



OPEN SCIENCE SOUTH ASIA NETWORK CONFERENCE

OSSAN 2022

5th–8th September

www.ossan2022.net

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under their Event Fund Grants**



**Organized by
DST-CPR, IISc, Bangalore**

DST-CENTRE FOR POLICY RESEARCH



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Open Science South Asia Network

OSSAN 2022

Organising team



Prof. TA Abinandanan



Dr. Moumita Koley



Dr. Pragya Chaube



Dr. Gautam Sharma



Mr. Jahnab Bharadwaj

Aim of OSSAN 2022

The Open Science Conference in South Asia 2022 is the open science international conference organized by DST-CPR, IISc, Bangalore, aiming at inculcating the concept of open science among the researchers of the region and also forming a network of like-minded people to connect (Open Science South Asia Network or OSSAN).

OSSAN presents the idea of bringing the open science enthusiasts of south Asia to engage in an international dialogue and sharing good practices for a stronger and more unified, workable Open Science policy framework, especially relevant for south Asia and the global south in general.

Why OSSAN 2022?

Open science is an emerging concept that aims to democratize science and has been extensively advocated by researchers, policy-makers, librarians, and international organizations like UNESCO and OECD. Open Science practices have been formalized to make research more 'inclusive', 'transparent', and 'efficient'. It is an approach designed to foster open and equitable sharing of knowledge through journals articles, greater access to data generated from research processes following the FAIR (findable, accessible, interoperable, and reusable) principles, reorienting research assessment mechanisms to foster open science practices and sharing of other research output such as codes, hardware.

However, globally more attention has been focused on the knowledge dissemination side with little or no contemplation of the knowledge creation process. Open science discussions focus mainly on the output of scientific research and how knowledge production can be more efficient, transparent, and reproducible. The cultural diversity in knowledge production is unexamined so far in the open science discourse. Insights on the knowledge creation process to make it more inclusive and collectively governed by society are also essential at this stage. Therefore the conference themes and discussions are aligned not only on the knowledge dissemination side but also on the creation with a specific focus on the need of south Asia. Conflicting intersections of IP and open science is another essential debate, especially in the global south context, and this has also been included in the agenda.

UNESCO OPEN SCIENCE RECOMMENDATIONS EXPLAINED

OPEN ACCESS



Unrestricted access to scholarly articles

OPEN DATA



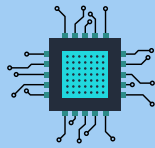
Access to raw and curated data from research projects

OPEN LAB NOTEBOOK



Access to raw and curated data from research projects

OPEN HARDWARE



Sharing of hardware design

OPEN SOURCE



Open sharing of code, software, dataset

OPEN EVALUATION



Responsible evaluation of research-quantitative vs. qualitative

CITIZEN SCIENCE



Participation of society in scientific research

TRANSPARENCY, REPRODUCIBILITY, COLLABORATION



Scientific process needs to be more transparent, reproducibility, collaborative

OPEN INFRASTRUCTURE



Sharing of digital and physical infrastructure, research facilities

EQUITY, INCLUSION, DIVERSITY



Inclusion of diverse knowledge system, inclusive practices,

OPEN INNOVATION



Open and collaborative innovation between academia and industry

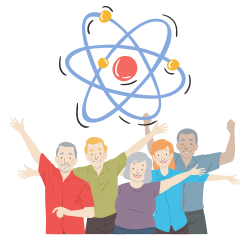
OPEN EDUCATIONAL RESOURCES



Open educational material for all

DEMOCRATIZATION OF SCIENCE

Science is defined as an inclusive construct that takes into account multilingual and diverse knowledge systems beyond the boundary of traditional STEM subjects. Knowledge creation and dissemination on both sides inclusivity, accessibility, and transparency must be ensured.



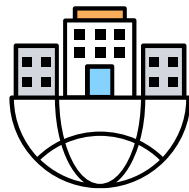
CITIZEN SCIENCE

society's participation in knowledge creation



TRADITIONAL KNOWLEDGE SYSTEMS

Inclusive of various knowledge systems traditionally practices by indigenous communities.



OPEN INFRASTRUCTURE

Research facilities and digital infrastructure opened for users beyond the institutional boundaries



COLLABORATION AND SHARING OF INFORMATION

For the benefit of science and society. Accelerating the pace of discovery



OPEN ARCHIVE

Knowledge from archives is available to an enquiring community

EQUITY, INCLUSION & DIVERSITY

open engagement and dialogue with diverse actors

WHY IS IT IMPORTANT TO SHARE RESEARCH DATA?

