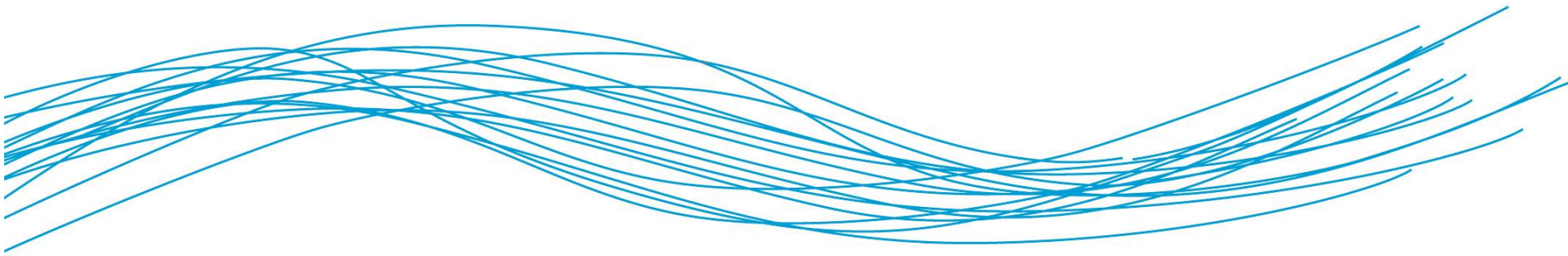# Open Science and Open Innovation

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Chair of ATTRACT Advisory Committee

**The Association of Commonwealth Universities**

European Commission

# Open Innovation
# Open Science
# Open to the World

*– a vision for Europe*

...iation
...nwealth
...es

# OSPP-REC: Open Science Policy Platform Recommendations

*Date of Adoption: 22nd April 2018*

## 1. Introduction

Open Science is scholarly research that is collaborative, transparent and reproducible and whose outputs are publicly available. The European Union will not remain competitive at the global level unless it promotes Open Science, and relatedly, Open Innovation. **The time to act is now**.

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- At its core, Open Science aims at: "increasing research quality, boosting collaboration, speeding up the research process, making the assessment of research more transparent, promoting public access to scientific results, as well as introducing more people to academic research". By taking advantage of Open Science, researchers can enhance the quality of curiosity-driven research, maximise the value and potential impact of their work to create new avenues of knowledge, and drive scientific progress and Open Innovation within Europe and beyond. Open Science also makes research more transparent and accessible to citizens, and helps involve citizens more actively in research activities. Open Science thus "provides policymakers, research institutions, funding bodies and researchers themselves with an opportunity to critically consider: what does and should count as high-quality research; what goals researchers should pursue; how research results should be evaluated and disseminated; and how research should be supported and embedded within society".

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# What is Open Science?

Open Science represents a new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools. The idea captures a systemic change to the way science and research have been carried out for the last fifty years: shifting from the standard practices of publishing research results in scientific publications towards sharing and using all available knowledge at an earlier stage in the research process.

:h

# OSPP current areas of work

- **Prioritised recommendations for the eight ambitions of Open Science**
-
- Below are a set of actionable recommendations from the OSPP to be taken as the next step towards the longer-term vision articulated by Open Science consultations and expert groups set up by the EC and other organisations in Europe and worldwide. The recommendations have been split up into the eight priorities identified from the 5 areas of the European Open Science Agenda, namely:
- Rewards and Incentives
- Research Indicators and Next-Generation Metrics
- Future of Scholarly Communication
- European Open Science Cloud
- FAIR Data
- Research Integrity
- Skills and Education
- Citizen Science

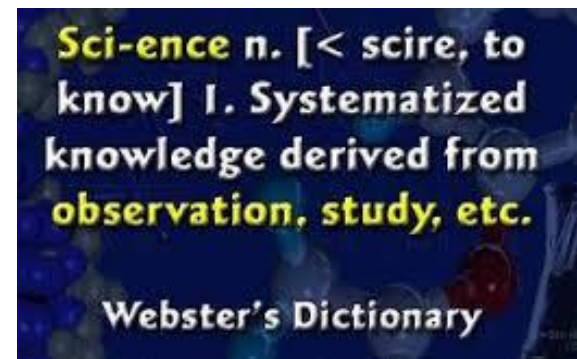# From the 2014 Yearbook

## Open Innovation 2.0

- Open Innovation 2.0 (OI2) is a new paradigm based on a **Quadruple Helix Model** where **government, industry, academia and civil participants work together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone.** This model encompasses also user-oriented innovation models to take full advantage of ideas' cross-fertilisation leading to experimentation and prototyping in real world setting.

