



# How to maximise the positive impact of Open Source on technological independence, competitiveness, and innovation

Paula Grzegorzewska



OpenForum  
Europe



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**OpenForum Europe (OFE) is a not-for-profit, Brussels-based independent think tank which explains the merits of openness in computing to policy makers and communities across Europe.**

**Founded in 2002 to accelerate and broaden the use of Open Source Software (OSS) among businesses, consumers and governments.**



**OpenForum  
Europe**

# In this presentation

- What is the economic impact of Open Source Software and Hardware in the EU?
- What impact did OS public policies have around the world?
- Latest developments in OS policy and research
- Recommendations

When I talk about open source...

Open Source is no longer a

niche

in policy

# Some history of measuring the impact of open source

FOREWORD BY JOHN SEELY BROWN

HENRY CHESBROUGH

*Named a "TOP 50 INNOVATOR" by Scientific American*

OPEN  
INNOVATION

The New Imperative  
for Creating and Profiting  
from Technology

HARVARD BUSINESS SCHOOL PRESS



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**Title:** Open source software and the "private-collective" innovation model: Issues for organization science.

**Author(s):** Von Hippel, E., Von Krogh, G.

**Year:** 2003

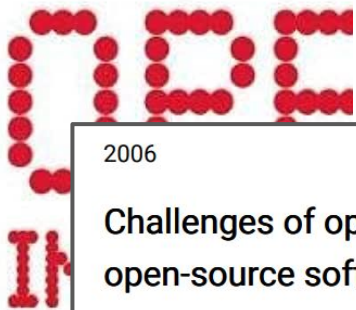


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**Challenges of open innovation: the paradox of firm investment in open-source software**

Joel West

*San Jose State University, joel.west@sjsu.edu*

Scott Gallagher

*James Madison University, gallagsr@jmu.edu*

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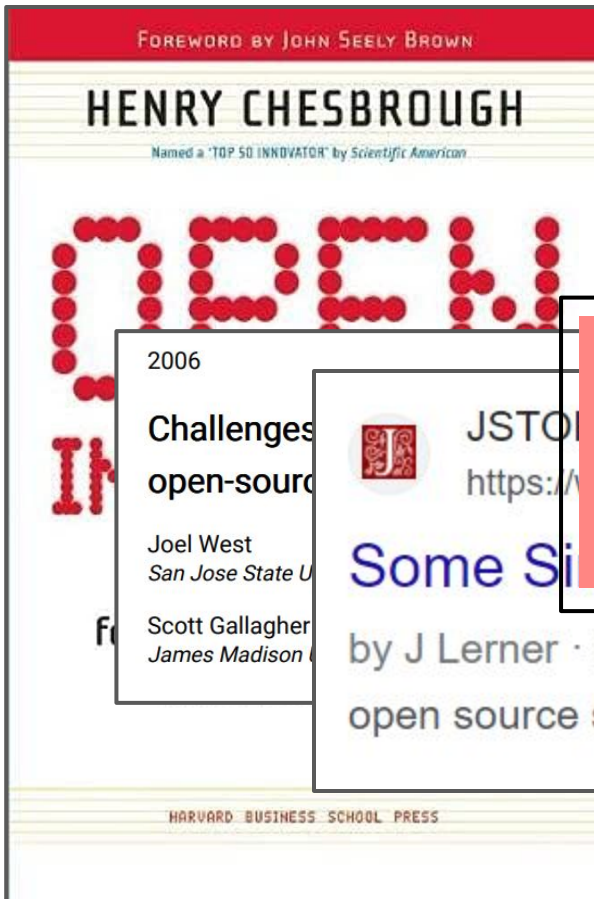
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## Some Simple Economics of Open Source

by J Lerner · 2002 · Cited by 3899 — paper makes a preliminary  
open source software. We highlight the extent to ... **SOME SIM**

“To an economist, the behavior of individual programmers and commercial companies engaged in open source projects is initially **startling.**”



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2006 - EC

## National level?

- Germany (Bitkom, 2019, 2021, 2023)
- France (CNLL, 2019 and Nagle, 2019)
- UK (OpenUK, State of Open Report, 2022)



