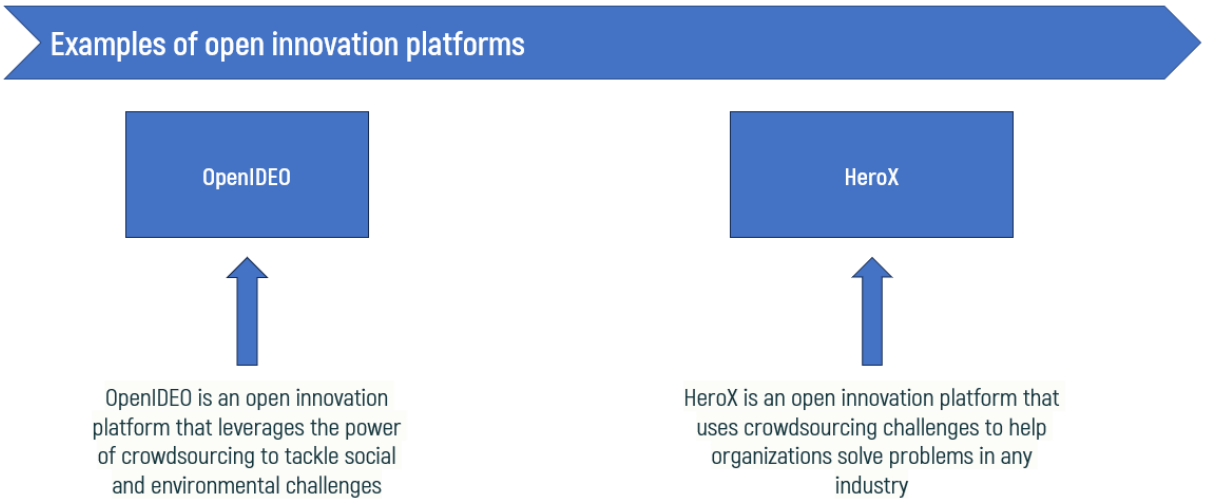

https://www.openideo.com/
https://www.herox.com/

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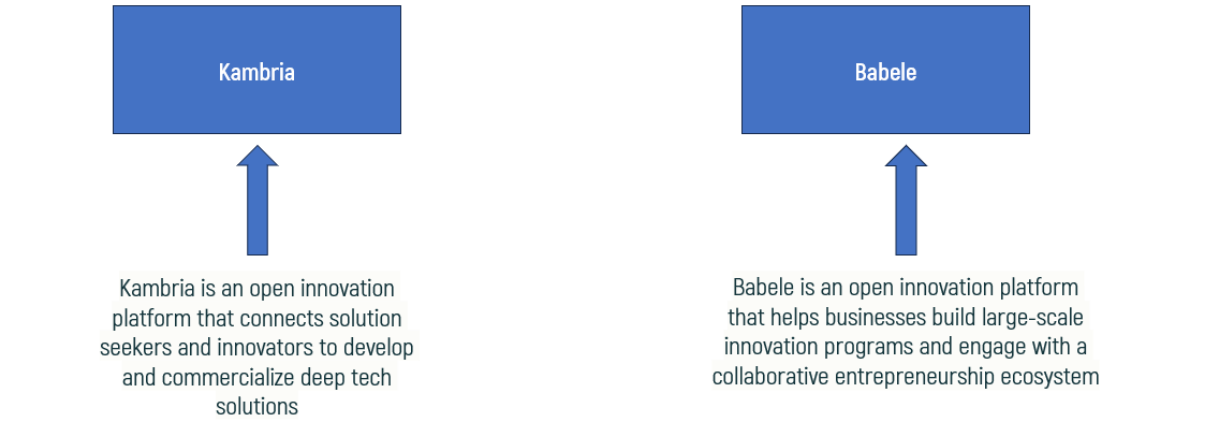
Examples of open innovation platforms