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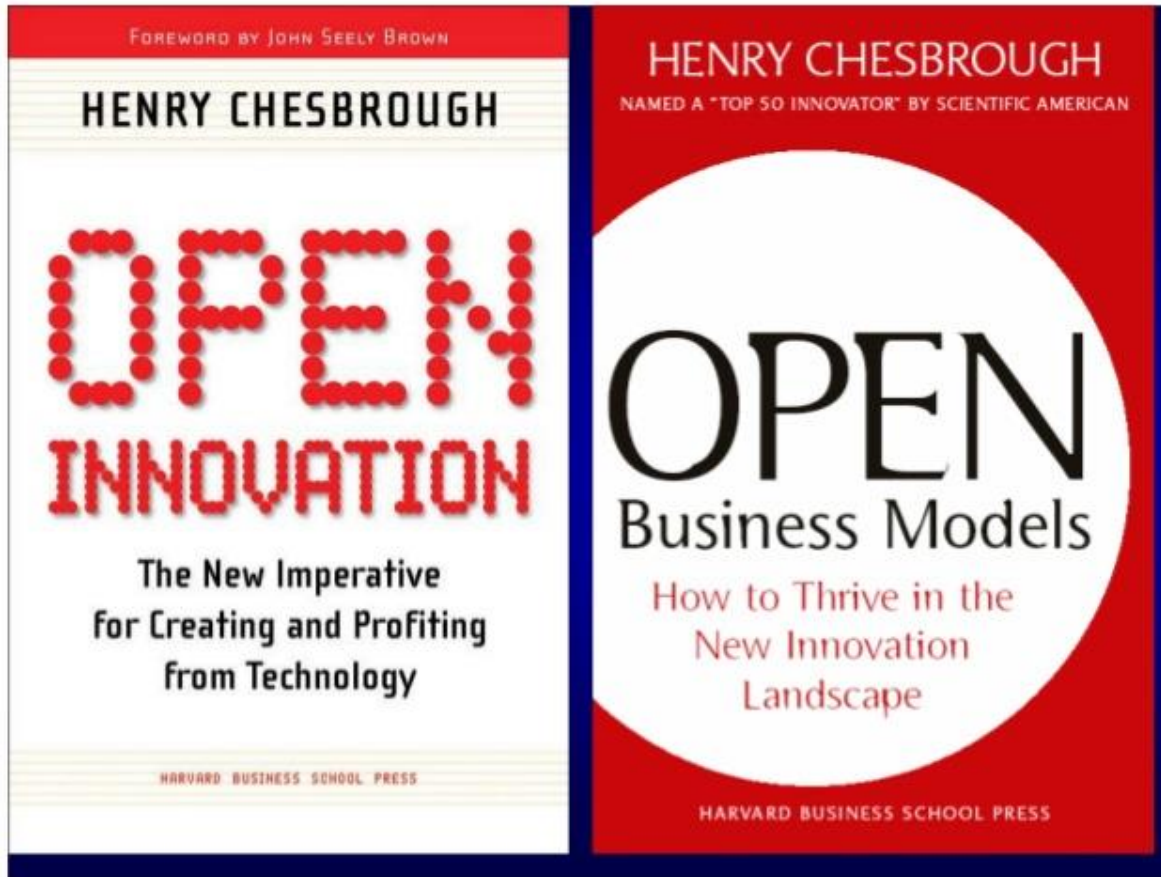Universities**

# All change but back to the past

**Open Science/Science 2.0**

➢ **A systemic change in the modus operandi of science and research**

➢ **Affecting the whole research and innovation cycle and its stakeholders including the public**

Sci-ence n. [< scire, to know] I. Systematized knowledge derived from observation, study, etc.

Webster's Dictionary

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# Speech of Oettinger

"We are in the middle of a true revolution — the fourth industrial revolution. It will change our industries, it will change our economy. And it will have a profound impact on our lives.

We are now in the midst of the next digital revolution which is precisely based on interconnection and communication: Any object, any machine, are now starting to be equipped with sensors in this "**internet of things**" - sensors able to communicate and to feed in real time into processes.
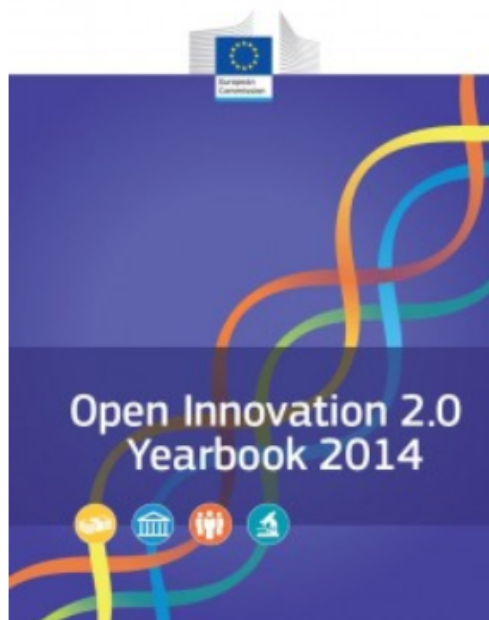
Philips Innovation and business ecosystem: High Tech Campus

# The EU Commission's Open Innovation 2.0 Yearbook highlights ESADE's expertise

**E**

The European Commission Open Innovation 2.0 Yearbook was released last week, in order to "bring some fresh thinking as well as compelling evidence of the OI2 paradigm", as the EU officials have stated.