Research Data Sharing benefits the researchers, the research community, and the public. It encourages better collaboration and reuse of data, reduces resource wastage due to duplication, increases reproducibility and, ultimately, better science- leading to better decision making

OPEN RESEARCH DATA

Raw & processed analog and digital data, as well as textual records, images, videos, protocols, workflows, and codes generated from or used in research (primarily publicly funded), with metadata available for reuse (subject to acknowledgment as a fair practice). Adhering to **FAIR** principles.

FAIR



FINDABLE



ACCESSIBLE



INTEROPERABLE



REUSABLE



BENEFITS-REUSE

Data should not be stored in the lab notebooks but shared, both raw and processed, for the benefit of science and society. Accelerating the pace of discovery.



TRANSPARENCY & REPRODUCIBILITY

Credibility of science is in question and sharing of data will help reproducibility & transparency, finally faith in science will be restored.



OPEN DATABASE

Data-driven discoveries. With due recognition to the original researcher



FOR RESEARCHERS

More Citation
Greater Discoverability
Enhanced Visibility
New Opportunities of collaboration



Conference Abstracts

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Are Big Tech Algorithms enemies of open science? A study of Human-Algorithm interaction bias using a Quantum-like framework, Karl Popper, and Youtube's recommendation Algorithm

ANSHUMAAN GOEL*, DR. SUDIP PATRA**

*Jindal Global University, Sonipat, India

**Jindal Global University, Sonipat, India

email: agoel@jgu.edu.in

Big Tech Algorithms today have become key to how scientific research is disseminated to various levels of society. AI is expected to promote open science and improve scientific research with citizen involvement. However, Big Tech companies and Algorithms are becoming tyrannical and totalitarian, leading to techno-feudalism and closed science. Our method is a novel quantum-like framework of cognition that borrows and adapts concepts and tools from quantum physics and extends the same to decision sciences. We use tools from open quantum-system modeling to describe networking and knowledge diffusions in society. We refer to the emerging literature in this area, for example, the social laser framework by Andrei Khrennikov.

Big Tech Algorithms and biases in Human-Algorithm interaction are causing problems such as exposure effect, bandwagon effect, echo-chamber effect, filter bubble effect, popularity bias, etc, that together create a closed society. A closed society limits and subverts free speech, critical reasoning, and the art of questioning, thereby hindering the very purpose of open science. A closed society also leads to radicalization and the spread of fake news instead of the dissemination of objective and scientific research. Moreover, the Blackbox nature of Big Tech algorithms and the limited explainability of AI among citizens further exacerbates the problem of the closed and opaque nature of present society. Social media Algorithms, for instance, promote majoritarianism and collectivism that lead to canceled culture directed against minority views of critically thinking individuals. We use mixed methods research design by incorporating Karl Popper's philosophy, Quantum-like framework, and empirical findings on Youtube's recommendation Algorithm. We use the philosophy of Karl Popper to explain how today's algorithmic society has become an enemy of open society and open science. We also use open quantum-system modeling tools to describe the diffusion of scientific research in society. To test our hypothesis, we compare engagement levels such as likes, dislikes, comments, views, etc on various academic and non-academic Youtube channels and videos to find how engagement levels vary as per the type and content of channel and video.

Finally, we propose an open science framework for reforming Big Tech Algorithms. We also prescribe policy interventions to bring change in Human-Algorithm interaction in society to reduce the phenomenon of closed science and promote the culture of open science. The promotion of open science has the potential to improve not just AI Algorithms but also the quality of scientific research around the world.

