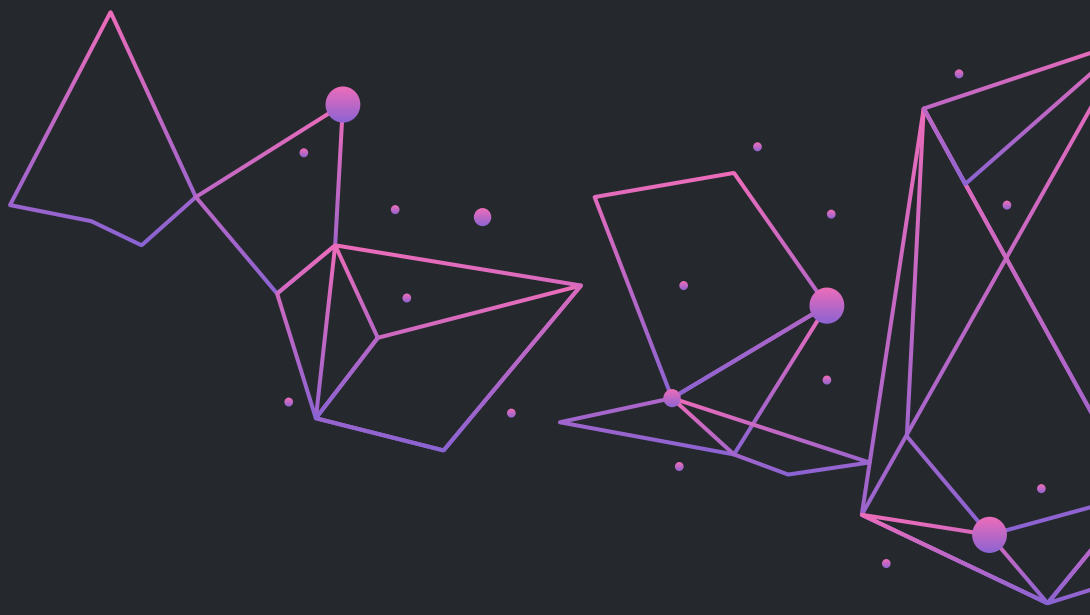
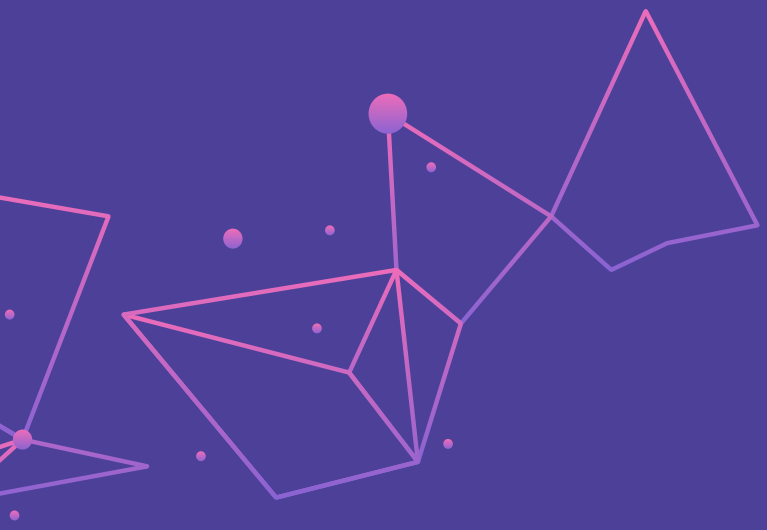
Open Source Software in India, Kenya, Egypt, and Mexico

Research report



WRITTEN BY GITHUB SOCIAL IMPACT, TECH FOR SOCIAL GOOD
RESEARCH LED BY OBI DIGITAL SOLUTIONS

GitHub



Open Source Software in India, Kenya, Egypt, and Mexico

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Key Terms and Acronyms

Scope of the Social Sector

In this paper, the term “social sector” refers to non-governmental organizations that have a primary purpose to actively advance or positively contribute to any pressing societal issue or challenge. This definition includes foundations, nonprofits, inter/national non-governmental organizations (I/NGOs), and some for-profit companies. Common industries include international (global) development, disaster risk management and humanitarian response, public health, and human rights. The scope of this paper also included several national government agencies that build digital solutions alongside the social sector.

Open Source Software

The open source ecosystem extends to many types of products and data. The working definition of open source software (OSS) used in this report is software distributed and uploaded to an accessible repository with source code that may be read or modified by users. The Linux Foundation and the Open Source Initiative provide additional definitions. GitHub is the world’s largest community of developers and their code, including open source software.

Open Source and Open Data

OpenDefinition.org states, “Open data and content can be freely used, modified, and shared by anyone for any purpose.” As is the case with OSS, open data must be in the public domain, in a machine-readable format, and easily accessible online.[1]

Open Source Applications vs. Infrastructure

In the commercial sector, OSS is typically built by developers for developers with an emphasis on infrastructural technology such as systems architecture, language frameworks, and APIs. In the social sector, most open source software is comprised of applications with a graphical user interface (GUI) that are intended for non-developers. Applications are defined as pieces of software meant to help an end-user achieve a particular purpose.

1 http://opendatatoolkit.worldbank.org/en/essentials.html

Forking

GitHub defines a fork as a copy of a repository. “Forking a repository allows you to freely experiment with changes without affecting the original project.”[2]

Medium / High Tech Maturity

Countries that have a medium or high tech maturity have strong current or rapidly emerging technology ecosystems. This is evaluated in terms of their private sector technology landscape, STEM education system, paid work opportunities in software development and engineering, the internet penetration rate, mobile penetration rate, and the degree of protection of freedom of expression.

Frequently Used Acronyms

- **LMICs** – Low- and Middle-Income Countries
- **DPG** – Digital Public Goods
- **DPGA** – Digital Public Goods Alliance
- **FOSS** – Free and open source[3]
- **I/NGO** – International / Non-governmental organization
- **OSS** – Open source software
- **OS** – Open source
- **SDG** – Sustainable Development Goals
- **UN** – United Nations
- **MENA** – Middle East and North Africa
- **IT** – Information technology
- **ICT** – Information and communications technology
- **IP** – Intellectual property

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2 https://help.github.com/en/enterprise/2.13/user/articles/fork-a-repo

3 For a discussion of FOSS vs FLOSS, refer to https://www.gnu.org/philosophy/floss-and-foss.html

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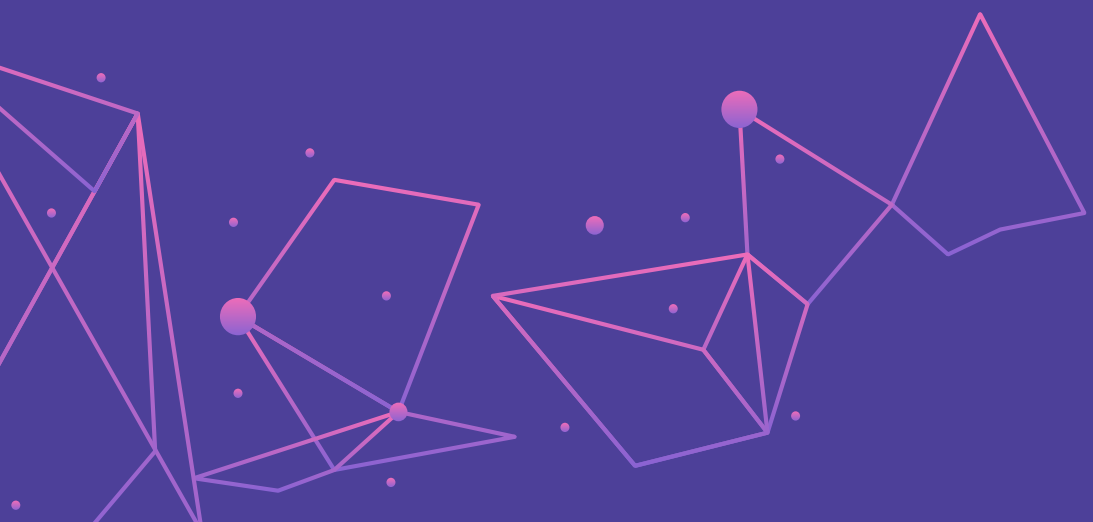
Introduction



In recent years, the concept of digital public goods (DPGs), which advocate for global collaboration in building digital solutions, has gained traction. According to the Digital Public Goods Alliance (DPGA), DPGs are open source solutions that align with the Sustainable Development Goals (SDGs).[4] While DPGs can be developed anywhere, they are often used in low- and middle-income countries (LMICs). Understanding communities and ecosystems working on open source software (OSS) in LMICs is therefore critical to ensuring representative and inclusive digital design and development.

Building on our Open Source Software in the Social Sector report that came out in 2020 and developed in partnership with OBI Digital, this research report will dive into OSS in four LMICs: India, Kenya, Egypt, and Mexico.