# Economic Impact

**Short summary of economic results produced by Knut  
Blind/Fraunhofer ISI**

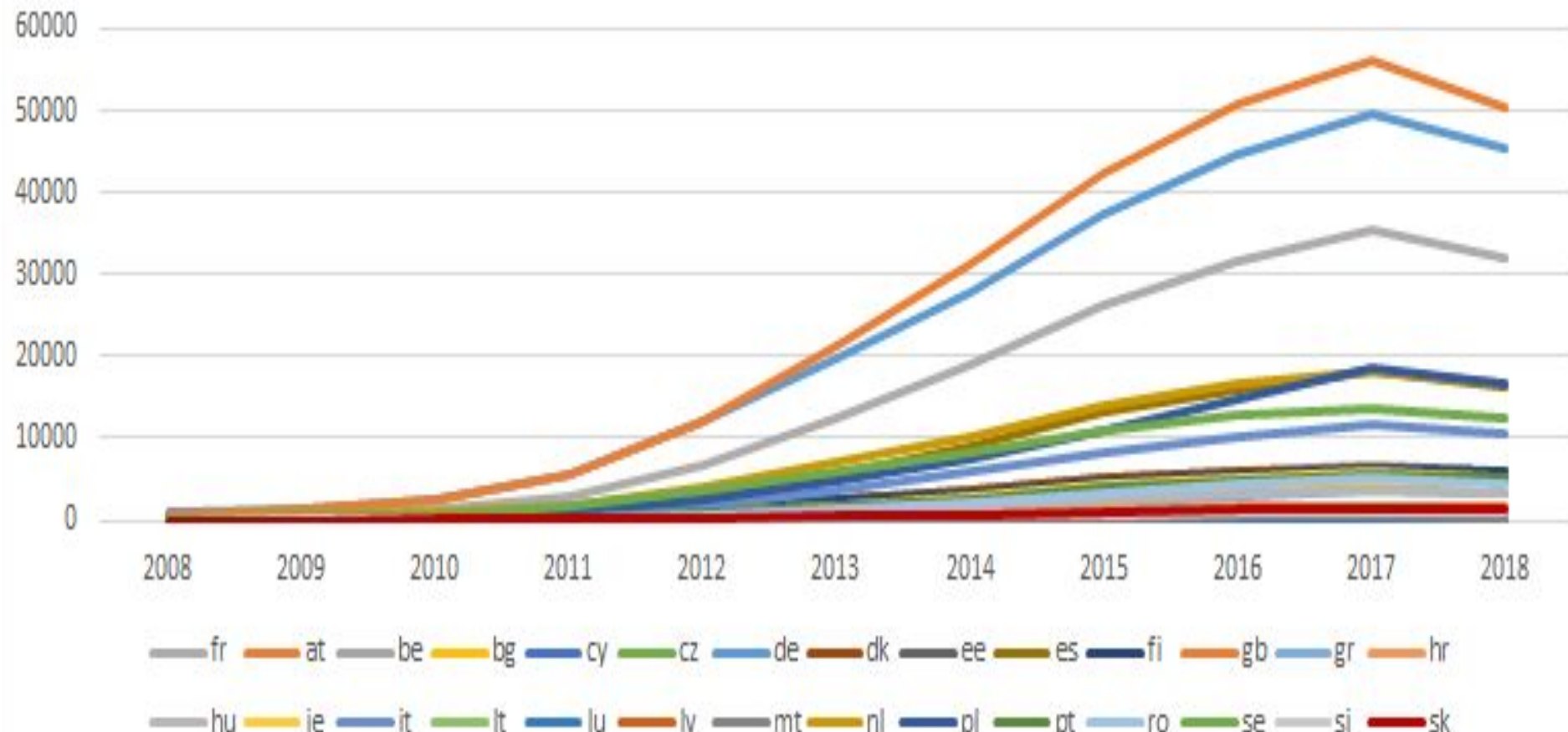
All numbers are for EU 28 in 2018



# Data sources

- Open Source Software
  - 1.3 billion commits at GitHub
  - 32 million users at GitHub with 1.5 million organisational affiliations and 2.5 million country codes
  - almost 700,000 organizations
- Economic Data
  - OECD
  - Eurostat
  - European Patent Office
  - Crunchbase, Amadeus, Worldbank, ILO, ...

