Global Openness: Making Science a Public Good to Tackle Global Challenges

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IFLA Division D Midterm Meeting, June 5-7, 2024, Koç University, İstanbul

Note: This keynote is based on one of my earlier presentations and shares some slides (#3 thru #9) therefrom. See Tonta, Y. (2022). Open Access: The key driver to address grand challenges. 11th Eurasian Academic Libraries Conference, October 27-28, 2022, Nazarbayev University, Astana, Kazakhstan. https://yunus.hacettepe.edu.tr/~tonta/Yayinlar/tonta-ealc-2022-open-access-kazakhstan-v4.pdf

Plan

- Knowledge / Science as a "Public Good"
- Relationship between Science and Property
- Vicious Circle of Affordability, Functionality, and Replication
- Open Science and Innovation
- Open Science Challenges
- Open Science in Turkey
- The Way Forward

Louis Pasteur (1822-1895)

"Science knows no bounds, because knowledge belongs to humanity, and it is the torch that illuminates the world."





Elinor Ostrom (1933-2012)





The Evolution of Institutions for Collective Action 2009 Nobel Prize Winner Understanding Knowledge as a Commons

From Theory to Practice

edited by Charlotte Hess and Elinor Ostrom



Source: http://www.bollier.org/category/tags/commons-theory

Science / Knowledge as a Public Good

- The amount and value of knowledge is not diminished when shared (nonsubtractable, non-rivalrous)
- Excluding a certain person or a group is difficult and costly (non-excludable)

Types of Resources

		SUBTRACTABILITY		
		Low	High	
EXCLUDABILITY	Difficult	Commons Useful knowledge	Common-pool resources Irrigation systems	
	Easy	Paid resources Licensed journals	Private resources Personal computers	

Relationship between Science and Trade



paywallthemovie.com



Source: Adapted from: Regazzi, J.J. (2015). *Scholarly communications: A history from content as king to content as kingmaker.* Rowman & Littlefield. p. 1

Relationship between Science and Property

- Intellectual property rights (IPR):
 - decrease scientific research and product development as much as 30%; and
 - curtail the knowledge use and innovation creation.
- Copying as a traditional IPR hinders the use of digital information
- How should we make IPR work for digital public goods based on copying then?

Source: Williams, H.L. (2013). Intellectual Property Rights and Innovation: Evidence from the Human Genome. *Journal of Political Economy*, 121(1): 1-27; Brown, C. (2009). Ayresian technology, Schumpeterian innovation, and the Bayh-Dole Act. *Journal of Economic Issues*, 43(2): 477-486; Pearce, J.M. (2013). Open-source nanotechnology: Solutions to a modern intellectual property tragedy. *Nano Today*, 8(4): 339-341.

Vicious Circle Affordability crisis Functionality Replication crisis crisis

Source: Brembs, B. et al. (2022). Replacing academic journals. https://zenodo.org/record/5793611

Open Science: Definition and Elements

- makes multilingual scientific knowledge available, accessible and reusable for everyone;
- increases scientific collaborations and sharing of information for the benefits of science and society;
- opens the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the conventional scientific community.



Shared Values and Principles of Open Science



Key Open Science Achievements

- Number of Open Access papers increased
- Open Science policy developments accelerated
- OS infrastructures (repositories, standards, etc.) strengthened
- Level of OS awareness increased
- OS accelerated innovation to tackle global challenges

Relationship between Open Science and Innovation





Source: Ongoing Activities to Advance Open Science at US Federal Agencies. https://www.youtube.com/watch?v=GUIbO1J2Kls&list=PLChfyH8TVDGnB_zDCm 8d9oonMomfk8v9X&index=4

Source: Bryan, K.A. & Ozcan, Y. (2021). The impact of open access mandates on invention. *The Review of Economics and Statistics*, 103(5): 954-967.

Time it Took to Develop Vaccines for Diseases

Disease agent	Year identified	Year licensed (FDA)	Time to develop vaccine in year(s)
Smallpox	300 AD	1796	c.2100
Haemophilus influenza	1933	1985	52
Influenza	1933	1945	12
Hepatitis A virus	1973	1992	19
Rotavirus	1973	1998	25
Ebola virus	1976	2019	43
HPV	1983	2006	23
COVID-19	2019	2020	<1

Source: Adapted from Table 1 in: Saleh, A. et al. (2021, July 26). Vaccine Development Throughout History. Cureus, 13(7):e16635. doi: 10.7759/cureus.16635.

Global Risks Ranked by Severity over the Short and Long Term

"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period."

Risk categories

Economic

- Environmental
- Geopolitical
- Societal
- Technological

2 years

- 1st Misinformation and disinformation
- 2nd Extreme weather events
- 3rd Societal polarization
- 4th Cyber insecurity
- 5th Interstate armed conflict
- 6th Lack of economic opportunity
- 7th Inflation

Pollution

10th

- 8th Involuntary migration
- 9th Economic downturn

10 years Extreme weather events 1 st 2nd Critical change to Earth systems Biodiversity loss and ecosystem collapse 3rd 4th Natural resource shortages Misinformation and disinformation 5^{th} 6th Adverse outcomes of AI technologies 7th Involuntary migration 8th Cyber insecurity

Societal polarization

Pollution

9th

10th

Source: World Economic Forum Global Risks Perception Survey 2023-2024; cited in The Global Risks Report, 2024, p. 8. https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2024.pdf

Open Science Challenges

- Market power of academic journal publishers
- Uptake of OS transformation
- Unintended consequences of OS
- Enabling OS infrastructures (i.e., accessibility and interoperability)
- OS capacity building
- OS incentives
- Culture change

Strategy for Open Science Culture Change



Source: Nosek, B. (2019, June 11). Strategy for culture change. https://www.cos.io/blog/strategy-for-culture-change

Source: Unesco Open Science Outlook (2023). https://unesdoc.unesco.org/ark:/48223/pf0000387324

easy

Open Science Policies in Turkey

- No mention of "Open Science" in:
 - the Presidential Program of 2024;
 - 2024-2028 Strategic Plan of the Ministry of Science and Technology; and
 - in the Presidential Digital Transformation Office's web site
- OS policies of the Turkish Higher Education Council and universities
 - "Open Science for a Better Future"
- Turkish Scientific and Technological Research Council (TÜBİTAK)
 - Open Science Policy (2019)
 - Open Science Portal (Aperta Open Data Archive, Harman, DergiPark, TR-Dizin, etc.)

The Way Forward

- "For open science to reach its full potential, it must be a **truly** global, equitable phenomenon.
- Open science is growing, but **unevenly**.
- Transition to open science requires a shift in the culture of science.
- Collective, collaborative and **coordinated action and investment** are needed to accelerate the transition to a truly global, equitable open science."

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