The report, which recalls the origins of the Open Innovation concept and its potential to provide better solutions "to domains such as healthcare, transportation, climate change, youth unemployment, financial stability, prosperity, sustainability, and growth". It also higlights that "these challenges provide a significant opportunity to create new shared value through innovation".

*We already see the influence of open innovation 2.0 which is taking the full advantage of strong seamless interactivity across all stakeholders, including users, across the whole innovation ecosystems: quadruple helix innovation! However, we need to continue actively searching for entirely new connections and areas between clusters.*

- There are 5 key elements in the new Open Innovation process:
- **Networking**;
- **Collaboration**: involving partners, competitors, universities, and users;
- **Corporate Entrepreneurship**: enhancing corporate venturing, start-ups and spin-offs;
- **Proactive Intellectual Property Management**: creating new markets for technology;
- **Research and Development (R&D)**: achieving competitive advantages in the market.

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**It's real!**

**An emerging ecosystem of services and standards**

Figshare.com

Sci-starter.com

Runmycode.org

Myexperiment.org

ArXiv

Roar.eprints.org

Datadryad.org

Openannotation.org

Researchgate.com

Academia.edu

Mendeley.com

Impact Story

Altmetric.com

**Data-intensive**

**Citizens' science**

**Open code**

**Pre-print**

**Open workflows**

**Open data**

**Open annotation**

**Open access**

**Scientific blogs**

**Collaborative bibliographies**

**Alternative Reputation systems**

**Analysis**

**Data gathering**

**Publication**

**Conceptualisation**

**Review**

4

# e-Science and the Fourth Paradigm

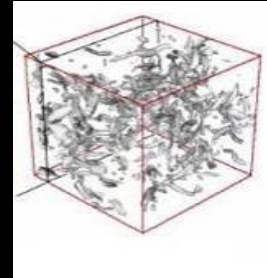Thousand years ago – **Experimental Science**
   Description of natural phenomena

Last few hundred years – **Theoretical Science**
   Newton's Laws, Maxwell's Equations…

Last few decades – **Computational Science -**
Simulation of complex phenomena

Today – **Data-Intensive Science**

   Scientists overwhelmed with data sets

      from many different sources
      •    Data captured by instruments
      •    Data generated by simulations
      •    Data generated by sensor networks

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{4\pi G\rho}{3} - K\frac{c^2}{a^2}$$

e-Science is the set of tools and technologies
to support data federation and collaboration
• For analysis and data mining
• For data visualization and exploration
• For scholarly communication and dissemination

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*(With thanks to Jim Gray)*

# There are three main global trends emerging today that will shape world in 2030:

'

the empowerment of individuals, which contributes to a sense of belonging to a single human community

greater stress on sustainable development against a backdrop of greater resource scarcity and persistent poverty, compounded by the consequences of climate change:

and the emergence of a more polycentric world characterised by a shift of power away from states and growing governance gaps as the mechanisms for inter-state relations fail to respond adequately to global public demands.'

ESPAS Report: 2012 "Global Trends 2030"

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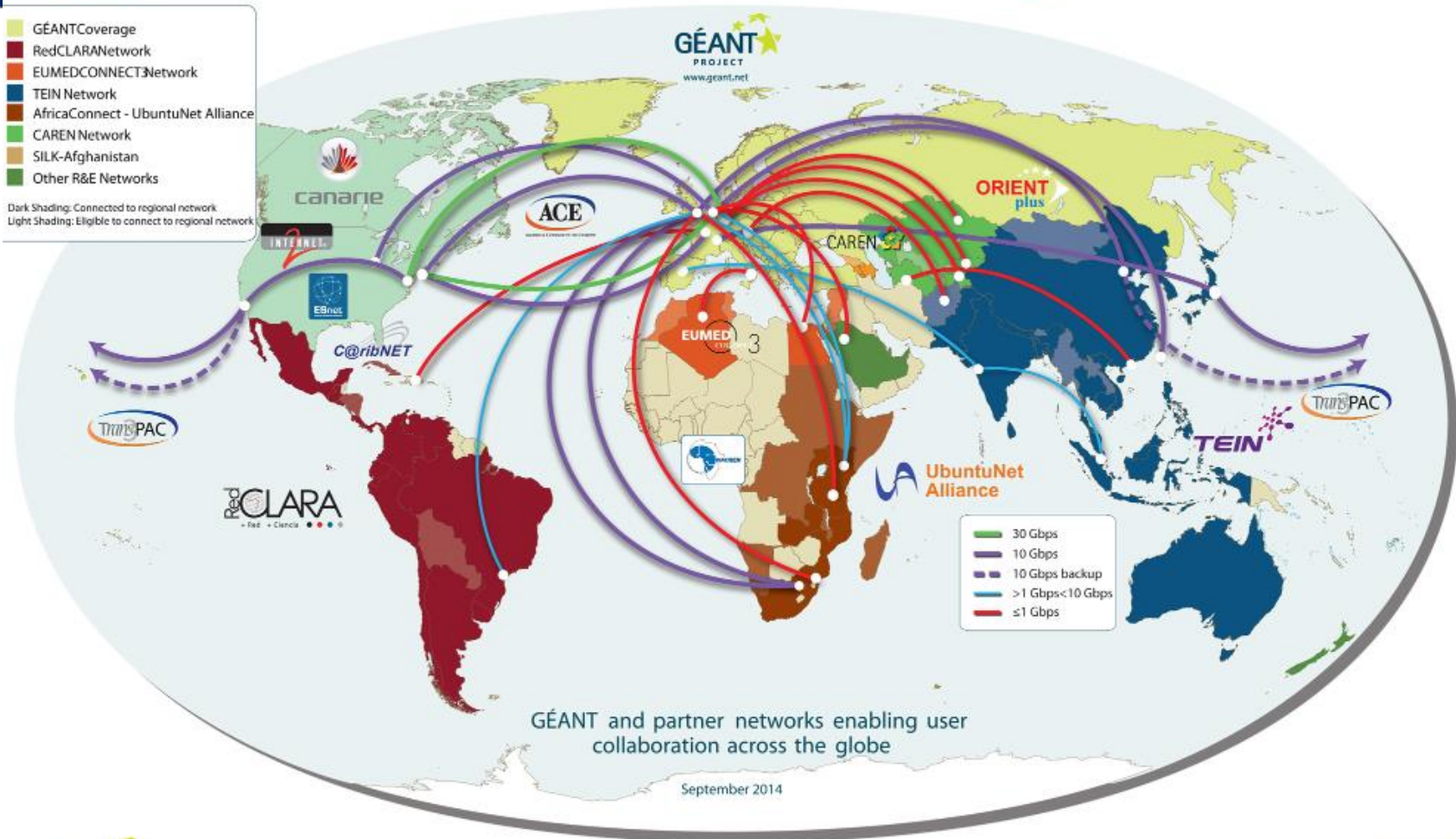
# From the ESPAS report