## Contributors by EU Member States



# Investment in OSS on MS level

- 8.2% of the 3 millions employees in computer programming contribute on GitHub in the EU
- 30 million commits to GitHub: effort of more than 16,000 FTEs
- €1 billion personnel cost investment in 2018
- Small companies most active, i.e. > 75% have < 100 employees; the smaller the company, the more commits

€65 - €95  
billion

OSS contribution to EU economy in 2018

*(lower bound)*

# OSS makes up between 0.5% and 0.7% of the EU's GDP.

- This means OSS contributes a similar value to the GDP as both air and water transport combined, according to Eurostat.
- Significant contribution of OSS to foundation of start-ups, i.e. an increase of 10% would generate around additional 1,000 ICT start-ups per year

10% increase  
in number of  
contributors:

€ 95 billion  
Increase in  
EU GDP

*(lower bound)*

1:4

Cost : benefit  
ratio

*(lower bound)*

# What about OSH?

- Difficult to estimate the impact: few studies and data points
- Some work done on OSH in research and scientific applications:  
“Distributed digital manufacturing of free and open-source scientific hardware (FOSH) used for scientific experiments has been shown to in general reduce the costs of scientific hardware by 90–99%.” (J.Pearce)
- Majority of OSH companies are both designing and manufacturing hardware products



# Open-Source Lab: How to Build Your Own Hardware and Reduce Research Costs

Authors Joshua M Pearce

Publication date 2014

Publisher Elsevier

Description Open-Source Lab: How to Build Your Own Hardware and Reduce Scientific Research Costs details the development of the free and open-source hardware revolution. The combination of open-source 3D printing and microcontrollers running on free software enables scientists, engineers, and lab personnel in every discipline to develop powerful research tools at unprecedented low costs. After reading Open-Source Lab, you will be able to: Lower equipment costs by making your own hardware Build open-source hardware for scientific research Actively participate in a community in which scientific results are more easily replicated and cited Numerous examples of technologies and the open-source user and developer communities that support them Instructions on how to take advantage of digital design sharing Explanations of Arduinos and RepRaps for scientific use A detailed guide to open-source hardware licenses and basic principles of intellectual property

And what  
about **policy?**

Introducing: the

**Digital Services Act**

and the

**Digital Markets Act**



EUROPEAN  
COMMISSION

Brussels, 25.4.2018  
COM(2018) 237 final

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN  
ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE  
REGIONS**

**Artificial Intelligence for Europe**

{SWD(2018) 137 final}

# Cyber Resilience Act

- (10) In order not to hamper innovation or research, free and open-source software developed or supplied outside the course of a commercial activity should not be covered by this Regulation. This is in particular the case for software, including its source code and modified versions, that is openly shared and freely accessible, usable, modifiable and redistributable. In the context of software, a commercial activity might be characterized not only by charging a price for a product, but also by charging a price for technical support services, by providing a software platform through which the manufacturer monetises other services, or by the use of personal data for reasons other than exclusively for improving the security, compatibility or interoperability of the software.

# Cyber Resilience Act



23 January 2023

**Feedback to the Commission regarding  
Cyber resilience act – new cybersecurity rules for digital  
products and ancillary services**

## **The CRA and Open Source Software**





# Cyber Resilience Act

- The exemption is "to avoid hampering research and innovation" → could make for a very narrow interpretation
- Collaborative software development might be difficult - assuming responsibilities and liabilities for the development performed by collaborators over whom they may not have authority to impose or verify adherence to the CRA
- What about using OS code from outside of the EU?

# Cyber Resilience Act

- Fix #1: remove the general ban on publishing non-compliant software and instead have CRA compliance as an optional seal of quality. Instead of making the CRA mandatory for publishing software, it would be mandatory for claiming that a particular version is "CRA compliant (CE)" - public administrations have to use CRA compliant software
- Fix #2: third-party provides an audit for particular solutions
- ...



# Public Policy

# OSS in policy

- OSS push in early 2000s
  - Internal lobbying achieved high-level political support
  - Intertwined with political concerns around independence and culture  
“Software as a commons”
  - Institutionalisation significant part of effort, but never centralised
- Early 2010s saw end high-level political support
  - Without central function, institutions quickly lost mandate
  - Why did the Software Libre movement lose its power of persuasion on the government?
- Today we see a new push for open source in public policy

# Policy and open source

- Compare expansiveness of public policy actions relating to Open Source (not normative!)
- Understand why governments engage with Open Source
- Understand what works and what doesn't