The key themes covered in this report are:

- Community Drivers
- Language, Culture, and Education
- The Social Sector and Digital Public Goods
- Government and Policies
- Sustainability and Finance

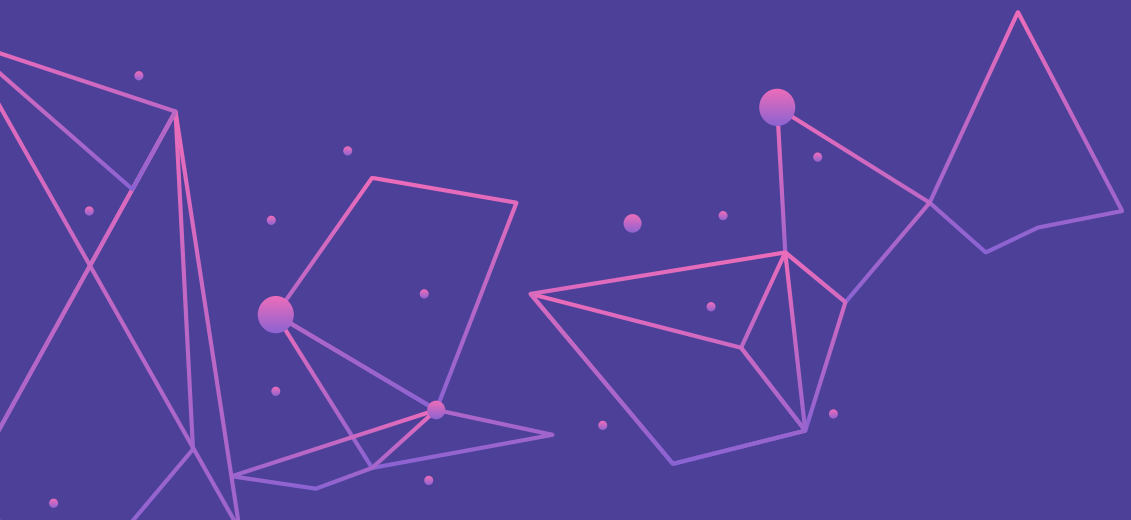
Detailed more in the following section, the four countries selected have a medium to high tech maturity, and represent differing geographies, languages, populations, and tech histories. Despite these differences, OSS in all four countries is largely driven by individual contributions, rather than company or organization-

4 https://socialimpact.github.com/insights/what-are-digital-public-goods-and-DPGA/

backed work. Many OSS projects that have active contributors in the countries were started elsewhere. OSS contributors in the four countries pointed to opportunities with foreign companies and the desire to better their societies as top reasons for participation. The most cited challenges to use or contribute to OSS included a lack of education and mentorship opportunities, language skills, and financial ability.

Each of these countries have made valuable contributions to OSS, and GitHub will use this research report to understand how to better support and amplify their work. It is our hope that this report will also serve as a tool for other companies, organizations, and individuals that wish to use or contribute to DPGs or other open source tools in LMICs.

Research Overview



Intended Audience

This report is intended for wide audiences in the social sector, as well as open source and digital development funders and communities. Findings and recommendations are particularly actionable for:

1. Companies or organizations that currently contribute to or wish to build DPGs
2. Technology implementers[5] in LMICs and/or the social sector
3. OSS funders in LMICs
4. Technology companies interested in stronger collaboration in LMICs and/or the social sector
5. Open source software platform providers and supporters

Purpose and Scope

The purpose of this report is to convey the major findings of a research project on the benefits of and challenges and opportunities for OSS communities and contributors in India, Kenya, Egypt, and Mexico, including how to better consume, produce, and fund OSS in the four countries. This report is **not intended** as an evaluation of whether OSS contributes to better technical solutions.

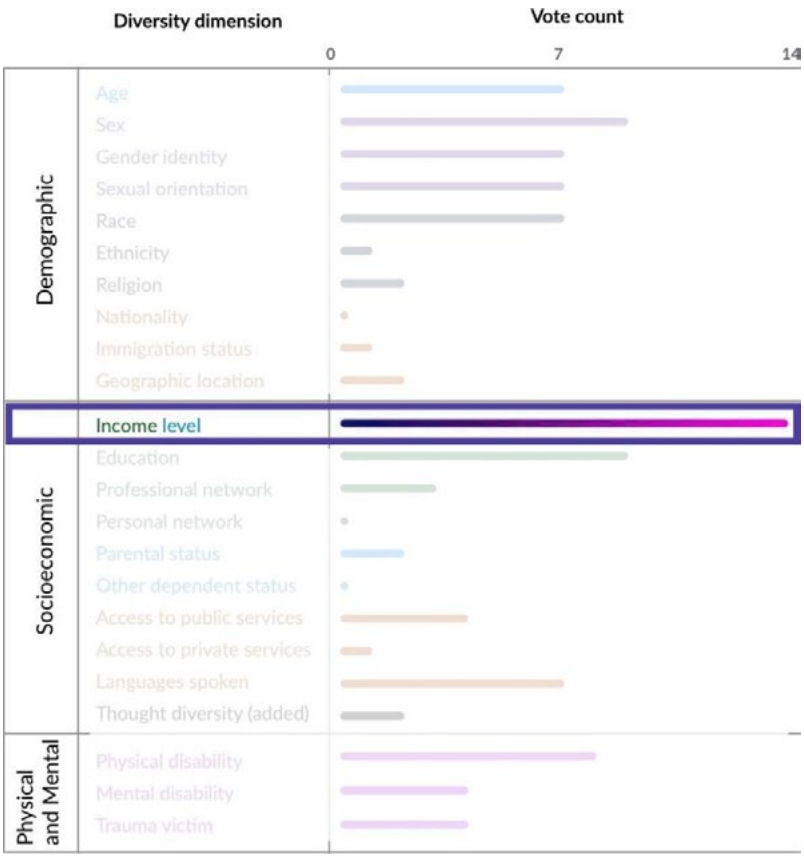
This paper is primarily focused on organizations and individuals that drive OSS consumption and production in the four countries across the social, public, and private sectors.

5 Defined as those who define and execute technical and business requirements and processes so that a software or tool can be deployed.

Methodology

The primary sources of data used in this report were expert interviews and OSS activity on GitHub. In April 2020, GitHub Tech for Social Good published its first OSS research report. A key insight from that report was that income level and overall socioeconomic status were main determinants of whether any one individual or community can contribute to OSS. This is demonstrated in Figure 1, which captures how OSS for social good experts voted when asked what determines an individual or community's OSS contribution rates. Income level was the top choice overall.

Figure 1: How OSS for social good experts voted when asked what determines individual or community OSS contribute rates



Since our first OSS research report focused on activity in high-income countries in North America and Europe, this report intentionally focused on OSS activity in low- and middle-income countries (LMICs). According to the World Bank's Atlas method, a country's income level is the ratio of gross national income (GNI) over midyear population.[6]

The overall technology ecosystems in LMICs vary widely. To narrow down which countries would be the focus of this research project, GitHub's Tech for Social Good team and OBI Digital first compiled a list of LMICs that have a medium or high tech maturity as defined by its private sector technology landscape, its STEM education system, paid work opportunities in software development and engineering, the internet penetration rate, its mobile penetration rate, and the degree of protection of freedom of expression. The two teams then scored the countries in an evaluation matrix by assigning weighted scores in five consideration types: relevant connections in-country, company / organization interest, relevant communities and ecosystems in-country, ability to connect remotely, and external considerations. The scores were then tabulated and resulted in the four selected countries.

OBI Digital used several research inputs to inform this final report, including 53 in-depth semi-structured interviews, 578 survey responses, desk research, and research on GitHub platform data. Surveys were primarily used for sourcing candidates to interview and were translated into Spanish for respondents in Mexico and into Arabic for respondents in Egypt. When requested, interviews were also conducted in these languages. Survey and interview participants were sourced from GitHub Tech for Social Good's and OBI Digital's networks, social media outreach, the GitHub Social Impact website, and the snowball method.[7] Finally, the research

6 https://data.worldbank.org/income-level/low-and-middle-income

7 More information on the snowball method: https://www.simplypsychology.org/snowball-sampling.html

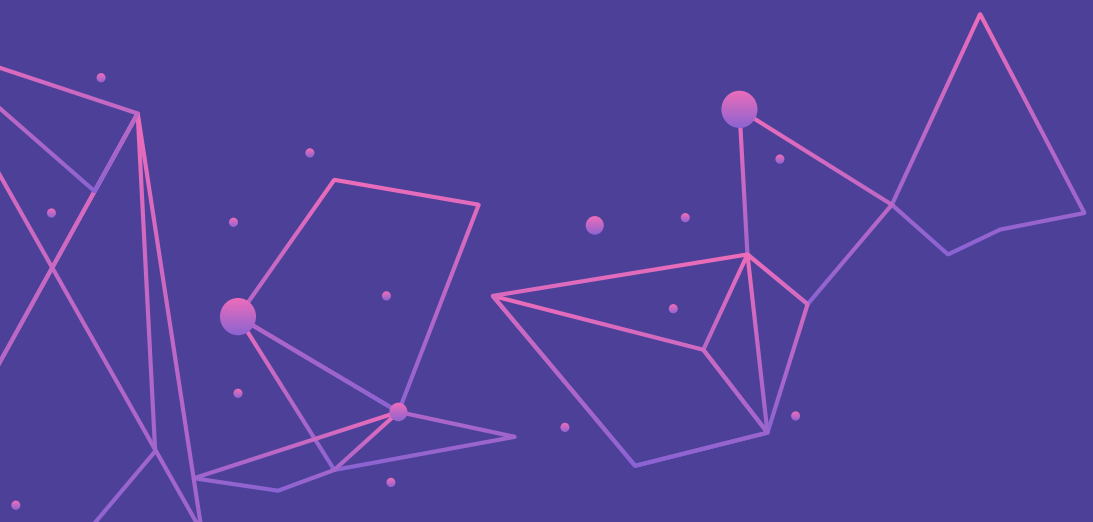
results were coded and collated. For each country, GitHub and OBI Digital presented initial insights in a validation workshop with experts who had been interviewed. Their feedback was used to update the initial findings. More than ten interviewed experts elected to review the draft report; their feedback was incorporated into the final version.

Those interviewed fell into broad categories: tech leaders and founders, social sector / ICT4D technologists, funders, and corporate technologists. Experts who are from the four countries and not foreign workers in the countries were prioritized for interviews. As in our first report, some of those interviewed primarily consume OSS, some primarily produce OSS, and some do both. Among the five key themes of the report, many interview discussions centered on individual and community motivations, needs, and priorities.

Limitations of this research

There were four main limitations of this research project. First, while many OSS contributions in the four target countries come from individual contributors, except for Egypt, the majority of those interviewed and surveyed in this report work on OSS through their companies or organizations. Second, (people who identify as) men are overrepresented in this report, despite extensive efforts of the report researchers and author (all of whom are women of color) to connect to non-male contributors. Third, it should be noted that most of the report contributors speak English with full professional proficiency, which in some cases is not representative of OSS communities in the four countries. Finally, the entirety of this research was conducted remotely due to COVID-19 travel restrictions, which likely resulted in grassroot projects not as strongly represented had the research been conducted in person.

What has shaped OSS?