'Right to Repair' For Circular Economy Transition in India

ANSEL ELIAS STANLEY

DST Center for Policy Research – Indian Institute of Science, Bengaluru, India

*email: anseleliasstanley@yahoo.in

Background: Repair is regarded as an essential strategy to extend the life of electronic items. The global e-waste generation is estimated to be at 53.6 million metric tonnes (Forti et al., 2020). A significant part of this E-waste generated can be attributed to the practice of planned obsolescence and a closed repair ecosystem that the manufacturers impose on their end-users (Bhutta et al., 2011). Planned obsolescence is the designing of products so that they are only functional for a short period of time to force consumers to upgrade to newer versions of their products (Aladeojebi, 2013). Planned obsolesces are also achieved by making it impossible to repair a product, leaving consumers with no other option than to buy a new device. Even though self-repairs and third-party repair are legal under most jurisdictions of law (Lata & Ahuja, 2021), The manufacturers make it very difficult by restricting access to spares, tools, and documentation essential for repair. Manufacturers often prohibit consumers from making repairs themselves other than through their 'official channels' of repair. They often employ end-user license agreements (EULA) and Digital Rights Management (DRM) to lock down their repair ecosystem. The restrictive repair practices by the manufacturers exacerbate the problem of e-waste generation. Industrialized countries like the United States, the UK, and the European Union have started formulating and implementing policies commonly referred to as the "Right to Repair" to protect consumers from these practices (Fetting,2020; Conway,2021; FTC, 2021). The legislation provides a statutory framework to access the materials needed to repair an electronic device and protect consumer interests. India ranks third behind USA & China in terms of the total E-waste generated (Forti et al., 2020). India generates around 1,014,961.2 tonnes of e-waste every year and is expected to grow 20-30% by 2030 (CPCB, 2020). India currently does not have any specific legislation or plan to protect consumers from the monopolistic behavior of manufacturers. Problem statement: 'Right to repair is a step toward achieving the UN Sustainable Development Goals by rescuing products that might have otherwise gone to a landfill through repair. The 'Right to Repair consumer movement is gaining attention globally to reduce e-waste generation.

India has been an outlier in the 'Right to Repair movement, even though India has a culture of reuse and repair. Methodology: The study employs a mixed-method approach to study 'Right to Repair in the Indian context. Quantitative data is analyzed through descriptive and inferential statistical techniques. Qualitative data is analyzed through thematic and Content analytic approaches. Solution/Conclusion: The environmental and social benefits of the 'Right to Repair' will significantly impact India's economy through employment generation and waste reduction. The study's data will help understand the 'Right to Repair' framework in the Indian context and how it will help India meet its SDG goals. Furthermore, it will add a new dimension to the existing research endeavors of 'Right to Repair' with specific reference to the circular economy.

Enhancing India's Open Science Infrastructure: A Case Study of I-STEM Portal

ANUP KUMAR DAS*, RABI SHANKAR GIRI**

*Jawaharlal Nehru University, New Delhi, India

**Presidency University, Kolkata, India

* email: anup_csp@jnu.ac.in

Background: Indian researchers, particularly those who are working as grassroots innovators, independent experimental researchers, or working with resource-poor setups in non-metropolitan cities and towns, often require scientific instruments and scientific facilities not available to them. There is a need for a gateway for innovators/researchers to locate the specific type of facility they need for their R&D work and to identify the one that is either located closest to them or available the soonest. Problem statement: This paper will focus on how an open science infrastructure in India can enhance scientific productivity and research experiments, expanding the use of scientific instruments and facilities available with centrally-funded R&D institutions. Results: During the Indian Science Congress of 2020, the Indian Science Technology and Engineering facilities Map (I-STEM) I-STEM portal was launched by the Honourable Prime Minister as the national web portal for sharing R&D facilities. This paper will be presented as a case study that evaluates the functions and usability of the I-STEM portal. Solution/Conclusion: The usability of the I-STEM portal can be enhanced substantially if more scientific institutions (both central and state-level) share relevant data on scientific instruments and facilities available with them and enlarge the user community base. The user community should also get timely information on the new additions to the portal.

Open Science for Digital Literacy Competency

AULIA PUSPANING GALIH

Eotvos Lorand University, Budapest, Hungary
& Universitas Brawijaya, Malang, Indonesia
email: auliapuspa@ub.ac.id

Background: Making the principal outputs of publicly financed research results—publications and research data—publicly accessible in a digital format with no or few restrictions are how the Organisation for Economic Co-operation and Development (OECD) defines Open Science. Open science is a new practice in Indonesia because, usually, researchers prefer to keep their research data and funding for their own purposes. Digital Literacy Activists Network, or Jaringan Pegiat Literasi Digital (JAPELIDI), is a community consisting of lecturers, researchers, and activists who are concerned with digital literacy issues. JAPELIDI was established in 2017, having 168 activists in Indonesia and abroad. JAPELIDI seeks to foster collaboration in Indonesia's research, publications, and campaigns on digital literacy. **Research statement:** The purpose of this study is to describe and understand the role and the activities of JAPELIDI in open science in terms of introducing digital literacy in Indonesia. **Methodology:** The research approach used in this research is a qualitative approach. This study was conducted by interviewing an active member of JAPELIDI and document analysis. Document analysis is a systematic procedure for reviewing printed and electronic materials. The documents were gathered from internet sources, including e-newspapers, articles from journals, websites, social media, and research reports.