# The framework

Dimension	Criteria
Public policies aimed at the public sector	<ul style="list-style-type: none"><li>• The level of prescriptiveness of a policy, throughout the jurisdiction.</li><li>• The degree to which public procurement policies take OSS/OSH into account.</li><li>• How effectively the policy is being executed.</li><li>• The degree of competence with regard to OSS and OSH within the public authority.</li></ul>
Public policies aimed at the private sector	<ul style="list-style-type: none"><li>• To what degree the jurisdiction supports private actors in adopting and developing OSS and OSH.</li><li>• To what degree the jurisdiction makes guidance available for private actors.</li><li>• Whether the jurisdiction's administration takes on a role (and if so, what role) with regard to OSS and OSH communities.</li><li>• To what degree OSS and OSH is being taken into account in neighbouring policy fields.</li></ul>

# Existence of OS policies in selected countries

Criterion	Max Mark	Bulgaria	France	Germany	Italy	Poland	Spain	United Kingdom	United States	Brazil	China	India	Japan	South Korea
<b>Dimension: Public sector</b>		<b>52%</b>	<b>65%</b>	<b>0%</b>	<b>63%</b>	<b>2%</b>	<b>57%</b>	<b>51%</b>	<b>54%</b>	<b>14%</b>	<b>40%</b>	<b>40%</b>	<b>0%</b>	<b>31%</b>
Policy existence	15	15	5	0	10	0	15	10	10	0	5	10	0	10
Public procurement	15	15	10	0	15	0	5	5	10	0	10	10	0	0
Policy implementation	15	3	8	0	4	0	5	6	6	0	5	5	0	0
OS competence	20	1	19	0	12	1	12	12	9	9	6	1	0	10
<b>Dimension: Private sector</b>		<b>2%</b>	<b>29%</b>	<b>16%</b>	<b>13%</b>	<b>2%</b>	<b>20%</b>	<b>11%</b>	<b>0%</b>	<b>4%</b>	<b>56%</b>	<b>27%</b>	<b>7%</b>	<b>76%</b>
Supporting private sector	20	0	0	2	0	1	0	0	0	0	14	5	1	17
Guidance	5	0	0	2	0	0	2	0	0	0	2	2	2	5
Community	10	1	10	1	4	0	6	3	0	1	4	4	0	6
OS present in neighbouring policies	10	0	3	2	2	0	1	2	0	1	5	1	0	6
<b>Total of achievable mark</b>		<b>27%</b>	<b>47%</b>	<b>8%</b>	<b>38%</b>	<b>2%</b>	<b>38%</b>	<b>31%</b>	<b>27%</b>	<b>9%</b>	<b>48%</b>	<b>33%</b>	<b>3%</b>	<b>53%</b>
Criterion	Max Mark	Bulgaria	France	Germany	Italy	Poland	Spain	United Kingdom	United States	Brazil	China	India	Japan	South Korea

Source: *The impact of OSS/OSH in the EU, 2021*

# Italy

- Italy's OSS policy story revolves around the CAD ("Codice Amministrazione Digital")
  - From 2012 on, developed into the "perfect" OSS procurement law
  - Comparative assessment, favouring OSS
  - Except nothing really happened
- Why?
  - Unclear responsibilities
  - Lacking awareness
  - No guidance
- Improvement as of late

# South Korea

- South Korea's government doesn't procure OSS specifically
- South Korea wants its industry to be sovereign
  - Ministry: "Open Source software [...] the basis of all activities"
  - Coordinates with CJK (China-Japan-Korea) countries on OSS
- Institutionalisation and industrial policy
  - Korea Copyright Commission, License compliance - \$3 mil annual
  - Open Source Software Competence Plaza - \$12 mil annual
  - KOSSLab, an Open Source incubator
  - National IT Promotion Agency - \$360 mil annual

# Conclusions

- Writing a good law is not everything
- Implementation and follow up is difficult
  - Awareness / ease of implementation / education
- It is difficult to force the disinterested to do something
  - External spark, intrinsic motivation
- Political support - changing priorities and governments



# Issues and approaches

- Level of prescriptiveness secondary as explanatory factor
- Culture seems most important factor - Open (Source/Innovation/Data/Government) culture
  - The bigger the organisation/scope, the more challenging
  - Only successful examples on regional level
- Institutionalisation common approach, but mixed results
  - Political support necessary if open culture has not set in