**Knowledge is no longer concentrated in the hands of a few; it can be created and shared by ordinary citizens everywhere, challenging the very legitimacy of traditional sites of knowledge and information production such as universities and the media.**

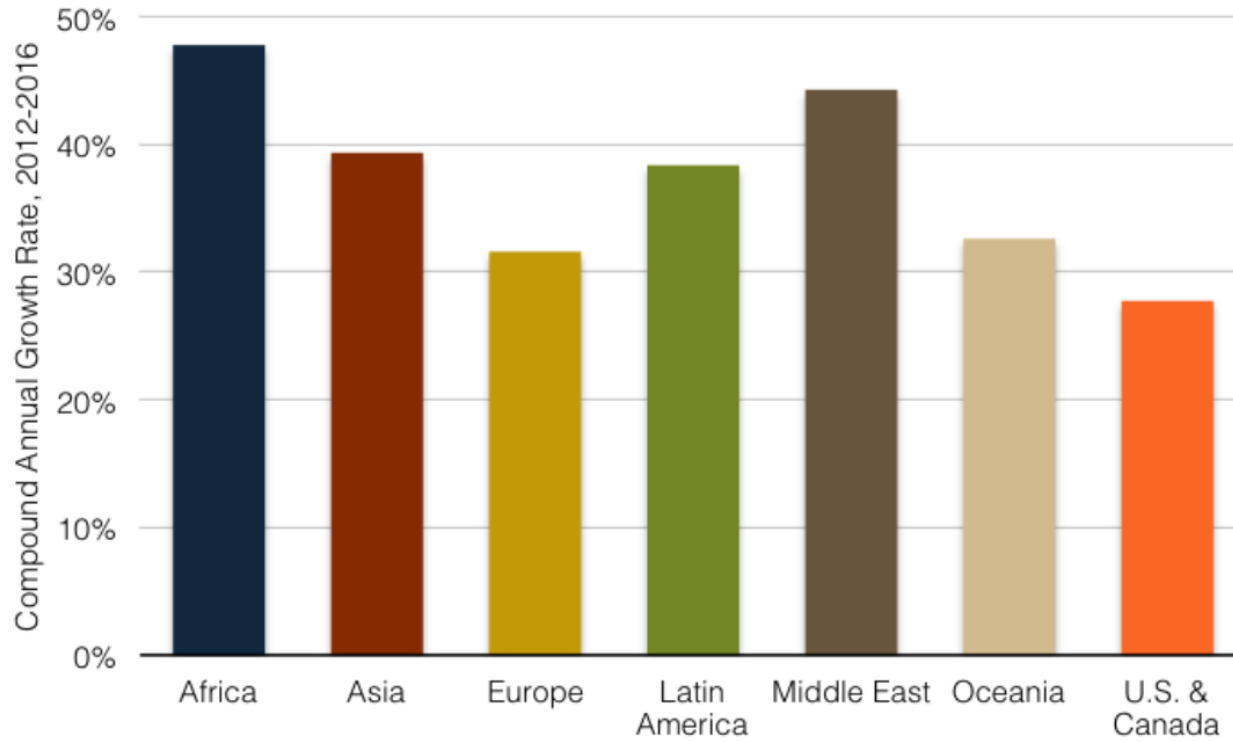GÉANT and partner networks enabling user collaboration across the globe