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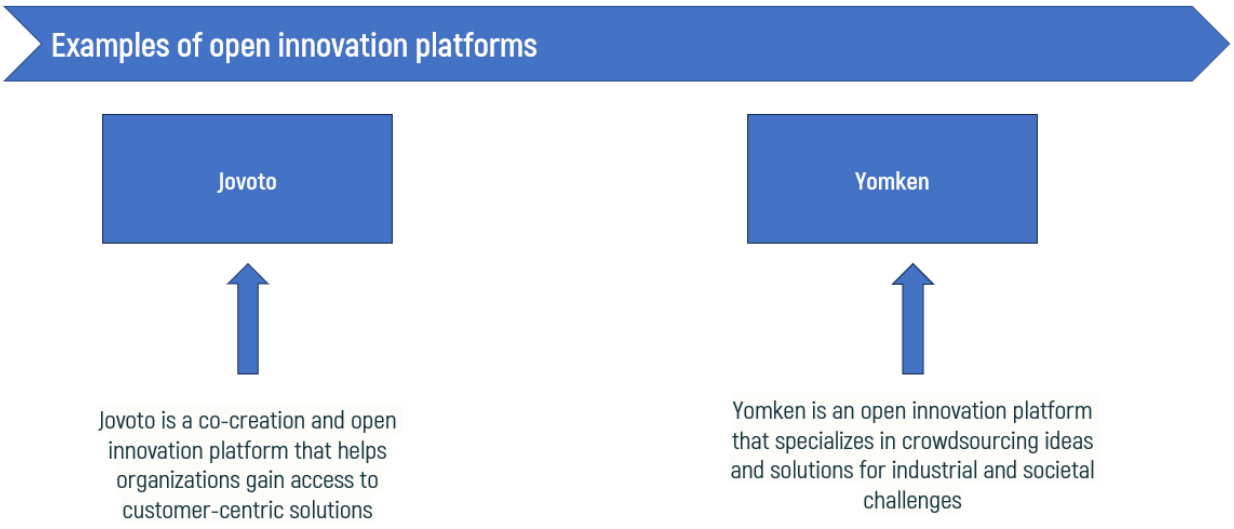

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For notes:

Useful links

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9. Open Research Data and Materials https://open-science-training-handbook.github.io/Open-Science-Training-Handbook_EN/02OpenScienceBasics/02OpenResearchDataAndMaterials.html

10. The Pros and Cons of Open Data https://merlcenter.org/guides/pros-and-cons-of-open-data/

11.What is open data https://data.europa.eu/en/dataeuropa-academy/what-open-data

12. What is open data? - Practical Guide https://www.opendatasoft.com/en/what-is-open-data-practical-guide/

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24. General Guidelines for Academic Integrity https://www.academicintegrity.eu/wp/guidelines/
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36. Open Innovation: the New Imperative for Creating and Profiting from Technology https://www.sustanciainfinita.com/wp-content/uploads/2017/03/LIBRO-Henry-Chesbrough-Open-Innovation.pdf
37. How can you use open innovation to improve your funding and grants? https://www.linkedin.com/advice/1/how-can-you-use-open-innovation-improve-your-su9ue

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39. Open innovation https://en.wikipedia.org/wiki/Open_innovation
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42. Top 10 Idea Management & Innovation Platforms https://www.herox.com/blog/1074-top-10-idea-management-innovation-platforms
43. Artyukhov A., Artyukhova N., Berezko O., Vesnii A., Volk Y., Herasymchuk H., Holoshchuk, R., Dvornychenko A., Doronina O., Zhezhnych P., Ivashchuk O., Kozlovskyi S., Krakovska S., Kuchma I., Luita O., Liashenko O., Markiv O., Mashtaler O., Mozolevych H., Oriekhova T., Petrushka, A., Radio S., Khadzhynov I., Shilinh A., Zhezhnych P. (Editor), Berezko O. (Editor) (2025). Відкриті наукові практики: навчальний посібник. Zenodo. https://doi.org/10.5281/zenodo.14641435