# Globally: Open Source policy mapping

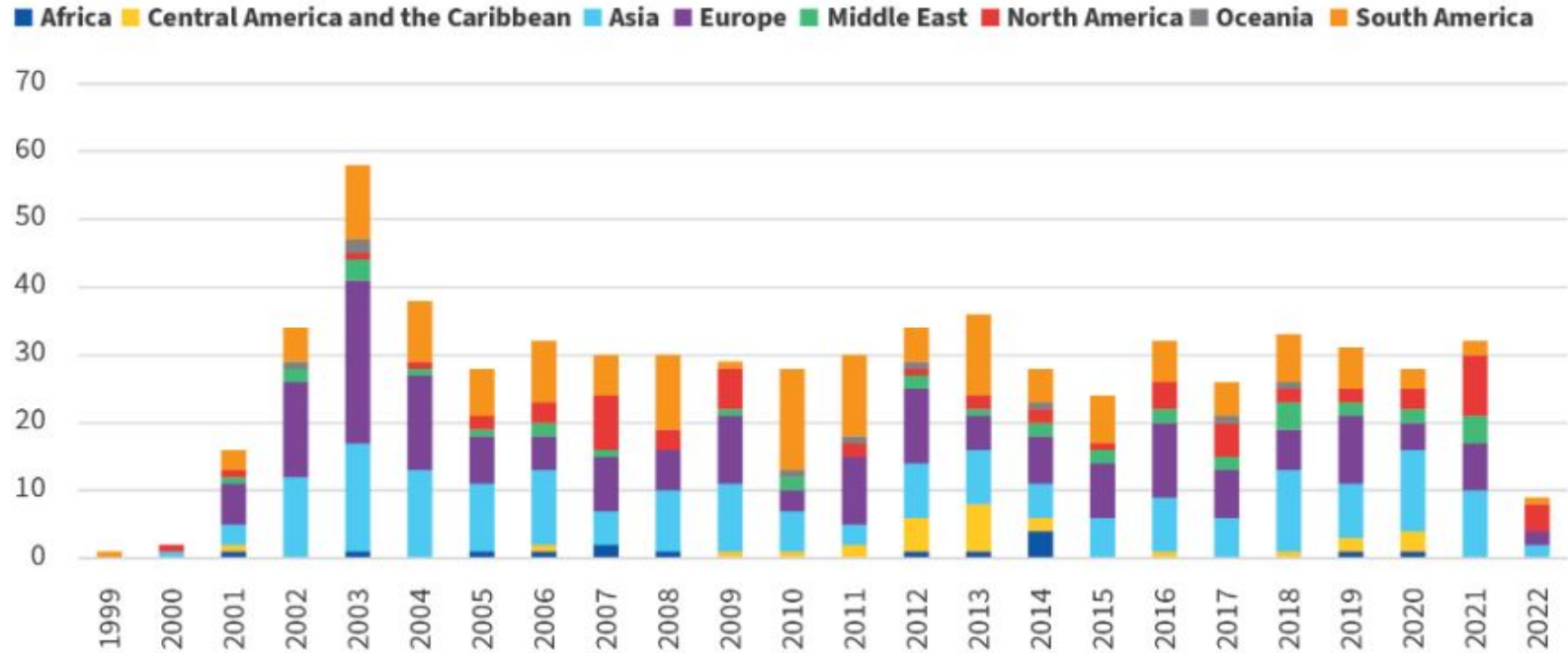
**Table 3**

**Regional Distribution\***

	Approved	Proposed	Failed	Total
Europe	126	27	10	163
Asia	59	20	2	81
Latin America	31	15	11	57
North America	16	11	10	37
Africa	8	1	0	9
Middle East	5	2	0	7

*Source: Center for Strategic and International Studies,  
"Government Open Source Policies", March 2010*

## Figure 2: Regional Distribution of OSS Policies by Year



Source: Center for Strategic and International Studies,  
"Government Open Source Policies", January 2023



and each entry contains information related to a specific event that has occurred within a system or network.

(j) the term “Software Bill of Materials” or “SBOM” means a formal record containing the details and supply chain relationships of various components used in building software. Software developers and vendors often create products by assembling existing **open source** and commercial software components. The SBOM enumerates these components in a product. It is analogous to a list of ingredients on food packaging. An SBOM is useful to those who develop or manufacture software, those who select or purchase software, and those who operate software. Developers often use available **open source** and third-party software components to create a product; an SBOM allows the builder to make sure those components are up to date and to respond quickly to new vulnerabilities.