Results: JAPELIDI has held various digital literacy programs such as research, conferences, seminars, workshops, book publishing, discussions, training, campaigns, and creative content production in the form of infographics and videographics. These various programs are carried out both through collaboration between JAPELIDI members and with the government and other communities, including the Ministry of Communication and Information Technology of the Republic of Indonesia, the Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia, the American Embassy in Surabaya, Siberkreasi, and the Community of Differences is Ordinary (Komunitas Beda itu Biasa). The noted role of JAPELIDI is the founder of the Digital Literacy Competency Model in Indonesia. **Solution/Conclusion:** JAPELIDI is a community which cares about Indonesian's digital literacy competency. The community shows that open science can be done by collaborating with other members and institutions, and sharing their knowledge, research data, and free-access publications to society.

Biomed News – a biomedical literature expertise sharing system based on machine learning and expert curation

THOMAS KRICHEL*, GAVIN P.MCSTAY**

*Open Library Society, New York City, USA.

**Liverpool John Moores University, Liverpool, UK.

** email: g.p.mcstay@ljmu.ac.uk

Approximately 30,000 biomedical research abstracts are published each week on PubMed. This provides an enormous resource for new information that needs to be retrieved by individuals who desire access to it – researchers, industry, funders, policymakers, clinicians, patients, and the public. This enormous amount of information is retrieved using searches or tables of contents. However, these methods are overwhelming, broad and irrelevant. Biomed News is a platform that provides a ranked abstract list on a weekly basis. Topic experts select abstracts relevant to their area of expertise. These selections are used by supervised machine learning to identify relevant papers in subsequent weekly issues. This reduces the amount of time required to identify new abstracts. Biomed News also provides an opportunity for selectors to share their weekly topic issues with other interested parties. Biomed News currently has around 80 experts from countries all over the world who are at different stages of their career. We aim for Biomed News to be a user-friendly platform in all areas of medicine that allows new abstracts to be identified and shared with interested parties. We have several users from South Asia and are interested in recruiting more users from the region.

Open platform for dissemination of traditional knowledge on medicinal plants

GUNTAMUKKALA SEKHAR

Assistant Professor, Department of Agronomy, Centurion University of Technology and Management,
R.Sitapur, India

email: guntamukkala.sekhar@cutm.ac.in

India is home to many medicinal plants, as mentioned in various Vedas, and ancient physician Susrutha documented the importance of medicinal plants in “Sushruta Samhita.” The prominence potential of very few medicinal plants was examined, but many of them remained untested. So there is a need to create a comprehensive database that contains extensive information on botanical names, common names, taxonomy, habitat, location, part use, medicinal use, chemical info, and scientific literature, with the goal of providing traditional and chemical descriptions of medicinal plants found in India. This can be accomplished by combining data from existing databases and scientific literature. We can foresee that incorporating information within the database will assist users in quickly obtaining the desired information.

Extension of Citizen Science Model for Environment Management Measures in Lieu of Development Activity: Case of ‘Namma Metro’

JAHNAVI SHARMA

Independent researcher on environment policy

(Project Associate-II, UNESCO Category 2 Centre, Wildlife Institute of India, Dehradun)

Could the citizen science technology model be extended in solving the problem of multiple public interest litigation (PIL)’s filed to check the afforestation activity and/or the other court-mandated efforts by the judiciary wing of the State of Karnataka? There are numerous concerns raised to ensure accountability on the part of, ‘Namma Metro’. One of them is to ensure the act of plantation in lieu of deforestation activity. The PIL’s are filed by various citizen groups and individual lawyers, at various dates, for various reasons. To reply to the multitude of technical queries, an organization like ‘Namma Metro’ entrusted with the primary task of constructing the metro might find it a hindrance in achieving its primary task. Citizen science initiatives often engage the public with nature and science in day-to-day life. It was started with the intention of imparting keen observation, seeking nature for inspiration, relaxation, novelty or for understanding the way it works. The various citizen science projects taken up till now include birds, fireflies, biodiversity, and science education in India. The citizen science project uses ICT platforms created as data sharing platforms for data collection, engaging citizens in activities, using apps for removing manual work, and connecting it to the cloud to avoid confusion in data collection and work repetition. Some of the recent applications of citizen science technology projects which could be used as a sample are amphibians projects and community-based fisheries monitoring projects in 2021. Such initiatives could be extended for citizen concerns for development-led projects wherein numerous PIL’s are filed to take cognizance of due diligence by the Government authorities, required in environment management (EMP) efforts in response to Environment Impact Assessment (EIA) for projects such as ‘Namma Metro’ project. Herein, for instance, the citizen science initiative could be used in identifying places for tree plantation, uploading places of interest details such as picture, location, latitude, longitude, preferred species, volunteering details, and availability. This could help in the democratization of information with regard to environment management activities taken up by, ‘Namma Metro’.