# West Coast Connectivity
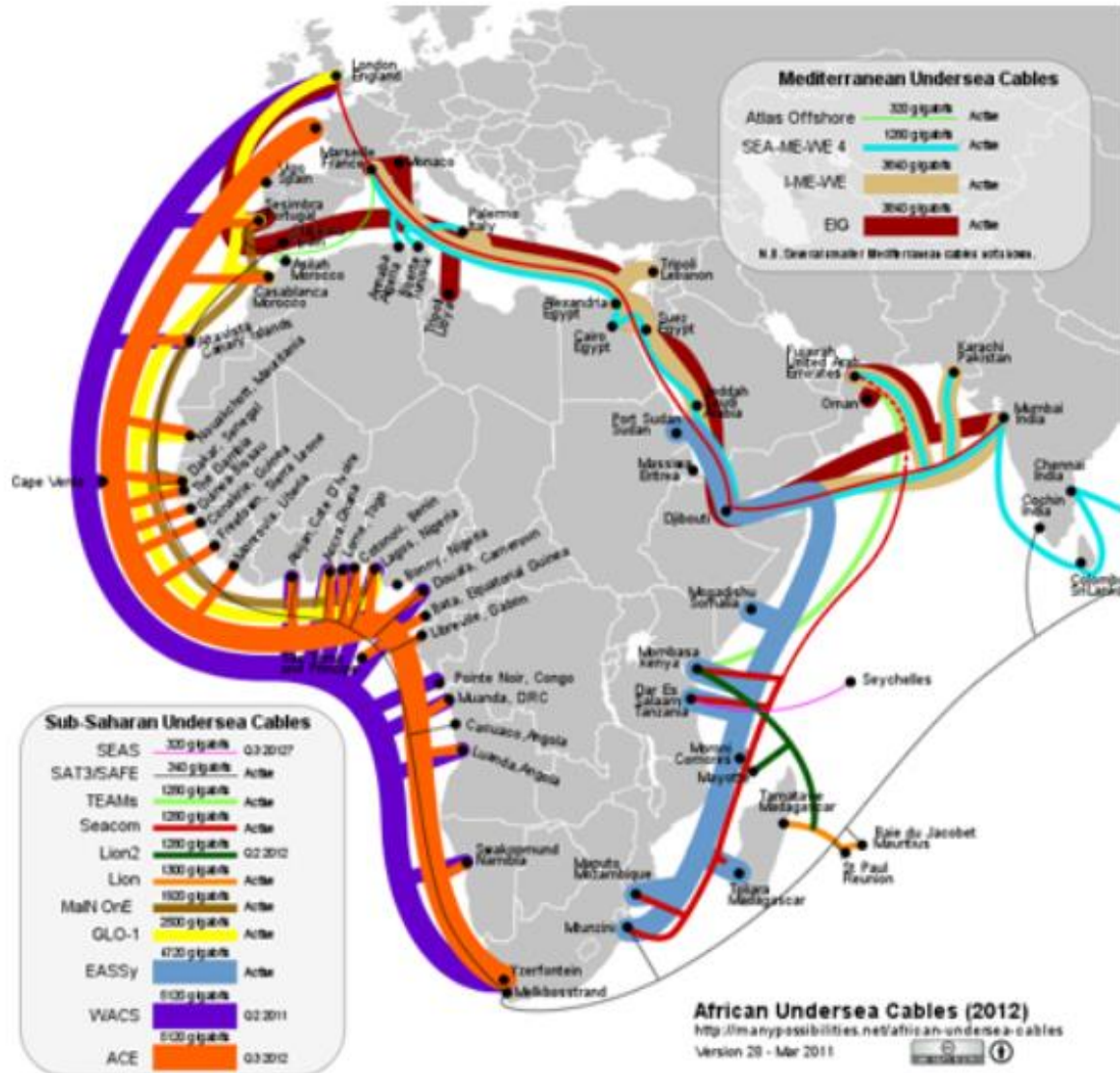
INTERNATIONAL INTERNET BANDWIDTH GROWTH BY REGION, 2012-2016
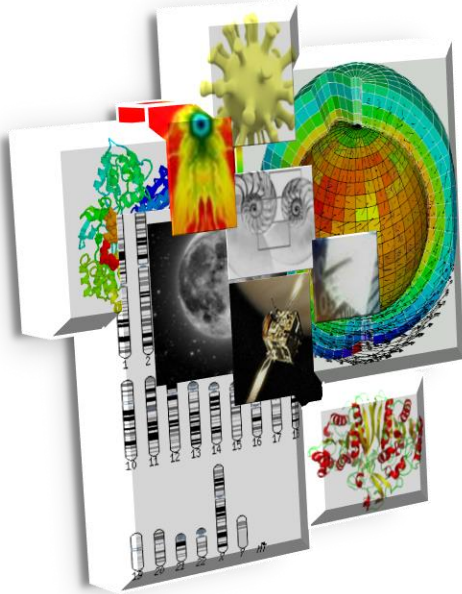
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RIDING THE WAVE

HOW EUROPE CAN GAIN FROM THE
RISING TIDE OF SCIENTIFIC DATA
A VISION FOR 2030

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>

# Global collaboratories

- They can engage in whole new forms of scientific inquiry and treat information at a scale we are only beginning to see.