*Source: White House, Executive Order on Improving the Nation’s Cybersecurity, May 2021*

Figure 5: Type of Actions

Tech Neutrality   Training   Repository   R&D   Procurement - Mandatory   Procurement - Advisory  
How to Use   Cooperation

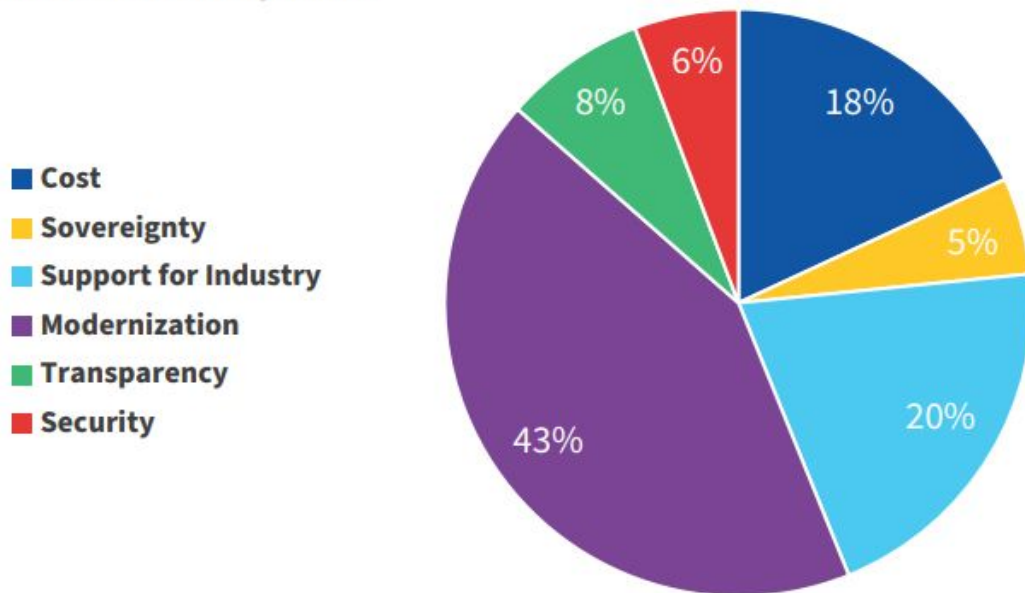


Source: CSIS.

Source: Center for Strategic and International Studies,  
"Government Open Source Policies", January 2023

## Why OSS?

Figure 8: Stated Objective



Source: CSIS.

Source: Center for Strategic and International Studies,  
“Government Open Source Policies”, January 2023

# European Commission's OS Strategy 2020-2023

- Set up an Open Source Programme Office in the Commission;
- Set and promote the inner source default;
- Enhance the software repository;
- Revise software distribution practices;
- Enable and create innovation with open source labs;
- Develop skills and recruiting expertise;
- Increase outreach to communities;
- Integrate open source in internal IT governance;
- Ensure OSS security;
- Encourage and promote inner source;

# Interoperable Europe Act

This bundles valuable resources in support of public sector entities all over the EU and paves the way to better reuse of existing solutions (**ideally open source**) for public benefit. In doing so, it helps remove administrative burdens, including legal, organisational, semantic and technical obstacles. As a result, it will reduce cost and time for companies and citizens, businesses and for the public sector itself.



# Interoperable Europe Act

- A structured EU cooperation of public administrations, supported by public and private actors, regions and cities.
- The sharing and reuse of solutions, often open source, powered by an 'Interoperable Europe Portal' – a one-stop-shop for solutions and community cooperation.
- Innovation and support measures, including regulatory sandboxes for policy experimentation, GovTech projects to develop and scale up solutions for reuse, and training support.

# Interoperable Europe Act

- Savings from €5.5 and €6.3 million for citizens and between €5.7 and €19.2 billion for businesses dealing with public administrations

# Summary

- Open source is 'pretty good' and it is more recognised by governments
- Economic value of open source can be derived by a variety of actors, and this impact is large
- Implementation and culture are the big challenges for OS

# Why do companies want to use open source?

- Speed of development
- Freedom to adapt to own/customers' needs
- Crowd-sourced product development
- Bottom-up sales
- Generating trust among the developer community
- Attractive to employees
- Variety of models: maintenance, hosting, consulting, freemium, support services...

