T7 Task Force Strengthening social cohesion

POLICY BRIEF

DIGITAL UTILITIES FOR SCIENTIFIC RESEARCH TOWARDS AN EQUITABLE WORLD

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Abstract

A vast amount of future-altering information has been created and gathered and is sitting, inaccessible, behind antiquated systems and structures. Two invaluable sources of information: scientific research and digital data remain trapped in systems that incentivize personal gain and profit over global access and equality. Between the scientific research pathways, Big Tech monopolies, patent systems and data security regulations, access is determined by prestige, power, and wealth instead of fair benefit. We propose a pathway to a more equitable future by way of generative governance models, digital data utilities, transparent digital rights management, and fair benefit sharing models. Through these systems, science and data can be used as a force for global good and innovation where anyone anywhere can innovate, engage, and participate.

Challenge

A few major factors contribute to the massive accessibility gap: Inequitable pathways to scientific data within the economy of knowledge, Big Tech, the patent system, and regulation. These silos create a vast accessibility gap where the solutions have been created but are inaccessible to the people and systems that both supported their development and urgently need to apply and learn from the findings.

1. **There are closed containers and inequitable pathways to scientific data.**

Scientific data is perceived to be "owned" by the researchers who generate or gather it thus rendering important findings unavailable. Scientists frequently collect and keep data in a protected and closed container and develop findings and products independently of the people and systems they are intended for (Denton, N. et al 2021). Other factors are at work here, including whether the researchers are publicly or privately funded. Moreover, scientists are increasingly coming under the weight of data protection regulations which means that in certain circumstances the ability to disseminate information is taken out of the control either by university authorities or regulatory authorities. Very often the guidance is unclear concerning access to date and the exchange of data between institutions in different nations. Additionally, citizens whose data has been collected and used for research are themselves unable to access digital services including their own data, creating further inequalities (Precision Medicine Initiative, NIH, US, 2015). Lack of openness on data can encourage the emergence of models based on very partial and incomplete evidence. Epidemiological modelling has been the basis for many policy decisions during the pandemic where complementary, and more diverse forms of evidence could have made a significant difference to outcomes. (Iranzo V., Perez-Gonzalez, S. 2021)

2. **Science, unfortunately like Big Tech, creates data silos and restricts access.**

Today, scientists are not incentivized to share data and research findings openly (Popkin G., 2019). Google and Facebook collect immense amounts of data and gain benefit which they keep for themselves (Curran, D., 2018) the global patent system falls short by restricting knowledge, creating pathways for monopolies (B.Z. Khan, 2022) and systems for regulations are inconsistent and inequitable in their distribution. Scientific output like published papers do not allow for independent access to the data on which the findings are based (Wiewiorówski, W. 2020). Data Traceability is digitally possible but practically stymied. To complicate matters further, the crisis in reproducibility of scientific experiments further entangles the information in the first scientific publication, with the data sources for the original and later experiments, the impact of the experiment and of later experiments performed after the published experiment is completed, and the eventual outcomes triggered by this new scientific advance (Wikipedia, 2022).

3. **The patent system fails to make innovation accessible for widespread usage and future invention**

Developing countries, specifically see technology transfer as part of the bargain in which they have agreed to protect intellectual property rights. The TRIPS Agreement Article 66.2 (World Trade Organization, 2017) aims to achieve the transfer and dissemination of technology as part of its objectives, and specifically requires developed country members to provide incentives for their companies to promote the transfer of technology to least-developed countries. This mechanism has enormous untapped potential to address key

challenges in lower-income countries Meanwhile, technology transfer (licensing) is an antiquated and complex process and often abandoned by licensees midway the negotiations. „$1 trillion in IP is never transacted upon because of the difficulties surrounding managing and evaluating assets" (IBM, 2021). Combined with the intellectual property leased through patents going off patent, the European Patent Office Espacenet repository contains over 130 million patent records. The knowledge from the expiring patents could be used in very constructive ways in both developing and developed countries. (Price., W.N., 2017)

4. **Data regulation and security favours a few at the expense of fairness** (Reeves, R., Joo, N. 2017)

The regulation system that governs data privacy is inequitable and prevents developing nations from accessing important data. (Z. Kmietowicz, 2002) Data is gathered and held as a way of creating wealth for a few instead of helping everyone thrive. There are also many instances where digital rights are infringed upon, and data is used for active surveillance of citizens by states thus further inhibiting the positive benefits of data use and access. (National Academy of Science, Engineering, Medicine, 2000)