- … and help us solving today's Grand Challenges such as climate change and energy supply.

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(6) The public has access and can make creative use of the huge amount of data available; it can also contribute to the data store and enrich it. All can be adequately educated and prepared to benefit from this abundance of information.

❑ Embed data science in all training and academic qualifications.

❑ Integrate into gaming and social networks

IMPACT IF ACHIEVED

❑ Citizens get a better awareness of and confidence in sciences, and can play an active role in evidence based decision making and can question statements made in the media.

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# Big issues facing Universities and Public at Large

- Open Access to both publications and data "all publicly funded research must be publicly available
- Who is providing the data, can it be trusted?
- How do I know the provenance – has it been corrupted?
- Is it accessible, what type of metadata is there?
- Personal and persistent identifiers, a loss of personal freedom or a passport to participate?
- IPR and legal position
- Personal health data – how can this be handled?
- How to teach and research in this global environment?

# Citizen Science

**What is the Zooniverse?**

The Zooniverse is the world's largest and most popular platform for people-powered research. This research is made possible by volunteers—hundreds of thousands of people around the world who come together to assist professional researchers. Our goal is to enable research that would not be possible, or practical, otherwise. Zooniverse research results in new discoveries, datasets useful to the wider research community, and [many publications](#).

**At the Zooniverse, anyone can be a researcher**

You don't need any specialised background, training, or expertise to participate in any Zooniverse projects. We make it easy for anyone to contribute to real academic research, on their own computer, at their own convenience.

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# Citizen Cyber Lab and the SDGs

THE CHALLENGE

In September 2015, world leaders committed to achieve [17 Global Goals](#) for Sustainable Development (also known as Sustainable Development Goals or SDGs) during the next 15 years. The Global Goals address a range of challenges to a sustainable future on this planet, including poverty, gender inequality, disease, climate change, and social injustice.

How can you help ensure that the goals will be achieved?

One way is to use open data to verify progress towards the goals at a local, regional, or global level. Such tracking can be done with the help of "crowdsourcing", which accelerates the analysis of large amounts of data, such as images or documents, thanks to collective efforts on the internet.

We are asking you to pitch a project that tackles Global Goals using open data.

The Open Seventeen Challenge aims to transform grassroots enthusiasm on the Web into new open knowledge that can help governments, the private sector, and civil society organizations achieve the Global Goals by the year 2030.

All you need to do is find a data set, define your crowdsourcing goal and [pitch your idea](#).

**The Open Seventeen Challenge** is a joint initiative of the research organizations [Citizen CyberLab](#) and [GovLab](#), [The ONE Campaign](#), and the open-source company [SciFabric](#)

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# First round of selected projects

•Safecity - crowdmapping sexual violence: analysing (tagging and digitization) data on sexual violence in public spaces in India and then visualising the collated information on a map.

•Crowdmapping public projects and policies in Nigeria with @cMapIT to track impact and effectiveness of governance.

•Track the extent of poverty: identifying, mapping and following the evolution over time of critical areas (e.g. slums) documenting the extent of poverty.

•Renewable energy: mapping renewable sources of energy using satellite images.

•2030-Watch: enabling civil-society-led SDG monitoring using official indicators and indicators maintained by civil society organisations.

•Crowd2Map Tanzania: Crowd2Map is a community crowd-mapping project putting rural Tanzania on the map.

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•OpenSpaceMap PH: using satellite images to map and study the use of land in the Philippines.

# Old Weather

*Help scientists recover Arctic and worldwide weather observations recorded in ship's logs since the mid-19th century.*
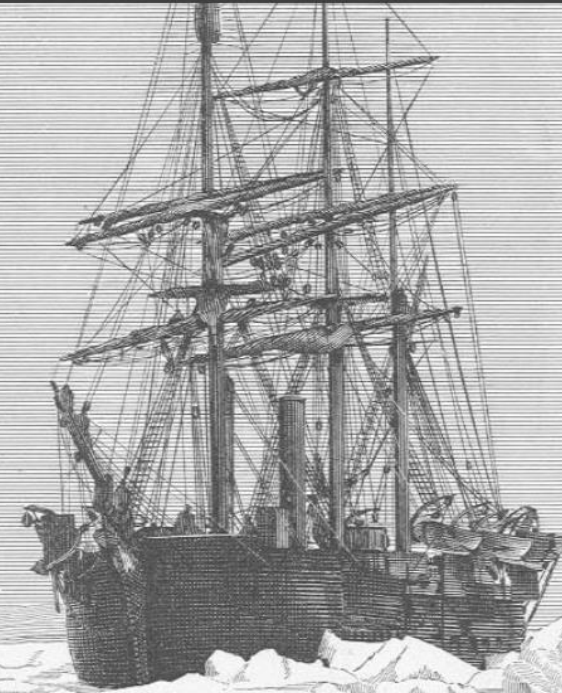
**Choose a project and get started:**

**Old Weather: Whaling** — *Explore the Arctic of the past from the deck of a whaling ship*

**Old Weather: Arctic** — *Rediscover the historic Arctic voyages of the U.S. Navy and Coast Guard*

## Why Scientists Need You

In this video scientists explain why your contributions are vital, and what they're doing with your results behind the scenes.