# Why do governments want to use open source?

- Transparency and trust
- Interoperability
- Technological independence/digital sovereignty and control over own assets
- Modernisation and speed of development at scale
- <economic impact>

# Why Open Source matters in digital policy?



Large economic impact of Open Source Software and potential impact of emerging Open Source Hardware



Public policy should be used to scale and incentivise production of OSS for EU economy



Comprehensive and coordinated policy approach is needed based on institutional capacity across public sector

How to maximise that impact?



Public sector



Research and Development



Industry

+ overarching ideas



# Public sector and policy

# Digital sovereignty

*“In the digital decade, Open Source will be a key element to achieve Europe’s resilience and digital sovereignty”*

- Thierry Breton, European Commissioner for the Internal Market

# How to foster open source through policy?

- When you talk about digital sovereignty, talk about open source
- Don't forget about open source when legislating
- Gather data on usage and creation of open source
- Fund, research and collaborate on OS security

# Building institutional capacity

- Economic value of Open Source > European institutional capacity
- Use OSPOs as a vehicle to increase institutional capacity in the public sector → laws are not all it takes
  - OSPOs: EC, Paris, France, Germany, Czechia, WHO,...

# Center for Digital Sovereignty (ZenDis, Germany)

The center is intended to act as a link between public administration and players in the open source ecosystem, determine market trends, absorb ideas, suggestions and requirements from public administration and communicate these in open source communities/market. By initiating and supporting collaborative projects, tailor-made open source software solutions for public administration are to be created and offered on a central marketplace. The solutions funded by the Center for Digital Sovereignty of Public Administration (working title) should be based on open standards, open interfaces and a modular architecture, as well as compatibility with existing IT of the public administration in order to achieve the greatest possible interoperability and flexibility in the future.

# Building institutional capacity

- Not only OSPOs, but networks of OSPOs (in public administrations, in research institutes...)
- Promote open source in future revisions of the European public procurement directive → government agencies have to favor OSS over proprietary software
- Provide guidance on how to procure open source

# Open R&D enabling European growth and innovation

# How to foster Open Source in research?

- R&D funding related to OSS and OSH projects through existing programmes, such as Horizon Europe; for SMEs
- Research awards and incentives for OSS and OSH communities, students, and professors.
- Incentivise sharing code of publicly funded research



# How to foster Open Source in research?

- Promote and include open source in educational programs: not only ICT, but also business schools, media studies, law...
- Support the creation and maintenance of European platforms and networks

# A digitised and internationally competitive industry

# How to support open source for the European industry?

- Contributions from both individuals and corporations should be treated as charitable donations for tax purpose
- Clarify liability regime for OS developers
- Fund security audits of critical OSS projects requiring specific security-improving changes with public resources