Proposals

1. **A generative evolving governance model: Access not Ownership Rights (Bank of England, 2020)**

We propose a generative evolving governance model where all stakeholders have a say in governance and access rights appropriate to their past or future contribution to the data cooperative or digital data utility. Cultivating environments of empowering scientific breakthroughs through data cooperatives, the widest range of stakeholders are given degrees of self-determination on how the data they generate or contribute can be accessed, aggregated, analysed, and have a say on the purposes to which the results are applied.

Digital Identity is under development by almost every country in the world and no country has "solved" this issue. Eventually global science will incorporate common agreement between countries on how the attributes of digital identity in one country can interoperate with the attributes of digital identity in another. Global science will have to determine interoperable approaches for protection of attribution of authorship, assurance of fair use intellectual property rights, and respect for privacy requirements in research data. Transnationally verifiable digital identity is an exceptionally complex problem that will evolve over many years, providing expanding opportunities for the international science community to evolve data sharing globally over time. Most importantly, the advent of digital identity will depend on a homogenous regulatory environment globally. SDG target 16.9 seeks to address this by setting a target to: "By 2030, provide legal identity for all, including birth registration" and sets a high bar for the international community to strive for. Achieving this, however, will require new approaches, partnerships, and technologies. Digital identity offers the potential to leapfrog from analogue ID infrastructures and scale

access to, and participation in, the digital economy. Policy makers, private and public sector actors will need innovative strategies to overcome barriers and deliver on this opportunity and address issues of trust, privacy, and data management, for example.

2. **An open-source-inspired foundation for tracking access, provenance, and intent.**

Digital utilities for data under public or cooperative governance focus on access rather than ownership. They can provide a common open-source-inspired foundation for tracking access, establishing provenance and scientific intent as well as replicating experiments, analysing, re-measuring, and sharing knowledge. Technology offers us the opportunity to amass and offer data that can be used across generations of scientists. Within this model, the incentive becomes about advancing scientific contribution for all by all, and not keeping data wholly inaccessible to other than the specific initial funders, regulators, and scientists.

Provenance and attribution require that each contributor is uniquely identifiable - 'digital identities' will be needed not only for participants but for any digital asset. Verifiable credentials technology to support this (W3C,2022), but it will also require the governance model of digital trust between issuers and verifiers.

3. **A pathway to build a scientist's reputation through contribution.**

Digital Rights management for scientific data can build a scientist's reputation by offering more opportunity for contributions than journal papers and recognizes the hitherto untapped potential of nascent citizen scientists who could be empowered to contribute more than experimental results than if treated as though a subject, only a 'guinea pig'. Fair benefit-sharing models align the goals and incentives and provide greater access to more diverse insights over time and space, thus improving both research and eventual outcomes. Importantly, welcoming more stakeholders in science can inspire future scientists anywhere.

4. **Address the restricted access to knowledge and data driven by commercial interests with digital access rights and apply the economic analysis made possible by digital utilities in science to focus research funding on delivering outcomes for people and planet.**

Commercial interests have created barriers to access to knowledge and journal publication for their own benefit – Covid has highlighted this and triggered global reaction from the World Intellectual Property Office (Gurry, W., 2020). We need a structurally new way of assigning a 'value' to a scientific result based on the outcomes generated by its downstream activity. We need to define new digital forms of Research Evaluation to replace proxy measures like 'citations' and 'the citation indices' that current researchers value most. Unlike upstream traceability like "citations", which is much simpler, the downstream traceability is about tracking outcomes which occur in the future, so it is a continuous and ongoing process which requires committed resources to do the follow up. It will ideally go beyond research and connect scientific outcomes to commercialization, patenting, licensing, impact, job creation, revenue, etc. The reputation of the entire research organization, not just individual scientists, can then be seen in terms of the outcomes that benefit society, people, and planet.