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# Shakespeare's **World**

Transcribe handwritten documents by Shakespeare's contemporaries and help us understand his life and times. Along the way you'll find words that have yet to be recorded in the authoritative Oxford English Dictionary, and which will eventually be added to this important resource.
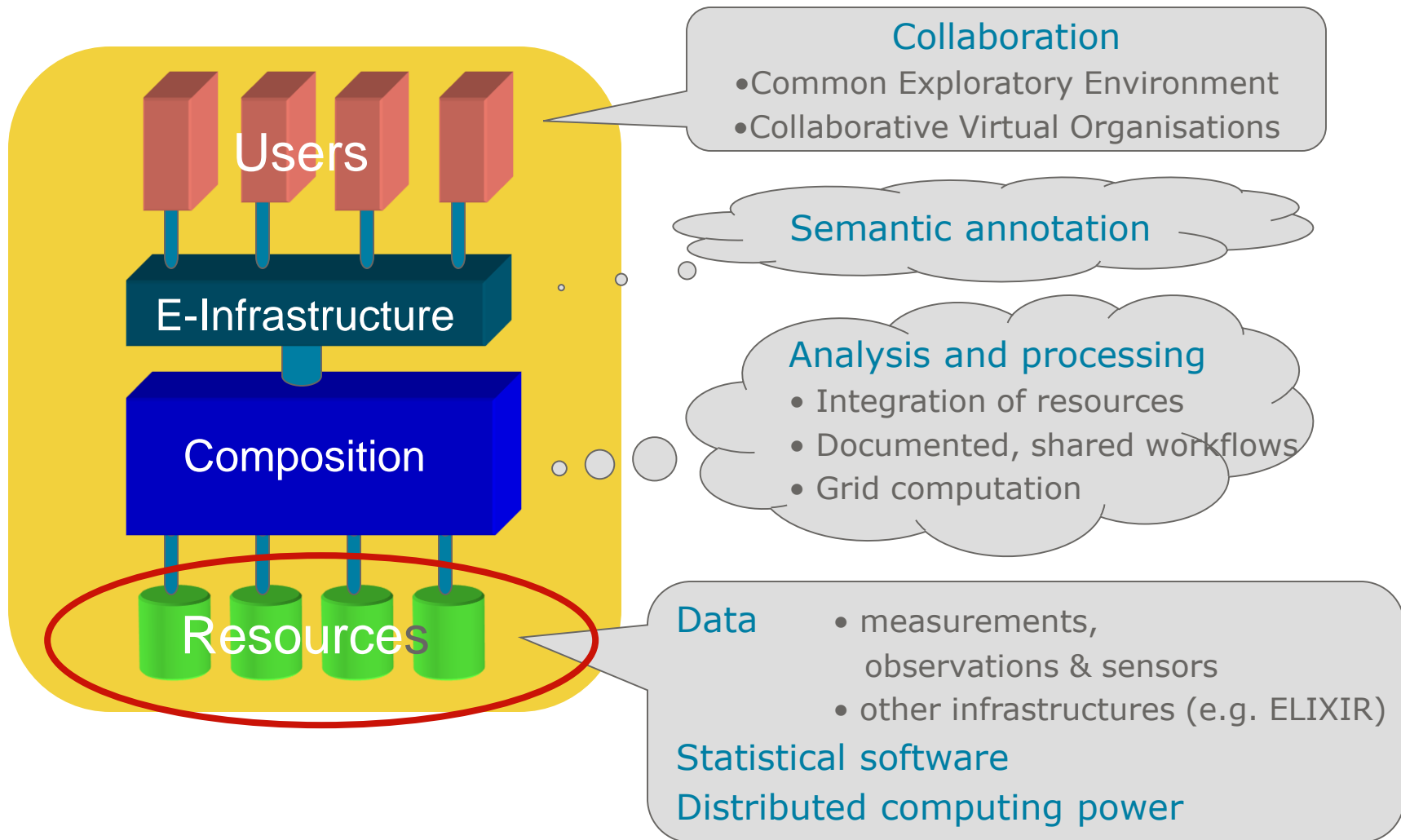
Get started