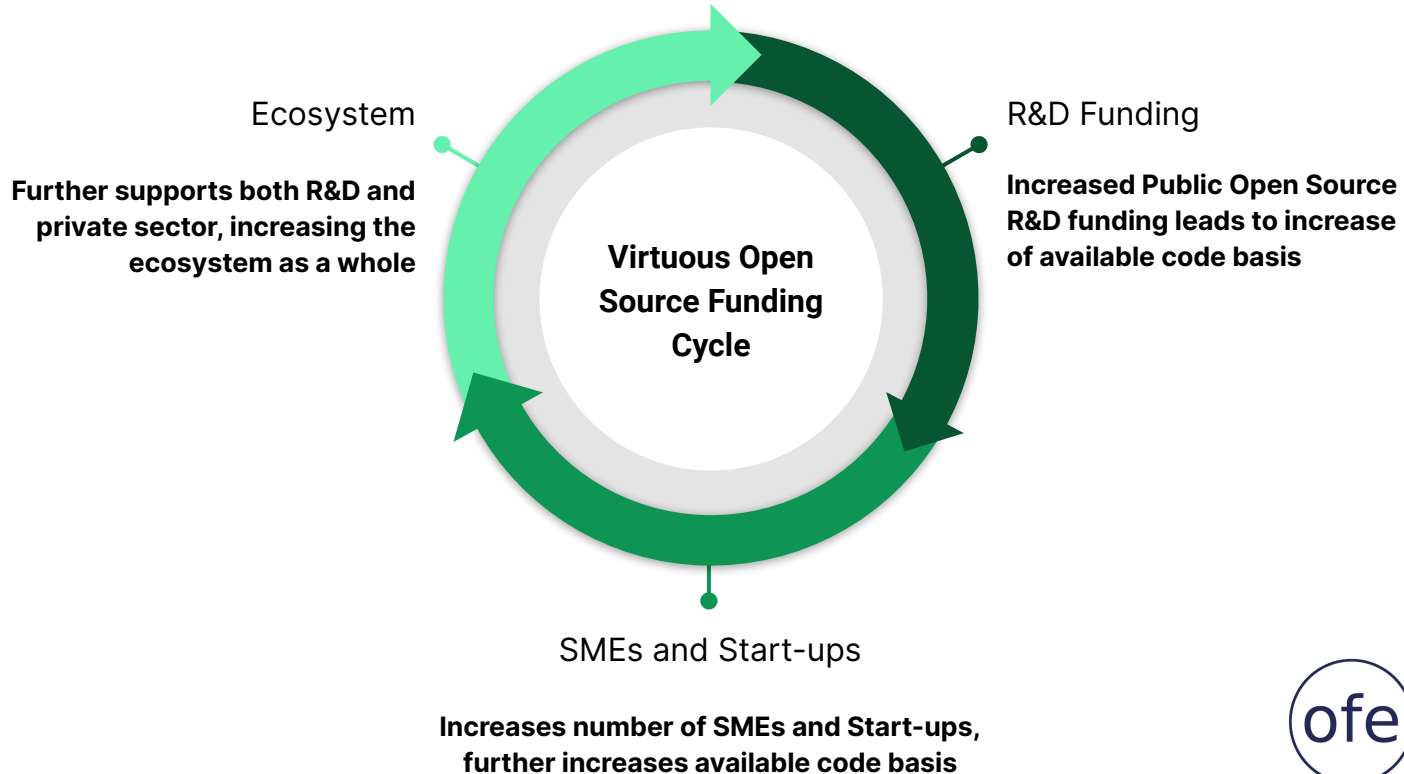
# How to support open source for the European industry?

- Finance high-risk, R&D intensive OSS based startups
- Embrace OSH early and research how to take advantage
- Additional funding in support of OSSH projects, if they provide supplemental "green" benefits

# How to support open source for the European industry?

- Promote partnerships between small open source players, trusted intermediaries and larger companies
- Consider OS in competition, platform and SME policies

# Virtuous Open Source Funding Cycle



# Open Source Program Office

- Supports and accelerates the consumption, creation, and application of open technologies within an organisation
- Emerging as a networking interface with other OSPOs, foundations, OS communities and the users of OS solutions
- Gathers knowledge and expertise on OS within an entity: on licensing, legal compliance, internal contribution policies, needs, resources, measuring the use of OS
- Provides training and guidance, can influence internal culture (“share early”)

# Open Source Program Office

- Very popular in the private sector, less so among universities and public administrations
- Universities: Johns Hopkins, Rochester Institute of Technology, Trinity College Dublin, University of California, Carnegie Mellon, CERN...





## Open Source Innovation in Universities

On March 24th, OSPO++ is organizing an in-person event in partnership with Trinity College Dublin to discuss emerging trends relating to open source in Open Science, Innovation and Knowledge Transfer.

Open Event



## OSS Licensing in Universities

In this OSPO++ Community Call, Cindy Chepanoske will share learning about OSS licenses from CMU's Center for Technology Transfer and Enterprise Creation.

Open Event

Watch Recording

# Representation

# APELL

Association Professionnelle  
Européenne du Logiciel Libre  
The European Open Source  
Software Business Association



RETE ITALIANA  
OPEN SOURCE



Les entreprises du numérique ouvert

OSB Open Source  
Business  
ALLIANCE

Bundesverband für digitale Souveränität e.V.

*ESOP*



CENTRE FOR OPEN SYSTEMS  
AND SOLUTIONS

OPEN SOURCE SWEDEN

Open:UK



ofe OpenForum  
Europe



[Openforumeurope.org](https://openforumeurope.org)



[@OpenForumEurope](https://twitter.com/OpenForumEurope)



[paula@openforumeurope.org](mailto:paula@openforumeurope.org)



**Thank you.**

Paula Grzegorzewska