While our first OSS research report mainly focused on the social sector, we found the sectoral influences OSS in India, Kenya, Egypt, and Mexico were broader. These sectoral influences varied by each country's technology industries, education systems, histories, and communities. We found that:

- In **India**, OSS consumption was shaped by **corporations**. **Startups**, the **government** and the **social sector** also shaped OSS consumption and production
- In **Kenya**, OSS consumption and production was shaped by the **social sector** and **startups**
- In **Egypt**, OSS consumption was shaped by **startups**
- In **Mexico**, OSS consumption and production was shaped by **civic tech**

India

Compared to the other three countries, India's use and production of OSS is much more common throughout various tech communities and sectors. During a validation workshop, experts from the country pointed out that the booming FinTech industry in India has adopted OSS. Several Indian software developers said that major corporations in India helped mainstream OSS use and production.

India was the only country where we had enough contributors to focus most of our research on the social sector. One trend we noticed is that successful tech entrepreneurs, like Nandan Nilekani and Donald Lobo, personally invest to create opportunities for

Indian software developers to produce OSS. The goal of these investments are to give back to society. In fact, alongside Shankar Maruwada, Nandan and Rohini Nilekani founded the EkStep Foundation for these investments.[8]

The Indian government and the social sector are also drivers of OSS adoption, particularly among DPGs. DPGs that were started and/or are largely driven in India include MOSIP, Divoc, Sunbird, and Glific. Organizations that work on the DPGs are Codevelop.fund, Project Tech4Dev, and Ek Step.

Kenya

Social sector funding is one of the main drivers of OSS use and production in Kenya. A leader in African technology, the social sector commonly pilots new technology products and programs in the country. For example, DHIS2, a DPG and the largest health management information system in the world, launched its first national rollout in Kenya. Kenyan experts spoke about the popularity of R and Python in the country. A commonly cited use of open source was open APIs of Safaricom's mPesa's mobile money system.[9]

As is the case in the other three countries, most OSS contributions from Kenya are from individuals, not large corporate tech companies. Former staff of private tech companies in Kenya say there is still uncertainty around OSS because many customers worry that open source tools are illicit or fraudulent. The National ICT Policy of Kenya did, however, commit to preferential procurement of OSS to increase the development and consumption of OSS. Today, Kenya is one of the top African

8 https://ekstep.org/
9 https://github.com/orgs/safaricom/repositories

government adopters of OSS. The Gates Foundation and Omidyar were large OSS funders in Kenya, though experts commented that the Gates Foundation did not explicitly fund OSS, but rather funded tools that ended up being open source due to government requirements.[10]

Egypt

Venture capital (VC) funding in Egypt is leading to greater OSS adoption for quicker, scalable product development. One well known example is the news aggregator Akhbarek, which was developed using OSS and became one of the top ten websites in Egypt. In June 2013, Sarmady, a Vodafone company, acquired Akhbarek.[11]

However, many startups that work on social good issues and consume OSS have not confirmed if they are producing OSS. Vezeeta, a medical health tech startup that was started in Egypt and serves more than 4 million customers in the MENA region and sub-Saharan Africa, did not open source its software. Mozare3, a startup that received social sector funding and developed an app to connect smallholder farmers with factories, uses OSS in its tech stack, but similarly has not confirmed if they will open source their tools.[12]

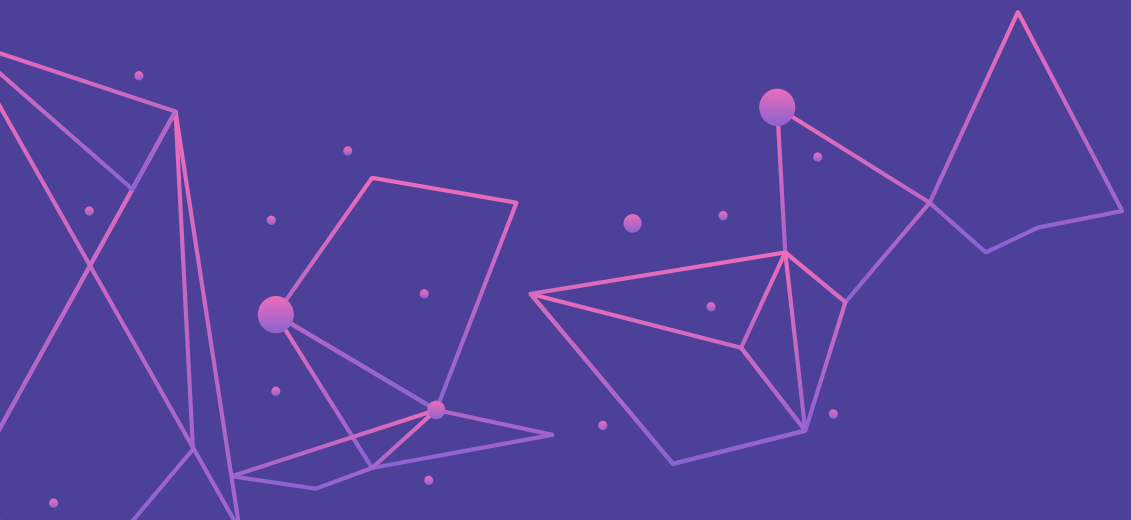
Mexico

For many years in Mexico, OSS was largely limited to niche developer groups, until it found its current support in the civic tech

10 https://www.gatesfoundation.org/ and https://omidyar.com/
11 https://www.crunchbase.com/acquisition/sarmady-acquires-akhbarak-net--5090b4a2
12 https://startuplist.africa/mozare3

community, which consists of both students and professionals. Civic technology and government transparency initiatives, such as Mexico's National Digital Platform, are now leading examples of how OSS can positively impact society in Mexico. Other sectors (and startups) have noticed. Several factors have limited the rise of OSS in Mexico, including a slow-moving national education system. Thanks to the influence of hackathon culture and open tech organizations and initiatives, startups have realized the value of OSS in pushing forward the increasingly vibrant Mexican tech space.

Community Drivers



Building Open Source Communities

Building an open source community can be difficult in any context due to a lack of direct financial incentives.[13] Community building in LMICs can be especially challenging due to fewer resources and paid opportunities. Experts across all four countries noted that it is relatively rare for large corporate tech companies to finance open source communities in LMICs as in high-income countries. Out of the four countries, India has had the most success, though challenges persist. As Surendrasingh Sucharia from the EkStep Foundation said,

> "Until getting to scale with community and users...it can be a lonely journey."

In our previous report, we highlighted two challenges in the social sector that also surfaced in this research project:

- Building community around a cause, not a tech challenge
- Scarcity of volunteer labor

A former staff member of a well-known social sector technology company based in East Africa pointed out that they have faced challenges in building open source communities around their causes and products. Part of the issue, they said, was staff attrition. At one point, their company had not retained any staff developers and did not have active volunteers from the country in which they're based. This has changed with a recent management shift, the former staff member clarified, but the community

13 Learn about sustainable communities on GitHub: https://octoverse.github.com/sustainable-communities/

momentum has been hard to reignite, despite the company's tools being used in more than 200,000 deployments.

Yet the need for community is great. Julia Dias, who is part of the innovation team at the Inter-American Development Bank, describes her experiences working with coding communities across Latin America, "A common sentiment among developers is isolation, especially with COVID, and there is a huge pressure to digitize everything, but without lots of resources. Developers in the public sector are eager to connect with others out there, especially with their peers."[14]

Figure 2: The CCOSS homepage

14 Julia Dias is an officer of the Inter-American Development Bank. The opinions expressed by Ms. Dias do not necessarily reflect the views of the IDB, its Board of Directors, or the countries they represent.

Finding consistent contributors was a challenge cited by experts in all four countries. In response, more tech companies are contributing to community building efforts. In India, Thoughtworks created student-led community building efforts. In Mexico, CCOSS is an initiative of Open Source Mexico (sponsored by GitHub, Microsoft, and Google) that brings together software developers across Latin America to contribute to open source projects.[15] Luis Sanchez Romero, a founding member of CCOSS, said that one of the initiative's goals is to encourage startups to allocate some of their time to contribute back to OSS, in the hopes of building a rewarding contribution culture.

Social Dynamics to Participation

Many experts interviewed for this report spoke about social obstacles they faced while participating in OSS communities and contributing back to code. These range from stereotyping based on nationality or ethnicity, to discrimination based on race, gender, country of origin, or sexual orientation, to assumptions about intellect or ability due to socioeconomic backgrounds. Women and racial, tribal, or ethnic minorities in the four countries said they faced outright abuse.

Some communities in the four countries are actively creating safe spaces to combat abuse against underrepresented groups. Juan Pablo Flores, a Program Manager on the Education team at GitHub cited Technolatinas as an organization helping women technologists in Mexico. "Technolatinas was born in the pandemic and is a very inclusive and open space," he said. The group is building off a strong feminist movement in Mexico and is one of the few that allows anyone who identifies as a woman to participate, including trans women. "They work on the soft skill

15 https://ccoss.org/

side, not only hard skills, providing a great space for women to not feel alone." But to screen out harassment, they must limit who can participate in their conversations.

Elric Wamugu is a software developer from Kenya who worked in Europe for several years. He was introduced to OSS while at school in Strathmore University in Nairobi. During his career, he noted that many software developers from high-income countries tend to not recognize the competence of software developers from LMICs.