Open access and the Democratization of Knowledge: the Indian Scenario

DR. KANCHAN LALA

India

email: kanchanlala@hotmail.com

Since the revolution of ICT (information and communication technology) scientific research publication has undergone a rapid change from hard copy to digital format, from subscription to Open Access (OA). In doing so, academic publishing has undergone a rapid change by promoting open access platform, but these change in the availability of scientific knowledge has brought back another form of complexity as APC (article processing charges). As a result, the scientific publishing model has lured commercial entities to step into the academic publishing area. Currently, five major commercial publishing companies control the industry, enjoy an oligopoly over the market, and their market power drives the subscription price of academic journals (Larivière et al., 2015). So the objective of democratization of scientific knowledge has again brought back the problem of availability of knowledge in a different format. On the other hand, with the steep rise in the APC and subscription fees, higher educational institutions (HEI) located in developing countries struggle to access scholarly knowledge or a forced to subscribe to less or low-budget journals, which in a way create a knowledge gap between the global north and south. So, increasing access-inequity due to the higher costs and monopoly by top publishing houses has created a new debate in the format of open access and knowledge transfer.

Growing Research Software Initiatives and Communities in South Asia

MICHELLE BARKER*, SARANJEET KAUR BHOGAL**

*Research Software Alliance, Queensland, Australia

**Research Software Engineering Asia Association, Asia

*email: michelle.barker1@my.jcu.edu.au

Background: Research software and open source scientific software are now recognized as a critical part of the research, enabling the generation, analysis, and/or presentation of research outputs. Research software and open source software (which are overlapping categories) are also critical enablers of open science. Communities that support research software personnel are one of the crucial venues for the provision of support and enabling of collaboration, and having local and accessible communities can make a huge difference for many.

Problem statement: A wide range of research software initiatives and programs exist internationally to address the varied challenges in software productivity, quality, reproducibility, and sustainability. However, initiatives relevant to South Asia do not necessarily engage with the breadth of the community and vice versa, and this needs to be improved. In particular, time zone differences can make it difficult for cross-pollination between South Asia and the rest of the world.

Methodology: This session aims to highlight the importance of software and relevant initiatives such as the Research Software Engineering (RSE) Asia Association and the international Research Software Alliance. We also highlight the mission of the RSE Asia Association, which is to promote the RSE community and profession in Asia. Research software is defined here as software that is developed to serve a research purpose rather than the standard software that some researchers also use for research purposes.

Results: This session will provide participants with an opportunity to engage with communities that are relevant to this geographic region and meet like-minded colleagues. The ongoing and upcoming activities of these communities will also be shared during the session to allow participants to continue their engagement.

Solution/Conclusion: Session participants will be encouraged to consider how they can assist in bringing together the research software engineering community in South Asia, be it in regard to their own team, institution, or country. Participants will also be offered opportunities to reach out to the leadership at the RSE Asia Association to find a role that they could potentially help with.

Open Data Policies and Strategies Roadmap towards Sustainable Development Goals

OBWAYA MOGIRE¹*, JOSEPH WAFULA^{**}, MWANGI WAWERU^{**}

*South Eastern Kenya University, P.O. Box 170, Kitui, 90200, Kenya

^{**}Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62,000, Juja, 00200, Kenya

*email: omogire@seku.ac.ke

Background: For a decade now, open data has been painted the “magic bullet”, if well leveraged has the potential to accelerate achievements of the vision 2030 agenda, whose goal is to build peaceful, resilient, equitable, inclusive, and sustainable societies. Open data can be used to implement, measure and track the progress of all the 17 SDGs. Commonly known benefits of opening data in political and social trends include; transparency, accountability, fighting corruption, building trust in government, citizen participation, self-empowerment, innovation, Improvement of policy-making processes, stimulation of knowledge developments; economic benefits like economic growth, stimulation of innovation through re-use of data, Improved products and/or services and efficiency. In order to actualize the Global goals, there is an urgent need to mobilize data revolution without leaving anyone behind, anchored in sound data legislation and policies. Contrary, for a decade now, the majority of open data initiatives seem to be voluntary and politically instigated, and as such, they are resting on shaky foundations with no or weak legislation, policies and strategies; and as such, the initiatives risk stalling or collapsing if political goodwill and community pressure subside. Problem statement: The world is facing vicious societal, economic, political and environmental challenges today. As such, there is synergies to have interventions that can lead to the achievement of 17 SDGs. Data that was once the sanctuary of statisticians and academicians has now become a developmental cause being embraced by everyone from grassroots to international forums. The UN recognized the vitality of open data by embodying data revolution principles that emphasize availability and equal and universal access to data towards achieving development goals. Open data can help to identify political, social, economic, and environmental trends and support the 17 Sustainable Development Goals. Yet many open data movements are voluntary and politically instigated hence resting on shaky foundations of legislation, weak or lack of data policies and as such, the initiatives risk stalling or collapsing if such political goodwill and community pressure subsides. Methodology: Various open data initiatives, open data policies, opportunities, challenges and the 17 SDGs from published literature, articles, grey literature (unpublished literature) were investigated. Results: Based on the inputs obtained from literature review and case studies, a conceptual open data policy and strategy framework to underpin open data readiness, implementation, monitoring and evaluation of open data initiatives towards the 2030 agenda is developed. We also build upon, remix,ed and reinterpreted data from the four open data barometer findings as secondary data with questions on open data initiatives, legislation, open data policies, strategies and the 17 SDGs in relation to data revolution. Conclusion: To fully harness the fruits of open data, data revolution initiatives must be rooted in strong and inclusive data legislation synergized by political benevolence with consistent global data management.