Implementation

The main concerns about sharing models and utilising digital utilities for scientific research are governance, rights, security, validity, and protection. While shifting scientific data to a digital realm opens new questions and challenges, it makes possible inherently a fairer, more reliable, and fact driven landscape than the pen and paper systems of the past. The provenance of the data is the most critical element in securing its validity and ensuring that it retains its integrity and remains intact as it ventures into the world for investigation, aggregation, and analysis. In addition, a form of digital common law could emerge from the use cases for scientific research digital utilities. Technology such as data tagging, source of truth, localised data utilities and protection of unaltered IP can enable development of robust digital rights management for the benefit of our future generations and to steward our planet. In building out these scientific utilities, these foundational recommendations better align science with humanity.

In the short-term:

- We propose the G7 **recognize the need for policies that work across national boundaries at all stages of the innovation cycle:** Basic science, applied R&D, exploitable outputs including patent data and know-how; We need global pathways to evolve global policies for global responses. We are hamstrung by research financing policy and development finance which lack policies for funding Global IP infrastructure for shared benefit. We must investigate and pilot digital utilities, and access models as alternative to data ownership models, applying regulation and governance that balances public good and profit.
- We propose the G7 recognize the need to **move beyond nationally mandated actions** that govern the way scientific data is used and managed globally. This has led to a globally fragmented environment for data regulation which, amongst other things, acts as a barrier to cooperation and development in lower-income countries. Global pathways for developing global policies in response to public assertions for digital access rights must be manifest.
- We recommend instigating a joint G7 Investigation into the “Digital Rights, Digital Tracking and Digital Economics of Global Science Research” with WIPO, including the existing Intellectual Property Offices as observers. The current science publication/citation system needs to harness digital advances, tools, and services to increase access and equity in science research and the funding of science. The aim is to intercept at the root, the problematic structures creating barriers. This investigation would produce structural and tactical recommendations with targeted support for the following (but not limited to these). The investigation needs to distinguish between the treatment of pre-competitive research and commercially oriented research to appropriately foster the potential of innovation and creativity, while protecting personal and commercial invention rights under national and global legal frameworks.

a) **Digital Literacy** – stakeholders will need to be educated on the possibilities that are listed in this paper, including foundational literacy in privacy and cybersecurity. Understanding the economics of data, open source and open knowledge, the ecosystem of data providers, custodians, brokers, and consumers, etc.
b) **Data Discovery** – setting up federated registries that allow stakeholders to discover innovation assets across various national and professional networks, including developing nomenclature and mechanisms for downstream traceability.
c) **Data Infrastructure** – a mechanism to allow connecting data registries, providers, consumers, brokers, and service providers across boundaries. Two initiatives are already doing some practical work: ID Society and Gaia-X Hub Germany.

In the mid-term:

- We propose the **G7 call for a UN Science Digital Commons akin to the UN Law of the Sea Conference (UNCLOS)**, recognising science, like the sea, as a shared global resource. Regulations developed by different countries, by different ministries, by different generations of public servants today impose inequitable barriers to global science collaboration: Indigenous knowledge is hidden for fear of cultural IP being stolen, developing nations' health data is not accessible for addressing the disease burden. These negative impacts limit developing countries from generating science and blocks science and data innovations and global patents that create value and wealth.

In the long-term:

- The global patent system releases about 5 million patents each year for public use, a huge global resource, whose value is severely limited by the lack of a defined process to disseminate knowledge. The WTO's Trade Intellectual Property Rights System Article 66.2 provides for the transfer of technology from developed nations to less-developed nations. This is little used, and it has the potential to be a global force for good as part of Global IP infrastructure to benefit science.
- The G7 should **call for an updated and fair-sharing model for patent access and distribution.**
- G7 should **examine what negatively impacts scientific access to data and build capacity to overcome the barriers in two dimensions**: Over space: Global access barriers inhibit developing nations from harnessing the value stemming from their data to create value and wealth, global scientists can generate science from digital utilities. Over time: Future generations of scientists can re-look at data from one experiment and make new discoveries.

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Mei Lin is Chair of the People Centred Internet which she co-founded in 2015 with Vint Cerf. She is one of the early pioneers of CRM at Oracle, building on her earlier work at Intel, and studies at MIT under future Nobel Economics winners, Modigliani, and Merton. Socio-Technical lead (2011-13) for the US Government Future of Health initiative she began as subject matter expert for Networked Improvement Communities (2009-10). She is the convenor of the Digital Cooperation and Diplomacy network working closely with the UN agencies, ITU and UNDP, serves as advisor to Design for Change, a global educational innovation network.

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