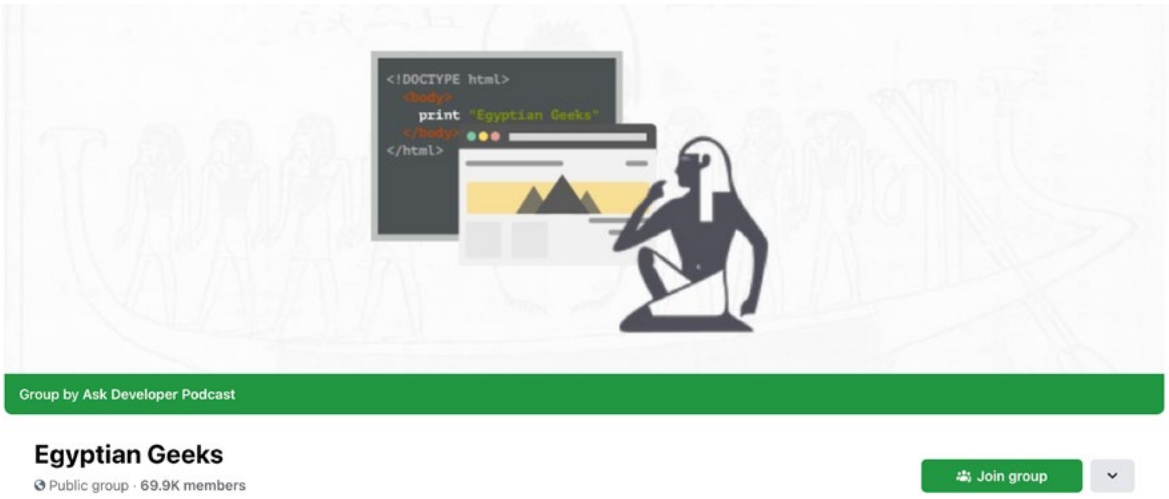
> "Developers from Lisbon or Poland may be surprised at the quality of OSS contributions [of African developers], but what they don't realize is that these developers started with OSS much later in life,"

he said, noting that support and mentorship make a big difference.[16]

Samuel Maina, a staff member from the Microsoft Africa Research Institute (MARI) also worked in Europe for five years. "I would always get asked about my Twitter account when I lived in Germany," he said, explaining that his public profile was important there in a way he hadn't previously encountered. He mentioned the time and labor involved to maintain an online presence could be difficult for the average Kenyan OSS contributor.

16 In our first research report, we uncovered the unmet needs of community, collaboration, and mentorship of OSS in the social sector. In response, GitHub's Tech for Social Good started the MERL Center, which is an open source community of monitoring, research, evaluation, and learning (MERL) practitioners. The community focuses on non-code content contributions on topics related to MERL and open source, and, more recently, data science and human-centered design. MERL is a growing discipline across sub-Saharan Africa and South Asia. At the time this report was written, nearly a quarter of the MERL Center members are from sub-Saharan Africa, including Kenya.

Figure 3: The Egyptian Geeks group on Facebook



Source: https://www.facebook.com/groups/egyptian.geeks/

Social media, on the other hand, has fostered OSS communities in Egypt. As of August 2022, the Facebook group EgyptianGeeks has nearly 70,000 members and some posts from Ahmed Alfy, an OSS influencer from the group, have been viewed 50,000+ times.[17] One expert from Egypt mentioned creating OSS communities on larger social media platforms can be advantageous because user generated content and user interfaces across all devices are fully supported in Arabic.

Global Technology Influencers

Several of the global technology companies that have intentionally contributed to OSS growth in our four focus countries – by creating a physical office, having staff presence, and actively cultivating its user base – are philosophically aligned to OSS. Thoughtworks, a software design and delivery company

17 https://github.com/ahmadalfy

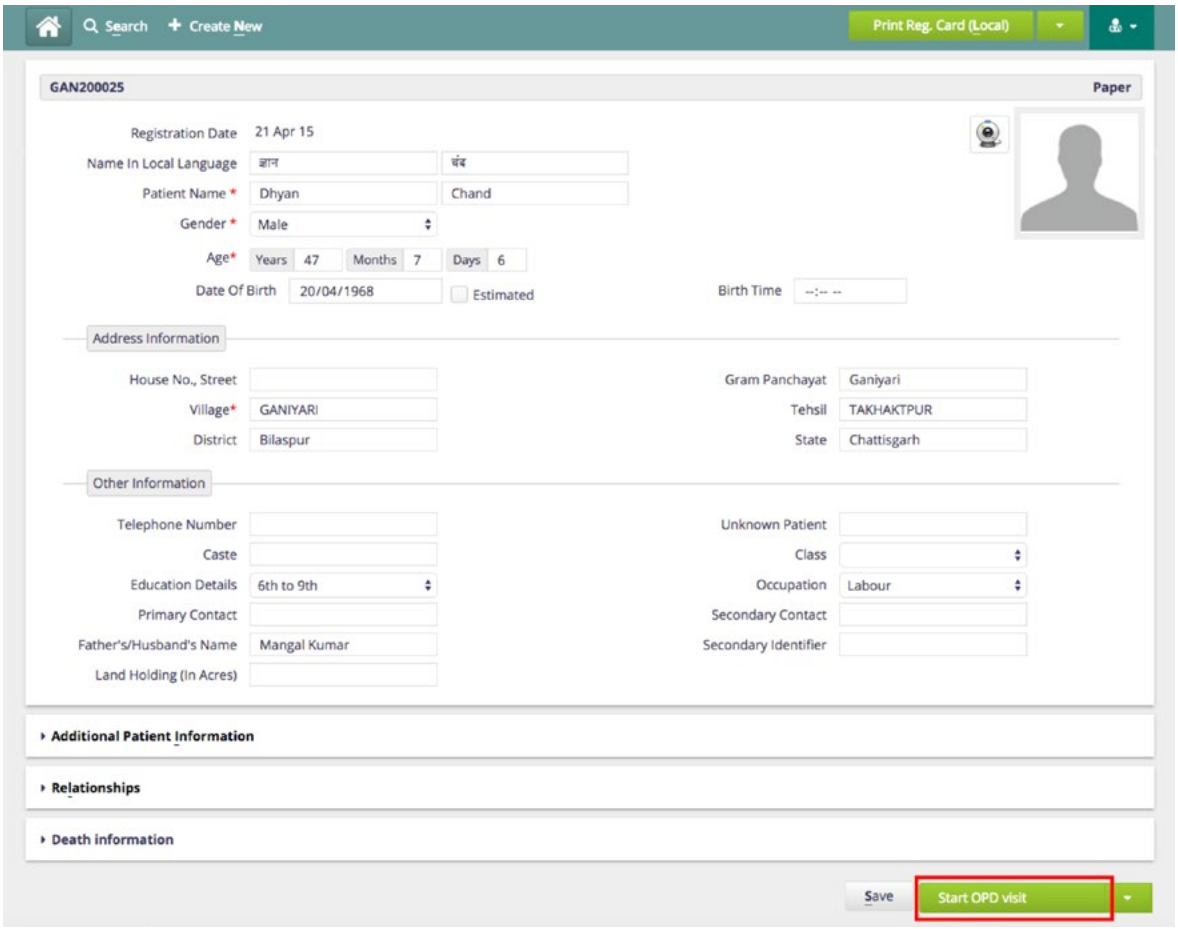
headquartered in Chicago, is a notable example. The company seeks to amplify positive social change, believing that it has a unique role to play in ensuring technology benefits all of society for a more equitable future. Thoughtworks has several offices in India and is known to host free community events globally.[18]

Satish Viswanathan (Head of Social Impact, India), Angushuman Sarkar (Principal Consultant) and Gurpreet Luthra (Principal Consultant) are three Thoughtworks India staff who focus on the tech for social good space, and much of their work contributes to OSS for social good. "It started organically. Thoughtworks staff was saying we could use our skills for social good, and a lot of us initially driving these efforts were Indian. It soon grew to a global program," Angushuman said.

With time, Thoughtworks's presence in OSS for social good expanded significantly, either leading or making significant contributions to RapidFTR, MifosX, OpenMRS, OpenLMIS, DHIS2, OpenSRV, and MoTech. The company has engaged with many United Nations (UN) agencies, including the World Health Organization (WHO) and the UN Children's Fund (UNICEF). Angshuman is a part of the Thoughtworks Global Health practice and was the architect of Bangladesh's National Health Information Exchange.[19] Satish was on the team that built RapidFTR, which is an OSS mobile tool to help reunification efforts post-disasters.[20] Gurpreet works on Bahmni, a FOSS electronic medical records (EMR) and hospital system tool that leverages and enhances various OSS into a single integrated solution.[21]

18 https://yourstory.com/2017/10/Thoughtworks-india-bengaluru/amp
19 https://www.Thoughtworks.com/en-us/profiles/a/angshuman-sarkar
20 https://www.Thoughtworks.com/en-us/profiles/s/satish
21 https://www.Thoughtworks.com/en-us/profiles/g/gurpreet-luthra and https://www.bahmni.org/

Figure 4: A screenshot of the Bahmni user interface



Source: https://www.bahmni.org

Thoughtworks is also investing in DPGs and joined the Digital Public Goods Alliance (DPGA) in February 2022.[22] According to Vinod Sankaranarayanan, Thoughtworks' Business Head for Public Goods, "Given their relevance in citizen services across multiple geographies, DPGs truly reflect Thoughtworks' commitment to social change, globally."[23]

Omar Amin, a Product Manager at Canonical, highlighted several global tech companies that have a strong OSS focus are

22 https://digitalpublicgoods.net/

23 https://digitalpublicgoods.net/blog/Thoughtworks-advocates-for-and-advances-digital-public-goods/

increasing their hiring in Egypt. Canonical is the company behind the popular Linux operating system, Ubuntu. Laravel, an open source PHP web framework, is popular in Egypt because one of the original employees at the company was Egyptian. Red Hat, a major player in OSS, hosted a Summit Connect meeting in Egypt in November 2021.[24]

Technologists in Kenya and Mexico mentioned some OSS engagement from GitHub and Microsoft, though there is opportunity to expand. “Most OSS funding in Kenya comes from Gates and Omidyar,” one expert noted. Another Kenyan technologist pointed out that most OSS communities in Kenya are part of a broader regional or international community, for example the Linux Foundation or ArcGIS. Getting involved in OSS in all four countries is thus known to present valuable networking and employment opportunities with international tech companies and organizations.

Individuals who live abroad and/or have a strong international presence have also had a significant impact on the OSS landscape in the four countries. As previously mentioned, Shankar Maruwada and Rohini Nilekani, Nandan Nilekani, the Co-Founder of the Indian company Infosys, founded the EkStep Foundation for this purpose.[25] Donald Lobo, a former executive at Yahoo! and the founder of CiviCRM, founded the Chintu Gudiya Foundation, which develops OSS for public good.[26] One expert pointed out that Egyptian expats working in the Netherlands and Germany are offering OSS internships.