GRIPPP-How Effective?

KEERTI PRADHAN

CHITKARA UNIVERSITY, PUNJAB, CHANDIGARH, INDIA

email: keerti@chitkara.edu.in

Background: There are thousands of researches being done and published in Indian academia, especially higher education institutions, to satisfy the personal career development, institutional accreditation goals and university ranking framework.

But there is no evidence of how much of it is getting into Policy, Planning and Practice?

GRIPPP-Getting Research Into Policy, Planning and Practice is a key indicator.

Problem statement: Impact of academic research to action for social good is not seen or felt. A huge amount of academic research and publication is found in numbers but no analysis on its impact on social and human welfare needs.

Methodology:

A secondary research and analysis need to be conducted based on all academia research and publications

Results: In India no major impact is observed as an outcome of all the research and publications happens from academia. Hence it remains as a theoretical publication in records only. GRIPPP can help in unlocking this potential.

Charting the Pathways towards Sustainable Diamond Open Access: A Framework from an Indian Perspective

RABISHANKAR GIRI^{1*} & ANUP KUMAR DAS^{**}

^{*}Presidency University, Kolkata, India; ORCID- 0000-0001-9459-8258

^{**}Jawaharlal Nehru University, New Delhi, India

* email: rsgiri11@gmail.com

Background: Science is essentially an evolutionary process that is highly grounded on prior knowledge. Its progression also relies on the process of embracing unique and innovative research ideas and interpretations that necessitates cognitive diversity. Open Access (OA) initiatives to research literature are thus one of the key steps in this direction. Though a cascading series of initiatives have emerged since the major OA initiative statement was declared in Budapest (i.e., BOAI) twenty years ago, reality has fallen short of the stated goals and benefits. Thus, the ability of the current OA publishing model to provide a sustainable, scalable, fair, responsive scholarly communication ecosystem is highly debated.

Problem statement: The current OA publishing model is largely driven by commercial publishers, emphasizing Article Processing Charges (APC) primarily, and APC cost is proportional to the Journal Impact factor. The high APC cost of journals from reputed publishing houses has deterred a large chunk of researchers from the global south to contribute in them in spite of the suitability of their papers in those journals. In the current academic marketplace, the prestige of a researcher is predominantly determined by the number of contributions in high-impact journals. Therefore, the alienation of researchers from the global south as a contributor to these high-impact journals has undoubtedly destined a kind of neo-colonialism that acts as a deterrent for the progression of science.

Proposed Framework: The challenges inherent to the current OA publishing model can be addressed by enacting changes at policy levels by emphasizing learned society journals and institutional start-ups for new journals. The proposed framework emphasizes two major aspects of long-term sustainability – The revenue model and scalable scholars' engagement. While the proposed revenue model is aimed toward different policymakers and stakeholders, scalability of scholarly engagement will be presented from a case study of 'The Journal of Scientometric Research, only a decade-old open access journal from India.

Conclusion: The proposed framework offers an alternative pathway toward sustainable diamond OA publishing that may act as a scalable, fair, and responsive solution to lessen the dependence on commercial publishers. The proposed model may be applied in an incremental fashion and be piloted on both small and large scales.