# Large-scale e-Infrastructures for Biodiversity Research

# Architecture

# CITIZEN SCIENCE AT UNIVERSITIES: TRENDS, GUIDELINES AND RECOMMENDATIONS

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# LERU recommendations

## Recommendations for institutions

**For universities, the recommendations are to:**

1. Recognise citizen science as an evolving set of research methods, as well as its societal and educational benefits;
2. Consider creating, where viable, a single point of contact for citizen science within the institution, to advise scientists and ensure liaison with national and regional citizen science initiatives;
3. Raise awareness amongst researchers of criteria for successful citizen science, including community management, pedagogical practices, open science standards and social, intergenerational and gender diversity policies issues.
4. Ensure that proposals to granting bodies for citizen science projects include long-term commitment for infrastructures and data repositories, in line with other research projects with long-term scientific or societal benefits;
5. Ensure that project participants comply with ethical, legal and privacy regulations relevant to the scope of a given citizen science project, and have access to professional advice for this purpose;
6. Adapt research evaluation and reputation systems to include metrics that can characterise projects with a high societal impact, such as successful citizen science projects, and develop ways of assessing citizen participation.

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# "An avalanche is coming – Higher Education and the Revolution ahead" – Rizvi et al 2013

'…the combination of marketisation – the student consumer as king with options outside universities for talented students too – and globalisation will lead to universities being less and less contained within national systems and more and more both benchmarked globally and a leading part of the growth of knowledge economics

 – collaborating and competing. In the new world the learner will be in the driver's seat, with a keen eye trained on value. For institutions, deciding to embrace this new world may turn out to be the only way to avoid the avalanche that is coming.

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# 3 D printing – Make, create, innovate!!
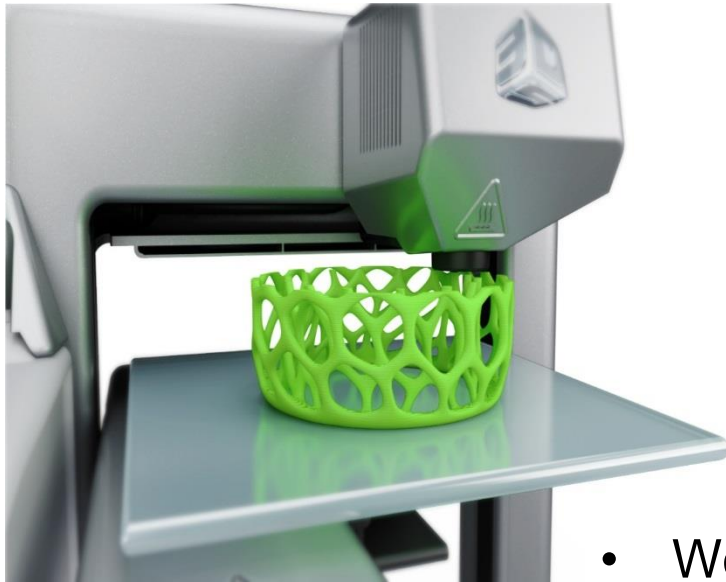








- Would you like to print out the weekly shopping in the comfort of your own home? Perhaps you're in the market for a new body part printed from your own cells? OK, you might have to wait a decade or two, but 3D printing technology is likely to change our lives forever
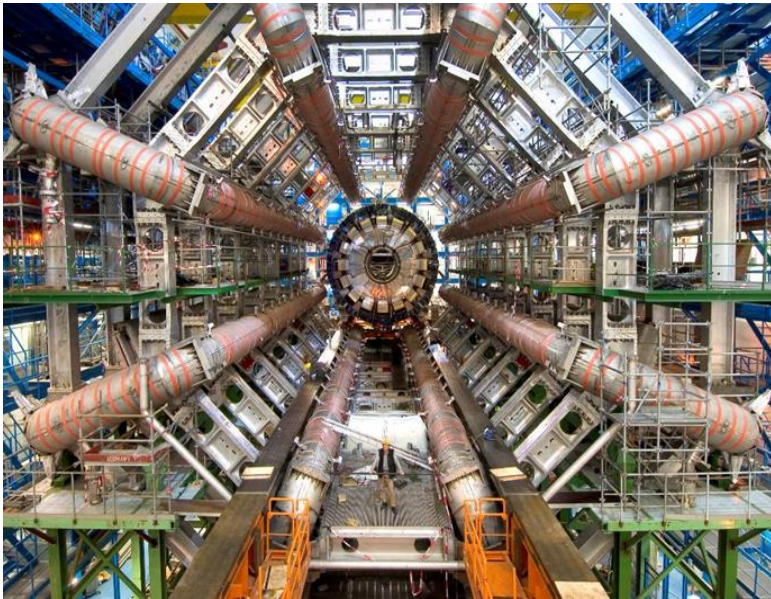
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# Goal – move from open science to open innovation

**The ATTRACT story: Starting with 6 of Europe's top public labs, joining forces to co-develop next-generation detector and imaging technologies, and bring them to market**



**The partners:**
» CERN
» European Molecular Biology Lab
» European Southern Observatory
» European Synchrotron Radiation Facility
» European XFEL
» Institut Laue-Langevin
» Aalto University
» ESADE Business School
» European Industrial Research Management Association

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