Technologists from Egypt and Mexico spoke about “brain drain,” which refers to a country’s top talent moving abroad to take a job with higher wages.

24 https://www.redhat.com/en/summit/connect/emea/egypt#agenda
25 https://ekstep.org/
26 https://chintugudiya.org/what-we-do/

As Ahmad Alfy said,

> "Many of our engineers travel to Europe, the US, and other countries. We are in a position where most engineers (in Egypt) are young and ambitious, but they just lack the experience to contribute back."

During the COVID-19 pandemic, however, several Mexican and Egyptian technologists returned to their home countries with remote work opportunities. Carlo Gilmar, a software developer from Mexico City, said that during the pandemic, he was able to get a remote job working with OSS languages, which has allowed him to connect more with local communities and give back.

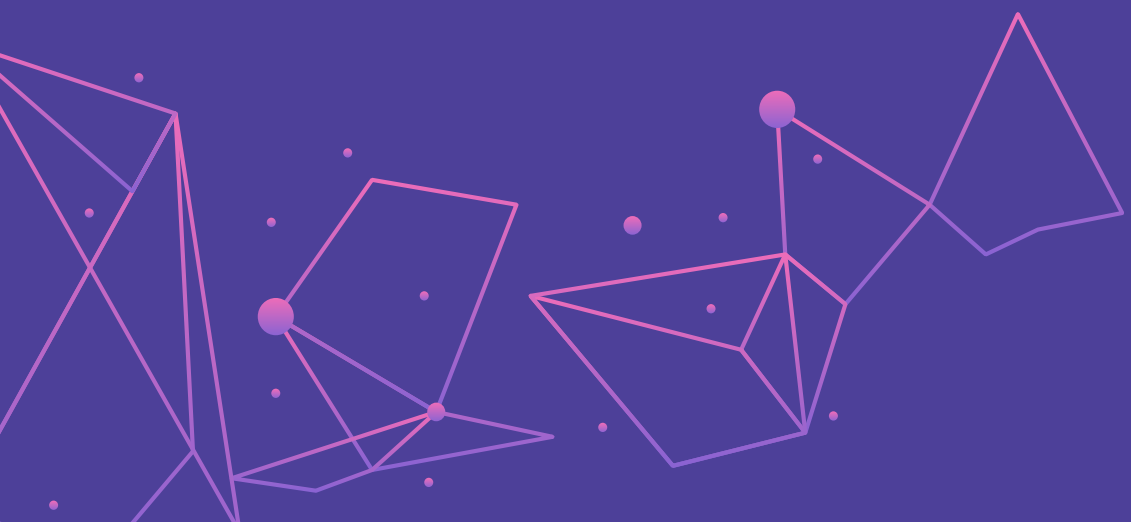
Emilio Velis is based in El Salvador and is the Executive Director of the open source wiki, Appropedia. He described changes he saw during the pandemic,

> "The Latin American community was especially closely knit during [the pandemic]. People were coding and building things together. The remote aspect of it got more people involved."

With an uptick of projects that were created to support COVID-19 response, recovery and prevention, OSS adoption rose. One COVID-19 project that used OSS and whose repositories are under various OSS licenses, was started by Indian expats living in Japan with Indians living in India. Some of the project repositories are now archived.[27]

27 https://github.com/covid19india

Language, Culture, and Education



OSS in Higher Education

Higher education institutions that teach computer science and computer engineering students continue to be major drivers of OSS and overall contributions on GitHub.[28] The Indian education system has long prioritized STEM fields, especially computer science. Several experts lauded university programs across the country for teaching new generations of Indian technologists about the technical aspects of OSS, like the Indian state of Assam, which incorporated FOSS into its ICT curricula starting in 2019.[29]

Pallavi Gupta, a product designer on the Alexa AI team at Amazon.com Services LLC, noted that her computer science program at a prominent autonomous engineering school in Bangalore, India, offered elective courses dedicated to OSS when she attended from 2010 to 2014. While mandatory courses at her university briefly covered related content, OSS education in some Indian universities are student-led. "I helped resurrect the Computer Science Club at the university...as a part of the club, we conducted open source events, including talks and workshops from [people in the] industry," she said.

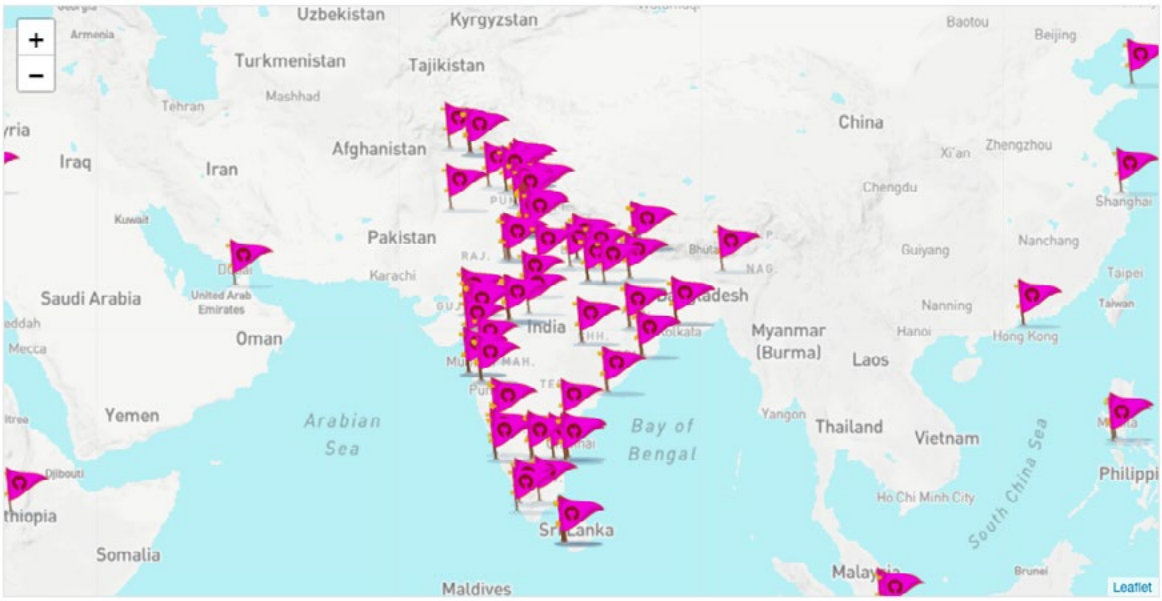
In all four countries, university curricula that do formally include OSS usually only cover the technical aspects, such as common programming languages and how to use OSS industry-standard tools like GitHub. In India, this may be because many computer science programs are highly responsive to the demands of the job market; overall demand for OSS contributions in India remains low compared to the entirety of the Indian tech industry. "Very little is taught in the way of community building, the ethos or philosophy, or governance of OSS," remarked one expert. "We want people to understand what OSS is...the rights and the responsibilities, and

28 https://octoverse.github.com/sustainable-communities/#gateways-to-open-source
29 https://ictcurriculum.gov.in/pluginfile.php/9653/mod_page/content/1/assam.pdf

contribute back to the community," Venkatesh Hariharan added, "In India, we consume open source software, but we need to start contributing back to the community and play a leadership role in creating new open source projects that have global relevance."

This may shift as Indian startups adopt more OSS and as tech company education programs continue to scale. The GitHub Campus Experts program, for example, works with current computer science and computer engineering students at universities in six continents. These students are designated as "GitHub campus experts" and host events, help provide mentorship, and help student technologists work on open source projects. Below in figure 5 is a snapshot of where Indian campus experts were in April 2022.

Figure 5: Where GitHub Campus Education Experts are Located in Indian Education Institutions, April 2022



Source: https://githubcampus.expert/experts

Kenyan technologists described a similar situation, where higher education student groups drive OSS education. One expert said there is a Kenyan student community using Python, an open source programming language.[30] To augment learning opportunities, open source professional organizations in Kenya try to include students. The ArcGIS community was cited as a particularly strong partner community with Kenyan universities. iHub, a Kenyan innovation center that has partnered with several tech companies and the World Bank, also hosts hackathons that drive OSS student engagement.

In Egyptian and Mexican universities, formal programs encouraging OSS use and production have been relatively limited. One expert in Egypt explained the cultural barriers to teaching OSS in universities,

> "Students are not taught the mentality to 'give back.' If they notice a bug or an issue in the OSS tool they're using, they are taught to work around the issue rather than create a pull request and help the maintainer debug. Most organizations and companies also do not encourage this culture."

In part, OSS adoption in formal Mexican and Egyptian higher education programs may be slow due to higher education systems that are extremely standardized. As Juan Pablo Flores said, "Changing the curricula is a years-long, slow-moving process." The Mexican and Egyptian government can be slow to react to new, modern technologies, noted experts in the countries. "That's why campus education programs are so crucial," Juan noted.