Stimulating Open Innovation Culture by Creating End-to-end Virtual Integrated Innovation Platforms

RADHIKA TRIKHA

Senior Policy Fellow, DST-Centre for Policy Research at Indian Institute of Sciences, Bangalore
email: radhikat@iisc.ac.in

Background: To scale up the system interconnectedness and scope of open innovation across the science, technology and innovation ecosystem, countries like India must develop an end-to-end virtual integrated innovation platform. **Problem Statement:** To stimulate open innovation, a platform that brings stakeholders across the STI ecosystem must be developed. Such platforms have to be transparent and accessible to the masses. Creating such a platform can be a daunting task with a huge amount of information that needs to be codified, curated, accessible and managed. **Methodology:** to address the above-stated problem statement, end-to-end integrated virtual; innovation platforms can act as a standard platform for showcasing innovation-related data information and, at the same time, lead to interconnections to pursue collaborative projects and formulate alliances to address regional, local and national problems.

Results: This platform will provide a comprehensive database of all entities in the innovation ecosystem, classified by category, geography, domain, capabilities, details of current innovation focus areas, resources, interests for collaboration, etc. It will have a collaboration portal for synchronous/asynchronous interaction and knowledge sharing among entities. It will enable government, industry bodies, and others to feed on their innovation priorities and problem areas, call for collaborations/solutions, and enhance interconnectedness. Such a virtual platform will provide high visibility even for remote/small players to highlight their innovation capabilities and participate in the larger agenda. The forum will enable swift response in addressing priority projects/exigencies like Covid with enhanced government-industry-academia interconnectedness. The platform will also allow multiple industry entities to participate in shared innovation agendas and enhance both industry-industry & academia-industry interconnectedness. Participation in the forum can be evangelized to the corporates and start-ups by industry bodies in each specific domain; and to academic institutions, incubators and R&D bodies by lead/anchor institutions in each geographic cluster. **Conclusion:** This will seed open innovation culture in the country, targeting stakeholders to come together to address local, regional and national problems for the nation's socio-economic progress.

POLITICAL ECONOMY OF INTERNATIONAL COOPERATION AND OPENNESS IN THE GLOBAL SPACE INNOVATION SYSTEM

RAMNATH REGHUNADHAN

Abstract: Technological wherewithal and know-how of nation-states in the outer space exists asymmetrically, wherein countries like the US, Russia, China, Japan, India and Europe exist in the forefront. The competition in the outer space began in the 20th century, particularly in the backdrop of a bipolar camp of Cold War between the US and the USSR. However, this also led to distinctive cooperation between nation-states within these ideological camps as well. Further, in the aftermath of the Cold War, the emergence of the US as a hegemon oversaw a transitional period, which transformed very much with the beginning of the 21st century. International relations changed with each period, though cooperation and openness existed amongst countries in regard with space technologies and the development of innovation ecosystems, all of which have a huge role in the development of global space innovation system (GSIS). The paper argues that the aspects of international cooperation and openness in outer space exploration and related technologies have existed during the Cold War era, the post-World War era, and has been strengthened with the emergence of digital globalization in the 21st century. A mixed-method approach, both qualitative (viz., case studies, archival research) and quantitative (viz., empirical analysis) are utilized for the study

Role of Democratising Science in Building Social Change

NAVYA POONIA*, RINGSEL BHUTIA**, SRISHTI RONGPIPI***

*National Law School of India University, Bengaluru India

** National Law School of India University, Bengaluru, India

***National Law School of India University, Bengaluru, India

**email – ringsel.bhutia@nls.ac.in

Background: One of the major criticisms of the Indian education system has been that since post-independence, the Nehru-Mahalanobis model prioritized a few eminent tech-heavy institutions over a universal primary education system. The scientific knowledge and technology have been concentrated in the hands of the elite or the experts, which reduces the involvement of traditional knowledge systems in the diagram. In response to this government's apathy and solely profit-driven interventions of the market, responses from civil society have been criticized for generating scientific temperament. Problem statement: Over-reliance on the technocratic approach has led to the understanding of indigenous knowledge as antithetical to the existence of scientific temperament, which has been disproven over a long period of time, where not only indigenous knowledge supplemented science and technology but also filled in gaps and attuned scientific knowledge to localized contexts. Methodology: Kerala Sastra Sahitya Parishad(KSSP) has worked on the ground to further the mission of democratizing science to ensure open science in its broadest sense. The study uses secondary data by analyzing the role of KSSP in ensuring accessibility of science through its intervention programs, by using the parameters of the use of indigenous knowledge in patents in the state, provisioning of open educational resources and science infrastructure, etc., and study correlations with the health and educational outcomes through the NFHS data, popular news articles covering science in the state, while studying the impact specifically on different gender groups, as well as also on indicators such as the environment. Results: The study uses KSSP as a model to study the role of democratizing science and the subsequent impact it can have on populations and compare it to different groups. Through the results of our study, we observe that while popular science movements have played an increasingly important role in imparting scientific knowledge to the impoverished sections of society that would traditionally not have access to the same, there still needs to be work done on ensuring that a holistic view of society is taken to ensure that indigenous knowledge from marginalized groups is also taken into account. We also observe that increasing scientific awareness does little to change attitudinal frameworks, such as gender roles. Conclusion: Popular science movements such as democratizing science play a facilitative, catalytic role in filling the vacuum created by the existing insufficient industry-academia linkages; however, our research suggests for it to permeate to the lowest levels and to have actual attitudinal changes, it is necessary for democratizing science movements to uphold and work in congruence with social science ethos, to have a progressive social transformation.