30 Python was the second most popular programming language on GitHub in 2021. See https://octoverse.github.com/#top-languages-over-the-years

Non-Traditional Education Routes to OSS

Across all four countries, experts frequently pointed to bootcamps and other non-traditional education programs to learn OSS. The GirlScript Foundation in India is a nonprofit organization dedicated to training young people in tech throughout the country; 50% of its participants are female. One of their programs, the GirlScript Summer of Code, is an annual three-month long program dedicated to teaching OSS. To-date, the program has had more than 5500 participants.[31]

Other Indian non-traditional programs cited were:

- Outreachy - a diversity initiative of the Software Freedom Conservancy, which operates an OSS internship program in India.[32]
- FOSSEE and Spoken Tutorial - two Indian government-backed initiatives that offer internship and education programs with OSS.[33]
- Swecha - a technology organization and community that hosts events like “Girls Who Hack” to support its suite of OSS for health, agriculture, education, CivicTech and assistive tech.[34]

Bootcamps and online workshops are also increasingly popular in Egypt. Some universities are offering single courses or certificate programs alongside full degrees to meet the demand for technologists. The Egyptian Online Ministry of Communications is currently teaching online courses in AI and Cloud computing

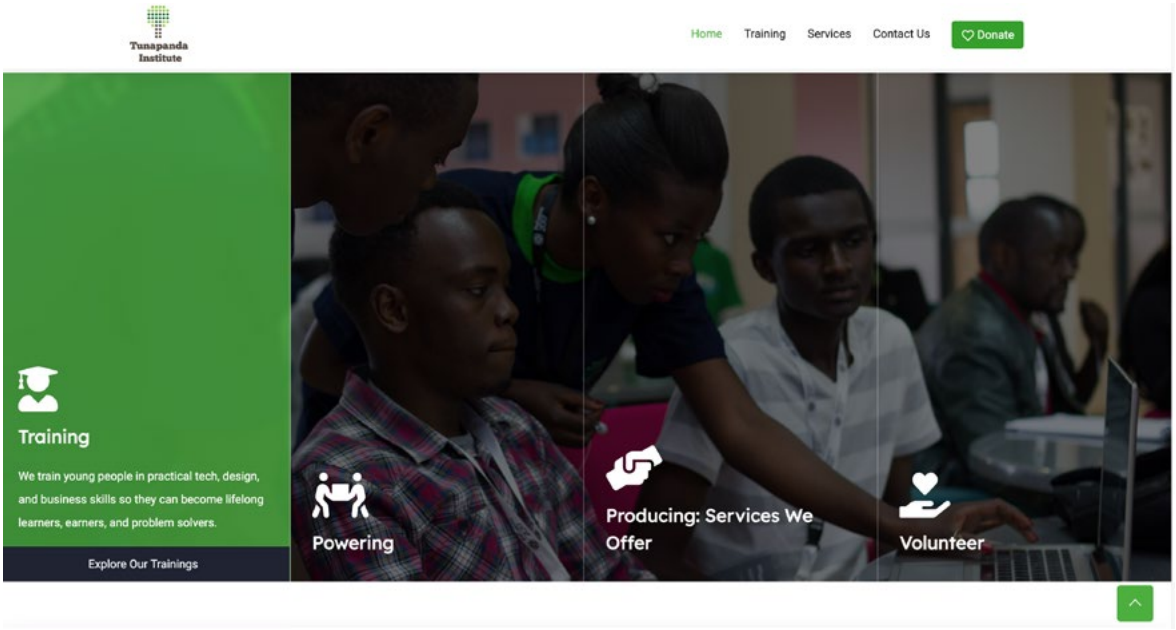
31 https://gssoc.girlscript.tech/#about-gssoc
32 https://www.outreachy.org/
33 https://fossee.in/node/82 and https://spoken-tutorial.org/
34 https://swecha.org/projects

in the country. One expert said there could be an opportunity to add courses on OSS.

In Mexico, coding bootcamps that focus on OSS are not as common as in the other countries, though community-led training sessions, hackathons, maker space events and online developer communities are gaining popularity. Several of these communities are prioritizing diversity and inclusion and helping OSS beginners get started. One expert noted that the Universidad Nacional Autónoma de México (UNAM) hosts "fab labs" and bootcamps but that, "An issue with those spaces, labs and events is they tend to exist in elite neighborhoods and urban areas, which exclude lower-income, rural and indigenous groups."

Renice is a software developer from Kenya and in 2015, joined the Tunapanda Institute for a three-month training in their "tech module," which focused on programming. After graduating, she went on to become staff at Tunapanda, where she leads their "TechDada" initiative for young women in tech. "We started with the Scratch programming language because most people had no relevant background. Then we went into P5.js to learn about game development. We used GitHub for our projects," she said. The entire program used OSS and was democratic and community-driven. "Tunapanda even uses Ubuntu as their operating system," Renice said.

Figure 6: Screenshot of the Tundapanda Institute website



Source: https://tunapanda.org/

Still, she mentioned there is always student apprehension around developing OSS projects. “When they are looking for jobs, they can use these projects to build their CVs. Renice said most employers in Kenya don’t care about the FOSS aspect; they are more interested in the skill sets that the trainees have.

> “So, we tell trainees during orientation that we think of OSS as a way for people to work together and fix problems the community faces.”

Renice said.

Mwalugha Bura (nicknamed “Douda”) is from Turkana in northern Kenya. He also attended the Tunapanda Institute, where he was exposed to an open source learning platform. He then went on

to become a part-time teacher there and has since been dubbed Tunapanda's "Open Source Ninja." According to Douda,

> "Learning OSS makes you not dependent on a tool, but you are learning a process instead. You can easily adapt to anything, and people who graduate from Tunapanda have a benefit over other people because of the learning process."

Spoken Language

Spoken languages across the four countries were both unifying and alienating forces. A current and significant challenge is that most OSS resources and communities are in English, which excludes non-English speakers. As Donald Lobo mentioned, "This can be especially difficult for OSS projects that are created for social good, as 20-30% of all NGOs in India are run by non-English speakers." An even higher proportion serve people who do not speak English.

The language diversity of India, a country with more than 20 official languages and hundreds more spoken languages, has been an obstacle for Indian OSS communities. In response, several initiatives have been formed to meet the challenge. One project started by OSS advocates translates Linux into multiple Indian languages, while Sunbird and AI4Bharat are running AI projects for Indian languages. Gaurav Godhwani, the Founder of CivicDataLab, pointed to IIT-B's Spoken Tutorial, which is creating FOSS resources in multiple Indian languages.[35] Another tool, Kalaam, is an open source programming language written in Hindi.[36]

35 "The State of Free and Open Source Software in India" was written by CivicDataLab and supported by the Omidyar Network India.

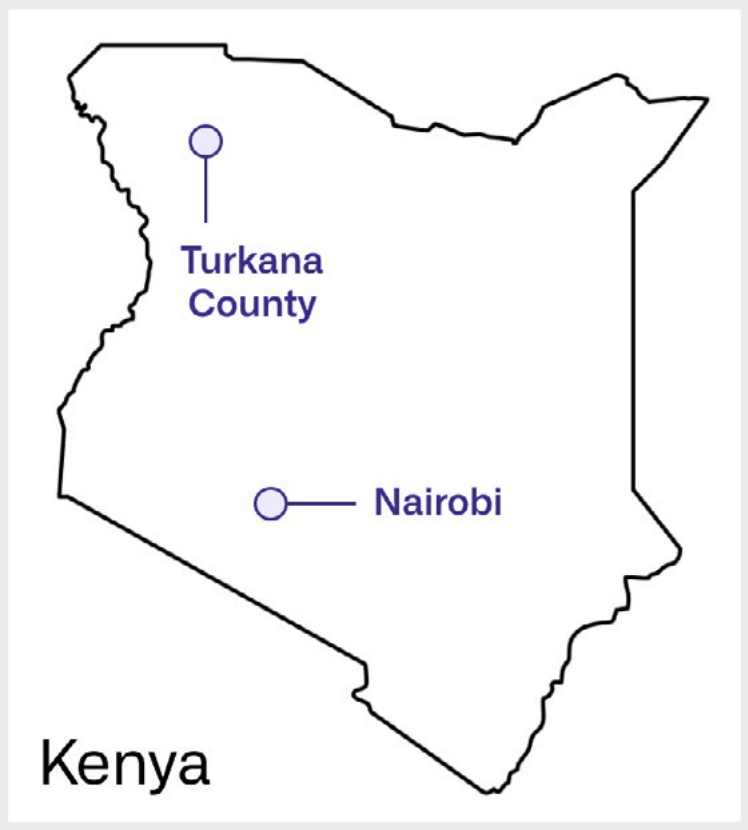
36 https://www.kalaam.io and https://github.com/Kalaam-Programming-Language/Kalaam

Unlike in India, technologists in Mexico and Egypt described how Spanish and Arabic have been unifiers across their respective regions, even with multiple dialects. Several Spanish-language OSS communities reach much of Latin America, addressing key regional civic issues like government corruption. CCOSS, an annual gathering of open source developers in Mexico, is conducted entirely in Spanish and welcomes Spanish-speaking developers, especially beginners, into the OSS community. Similarly in Egypt, OSS software developers described working with others in the wider Middle East and North Africa (MENA) region on religious projects and projects for languages like Arabic, which is read from left to right. One expert also pointed to an initiative led by the UN's International Telecommunications Unit (ITU), which attempted to create a pan-Arab FOSS platform.

Across all four countries, experts noted the need to go beyond the lingua franca of the countries. There are already organizations working addressing this issue. In Mexico, the Mozilla Foundation is working with Mexican developers to translate the open source Firefox browser into indigenous languages. Tunapanda Institute and Outreachy in Kenya, CCOSS and TechnoLatinas in Mexico, and GirlsScript in India hire instructions from around the country to help native speakers of different regional languages.

Spotlight on Kenya: Intra-Country Regional Differences

Figure 7: Turkana County and Nairobi, Kenya

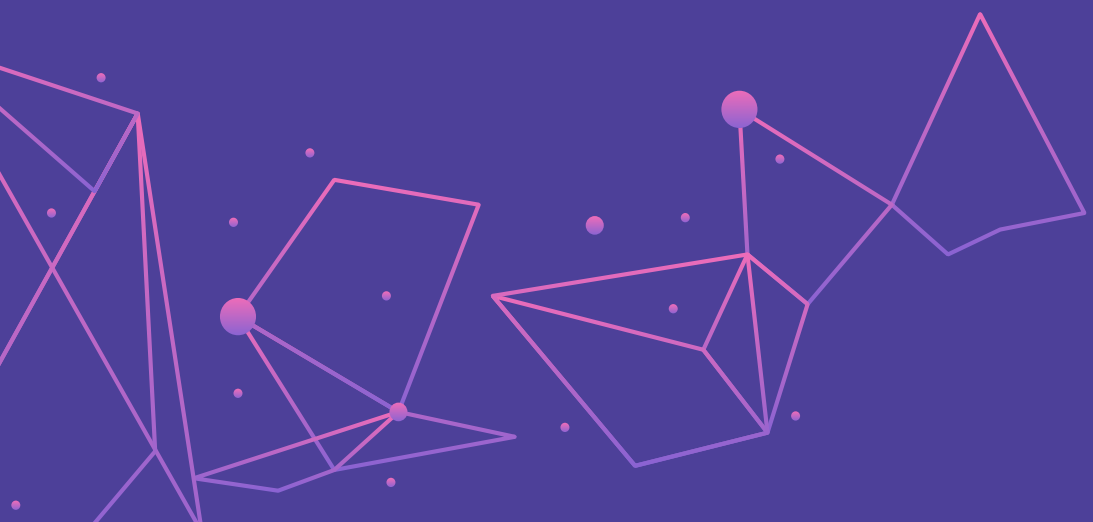


Douda, a Tunapanda Institute instructor living in Turkana, Kenya, described the challenges he faced as a technologist in northern Kenya and outside of the Nairobi tech hub. “When I tell people [here] I am a software engineer, they think I am a hacker! Why? Because people here [in northern Kenya] aren’t so exposed to technology, just email and Facebook. When people of an older

culture here think of computers, they think of shady people," he said. Douda also mentioned that most people he encounters don't care if a software is OSS or proprietary. Because the government doesn't always regulate tech well, some people even distrust OSS, thinking it must mean pirated software.

"Meanwhile, Kenya is a top-ten global transactor of Bitcoin," Douda said. An OSS designer who has worked in Kenya, reiterated this point, "OSS is not a term used outside of tech circles, which are very Nairobi-centric in Kenya with iHub and some universities." Technologists with Medic, MARI, and Ushahidi also spoke about OSS use and development being concentrated in Nairobi, with little to no reach in other parts of Kenya.

The Social Sector and Digital Public Goods



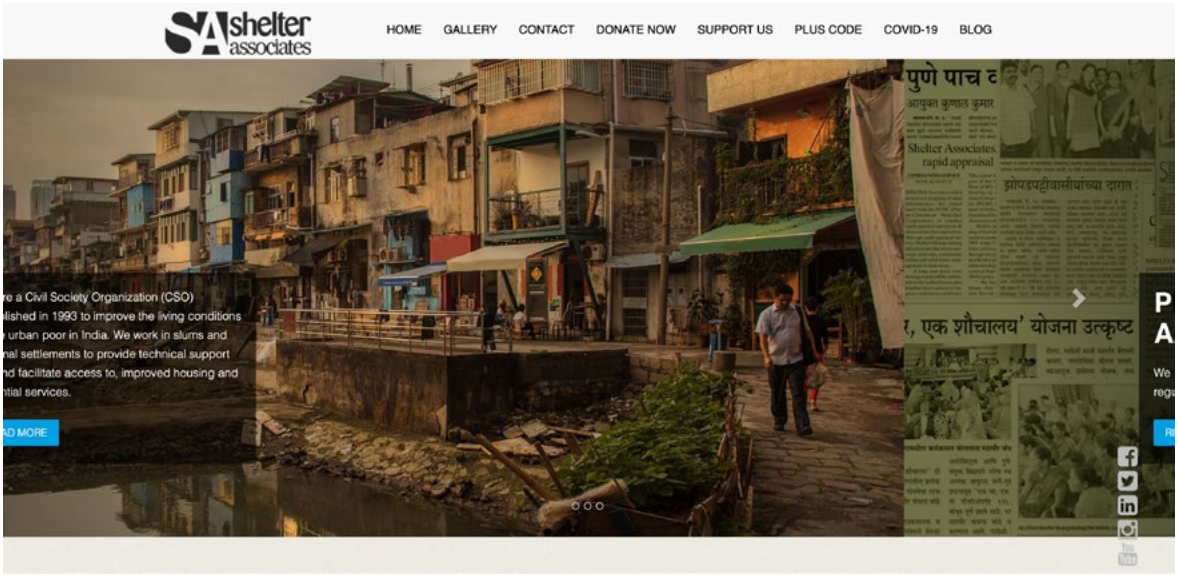
> "We cannot think without data. As architects, we are taught that unless you know the needs of the client, there is no way you can address their problems. Our clients are poor, and we needed good data sets to understand what was missing or lacking. But data is not cheap....and the requirements keep changing with each project. There has to be a certain amount of flexibility and I found that with the open source community,"

said Pratima Joshi, founder of Shelter Associates, an NGO based in India.[37] Pratima started Shelter Associates in 1993 to improve living conditions related to housing and essential services of India's urban poor population. The organization's first interaction with software was with a GIS tool to create spatial data of the NGO's target area – Pune – which is 150 kilometers south of Mumbai. "Nobody was even using computers back then," she explained.

As the organization's data needs matured, so did their technology needs. At first, they contracted out a company to create digital data collection forms. "I spoke on a panel at Stanford about sanitation, which is where I met Donald Lobo," she said, who agreed to help fund her technology needs if she considered moving to open source. She agreed, and now Shelter Associates uses a mix of OSS, such as QGIS and KoboToolbox, to build custom open source solutions. The cost savings and flexibility of their solutions have paid off in the long-term and today, and Shelter Associates is a leader in data research and data-based decision making among Indian NGOs.

37 https://shelter-associates.org/

Figure 8: The Shelter Associates homepage



Source: https://shelter-associates.org/

Pratima pointed out that social sector organizations in India are mostly unaware of OSS and its benefits. Creating a community and dialogue is paramount to OSS awareness for NGOs, said Abhishek Sharma. He is the product manager at Glific, an OSS communication platform for NGOs.[38] Abhishek stressed the need to bring a cross-sectoral community together and use design thinking to create OSS awareness in the social sector.

Sunandan Madan, the founder of Dhwani Rural Information Systems in India, is optimistic. “There is a new wave of NGOs. You will find NGO founders who started in education with Teach for India, used to work at McKinsey, and now have a data and tech mindset with their NGO program and activities. These new NGOs are more likely to meaningfully engage with OSS," he said.

38 https://glific.org/ and https://coloredcow.com/

Digital Public Goods (DPGs)

As detailed in our previous report, OSS for social good is particularly important for reducing duplication of efforts and costs in humanitarian contexts. DPGs describe OSS, open data, open AI models, open standards, or open content that adhere to the DPG Standard.[39] There are nine requirements in the DPG Standard, the first of which is relevance to the Sustainable Development Goals (SDGs)—a critical feature distinguishing DPGs from other openly licensed solutions. DPGs must also adhere to privacy and applicable laws and demonstrate that they have taken steps to ensure the project anticipates, prevents, and does no harm. DPGs may help protect countries from vendor lock-in, facilitate local capacity building, and break down innovation silos by facilitating connection and reuse of existing systems.

To be considered a DPG, an open source project must first go through a nomination process and can be submitted by anyone through a public form.[40] The DPGA's technical team reviews the nomination to confirm that all nine requirements of the DPG Standard are met. Successful nominees are then considered a DPG and are displayed on the DPG registry.[41] The DPG API can be used to populate other registries and catalogues that wish to display DPGs, such as the Digital Impact Alliance Catalogue of Digital Solutions. These registries and the DPG API increase discoverability of DPGs and ensure that they can serve critical development purposes and contribute to a more equitable world.

In October 2021, the code bases of ~88% of all DPG nominees were hosted on GitHub.[42] All four countries have made contributions to DPGs that are hosted on GitHub. Figure 9 below

39 https://digitalpublicgoods.net/standard/

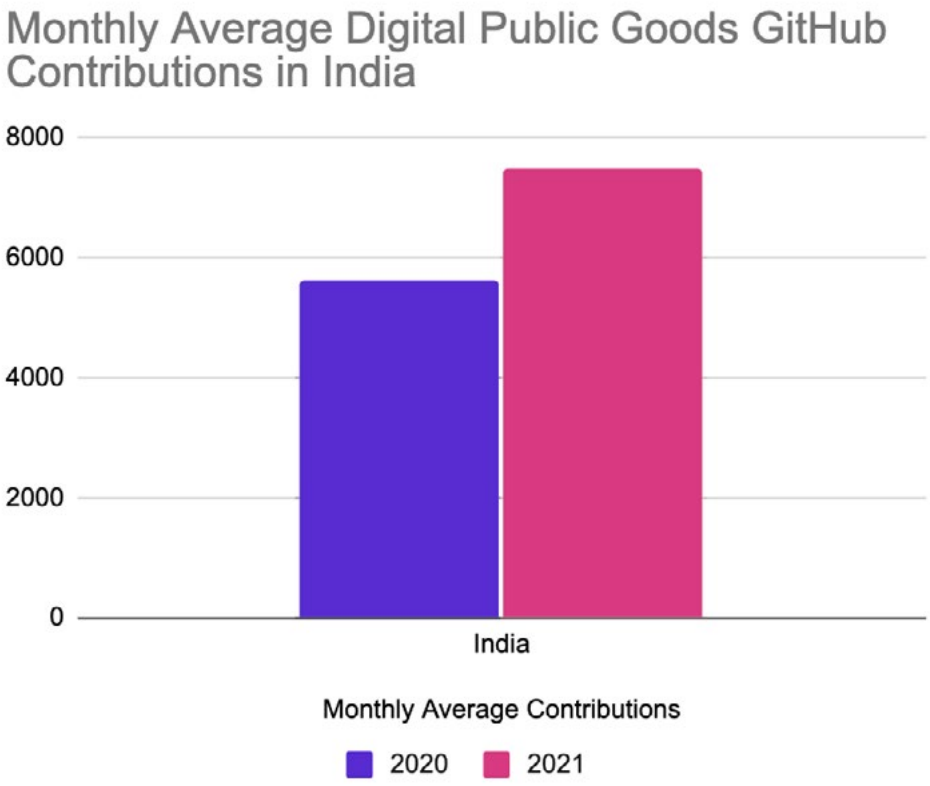
40 https://submission.digitalpublicgoods.net/