Integrated water resources assessment of Udaipur District

TANYA ISSAR¹, NIDHI SEHRAWAT, GITIKA GOSWAMI³

¹Development Alternatives Group, New Delhi, India

²University of Copenhagen, Copenhagen, Denmark

³Geological Survey of Denmark and Greenland (GEUS), Copenhagen, Denmark

⁴DHI, New Delhi, India

⁵Vidya Bhawan Polytechnic, Udaipur, India

*email – tissar@devalt.org

Background: Indian water resources are under strain from increasing population, intensified agricultural production, industrial development, changing food habits with growing income, as well as pollution of the surface and subsurface waters. Climate change aggravates the problem with higher temperatures, longer droughts and increased intensity of rainfall, and a reduced number of rainy days during the monsoon season. This has led to concerns about whether water demands can be met while achieving food and nutrition security for the growing population and, at the same time, protecting the ecosystems. Problem statement: Rajasthan, a semi-arid state, is highly vulnerable as it only has 1% of water resources despite covering India's 10% of geographical area. The state has seen an increased rate of urbanization over the past few decades. Udaipur city is the most significant of all as it has the second largest percentage(16%) of total tourist influx in the state after Jaipur (21%). This has led to increased pressure on water resources. The water supply for residents of the city is primarily dependent on 5 surface lakes which contribute 88%, followed by other local sources contributing around 12% of the water supply. The Ahar River in Udaipur is contaminated by untreated wastewater, which is diverted to rivers and lakes, causing environmental and health problems.. Thus, the Udaipur District is facing serious problems and challenges in securing an adequate water supply of acceptable quality and in mitigating pollution of the water resources. Methodology: At present, citizens' and stakeholders' participation in the management of the surface and groundwater resources is limited. The study adopted Citizen Science, an emerging discipline that can contribute to community-driven governance of water resources. This methodology will also help build capacity and enhance awareness related to efficient and sustainable water management among the citizens.

Citizen science is also a tool to improve data collection through crowd-sourcing of data in data-scarce catchments where a better understanding of the water resources is required. Results: Under the study, a cohort of 10 institutions was selected from the Ahar River basin to impart training on rainfall measurement and water quality testing. Through the study, more than 100 students, teachers, and citizens of Udaipur were mobilized to record daily rainfall data through rain gauges installed as a part of training and testing the water quality of borewell and tubewell samples of their schools and nearby water sources. The results of water quality testing revealed an increased amount of fecal coliform in almost all samples. Maximum samples reported low chloride levels (<250ppm).

To enhance the efficacy and robustness of data, more institutions will be bought under citizen science engagement. Solution/Conclusion: An important outcome of the study is the strengthening of India's research capacity on integrated water resources management. Municipal and state water administrations in India will benefit from the project-developed knowledge and tools. Local stakeholders will benefit through the citizen science approaches and data management tools. Finally, broader stakeholder groups will learn of the project outcome through public seminars and meetings.

Scientific Research towards Innovative and Creative Output for Development

V S JAYAKUMAR

Vision Smart Innovations & Collaborations (VSIC)

Amaravila P O; Thiruvananthapuram 695122

KERALA, INDIA

email: vsjkumar@gmail.com

The scientific research manpower and brainpower available to our nation have not been fully able to generate the high-quality scientific innovations needed or expected by the nation for its advancement as a superpower. Our scientific research of the past 70 years needs a total review and reassessment using well-designed development-related indices with regard to the quality and relevance of the outcome from our R&D investments. Using the vast amount of data available on our scientific investments in infrastructure, human resources, and accomplishments during the past seven decades, the time is most appropriate for a precise evaluation of our performances and strategies needed for a giant leap for advancement in science and technology targeted for realizing national developmental goals. We need to move From age-old traditional scientific research conferences to a new era of innovative, goal-driven conferences specifically aimed and designed for specific solutions, addressing the most important and up-to-date science and technology challenges essential for the development of the livelihood of people. Research by the S&T community and institutions should be able to identify the key stumbling blocks of S&T in development and generate the right novel solutions the nation needs in a time bound manner