41 https://digitalpublicgoods.net/registry/

42 This analysis was done using a script to extract the listed repository links from the nominees in GitHub.

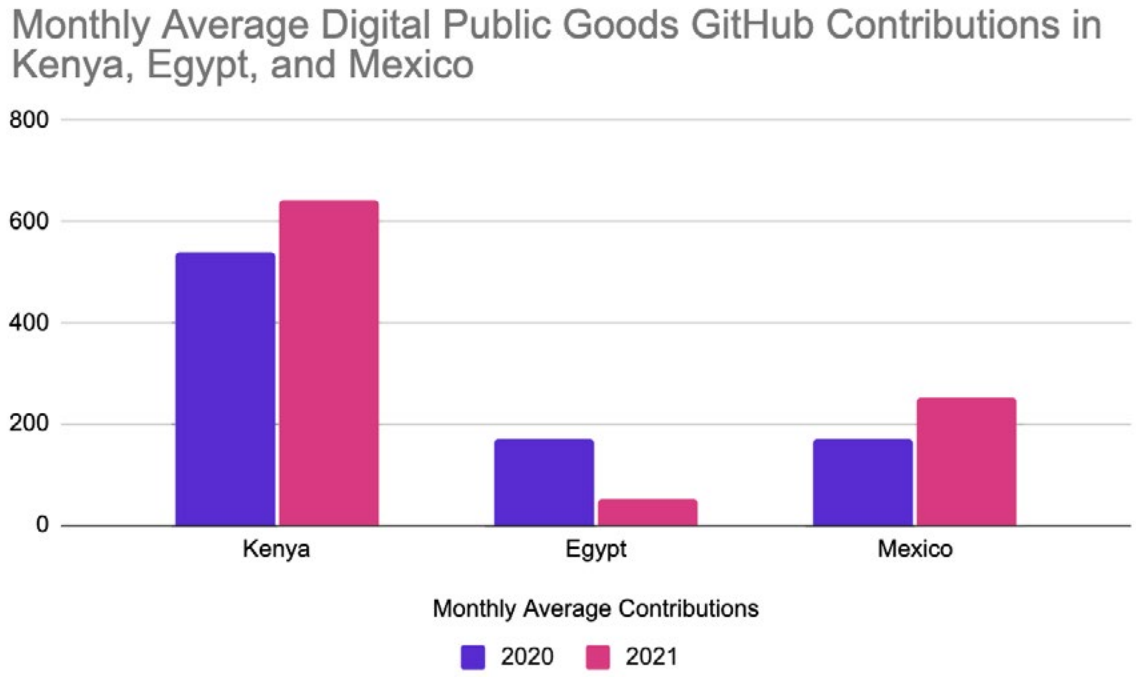
shows the average monthly GitHub contributions to DPGs in India for the years 2020 and 2021. Figure 10 below shows the average monthly GitHub contributions to DPGs in Kenya, Egypt, and Mexico.[43] These non-cumulative figures are not adjusted for population.

Figure 9: Monthly Average DPG GitHub Contributions in India (non-cumulative totals, not adjusted for population)



43 India was separated from the other three countries to account for relative scale.

Figure 10: Monthly Average DPG GitHub Contributions in Kenya, Egypt, and Mexico (non-cumulative totals, not adjusted for population)



While the concept of the DPGs has gained traction since our last research report, the experts interviewed mentioned a disconnect between many social sector organizations and corporate tech companies that drive the majority of OSS development and employ a critical mass of OSS software developers. One manifestation of this disconnect is that in India. OSS is still seen with distrust or confusion in the social sector. Donald Lobo pointed to the large number of NGOs in India that choose Salesforce because they feel it's easier to use, even though the OSS tools offered from FOSS United and Code Alpha are better suited to their needs.[44]

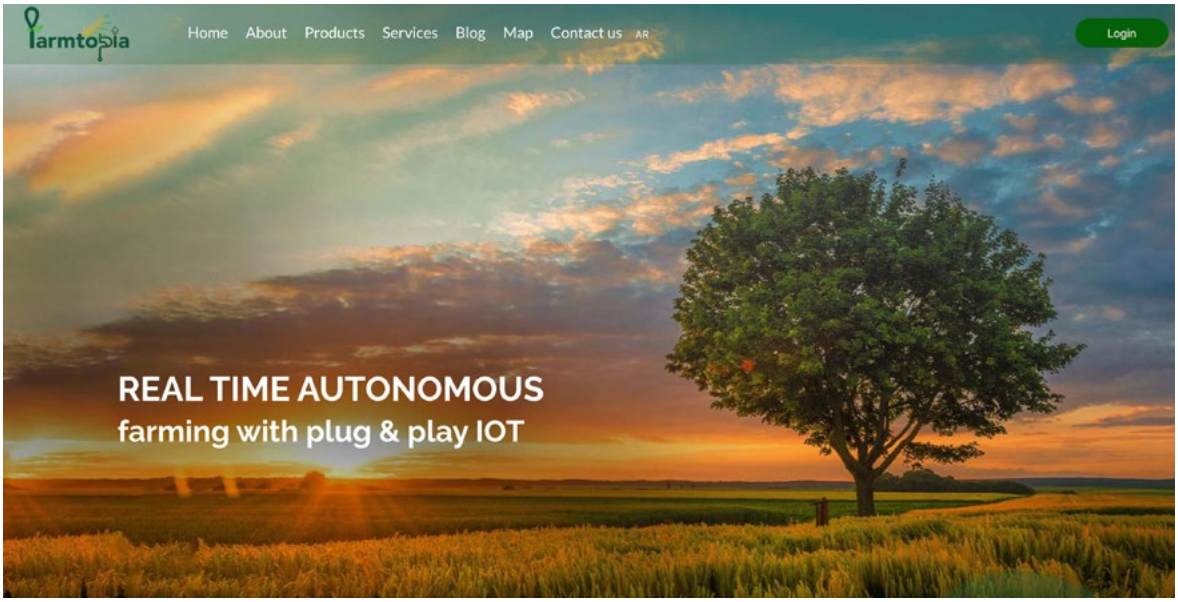
44 https://fossunited.org/erpnext-for-npo and https://code-alpha.org/

One approach that has increased social sector OSS engagement, said Gaurav Godhwani of CivicDataLab, is bringing together multidisciplinary groups to create DPGs. "In some of our initiatives, like Open Budgets India, Justice Hub, Open Contracting India, we are seeing policy researchers, economists, legal researchers, designers, and data scientists coming together with technologists to create much more inclusive and robust DPGs. They are contributing not just code, but research, data, content, and design, which allows more diverse talent in the community to co-create DGPs that can be widely adopted."

As in the case in India and Kenya, some USAID healthcare activities in Egypt are requiring the use of DPGs or other OSS that align with the SDGs but have not yet been added to the registry. Some of these activities are contributing code back to existing DPGs. The Egyptian startup Farmtopia is self-funded and is trying to build OSS / DPGs on precision farming and IoT sensors.[45] The company is having difficulty securing funding from global development organizations due to a lack of understanding about the benefits and business model.

45 https://portal.farmtopia.farm/

Figure 11: The Farmtopia homepage



Source: https://portal.farmtopia.farm/

Experts in Mexico said that the disconnect between the social sector and tech sector is significant in the country. Software developers who want to use their skills to "do good" are most often enticed by an active civic tech space, hence the reason why most DPG / OSS for social good contributions in the country are aligned with SDG 16: *Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels*.

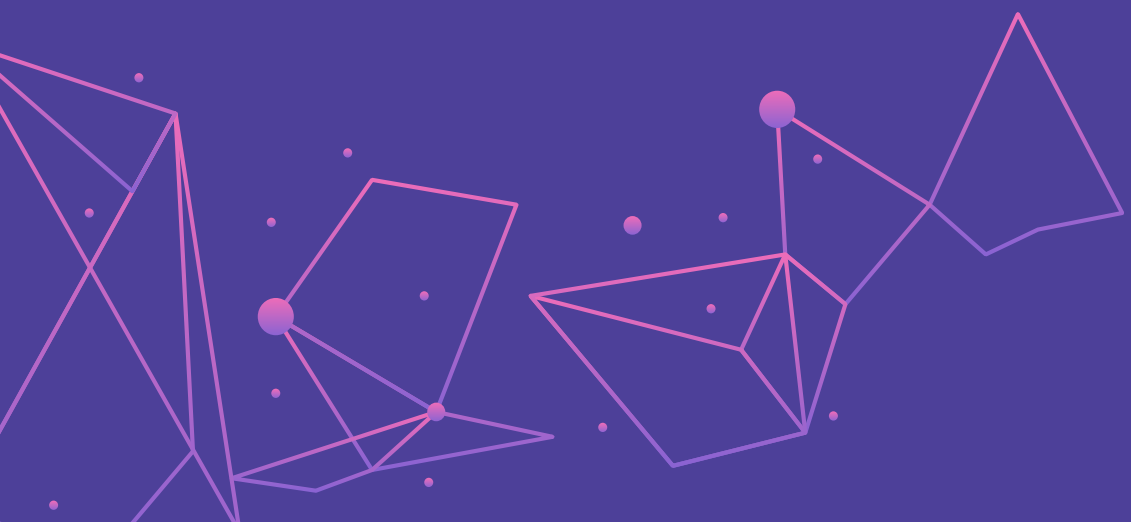
Technologists who work on OSS for social good (including DPGs) in Kenya pointed out that tech for international development (ICT4D) and other international development organizations have strongly influenced OSS adoption in Kenya, though not in a strategic way. Big organizations that develop tools in higher income countries tend to get prioritized, and funding requirements can be too restrictive on which tools are deployed in the country.

One expert went so far as to describe the situation as "erratic," with funding going to new OSS tools without any long-term roadmaps or sustainability plans.

On the other hand, there are Kenyan social sector organizations that both use and significantly contribute to OSS. Samuel Mbuthia, the Head of Community at Medic (formerly Medic Mobile), a global health tech company with a strong presence in Kenya, pointed out that the company has centered OSS in its tech solutions.[46] Samuel has spent a lot of his time developing documentation and how-to guides to build digital products for Medic. In his experience, building OSS was very attractive to software developers in Kenya because of the low cost to contribute from the availability of free and open resources, documentation, and guides. He did say, however, that it has been hard for Medic to recruit and/or keep good OSS developers in Nairobi with stiff competition from corporate tech companies vying for talent.

46 Samuel is the incoming World Health Organization Open Source Programme Office (OSPO) Lead. The OSPO will sit under the WHO Pandemic Hub, which has a strong country office focus. Read more about the WHO OSPO launch here.

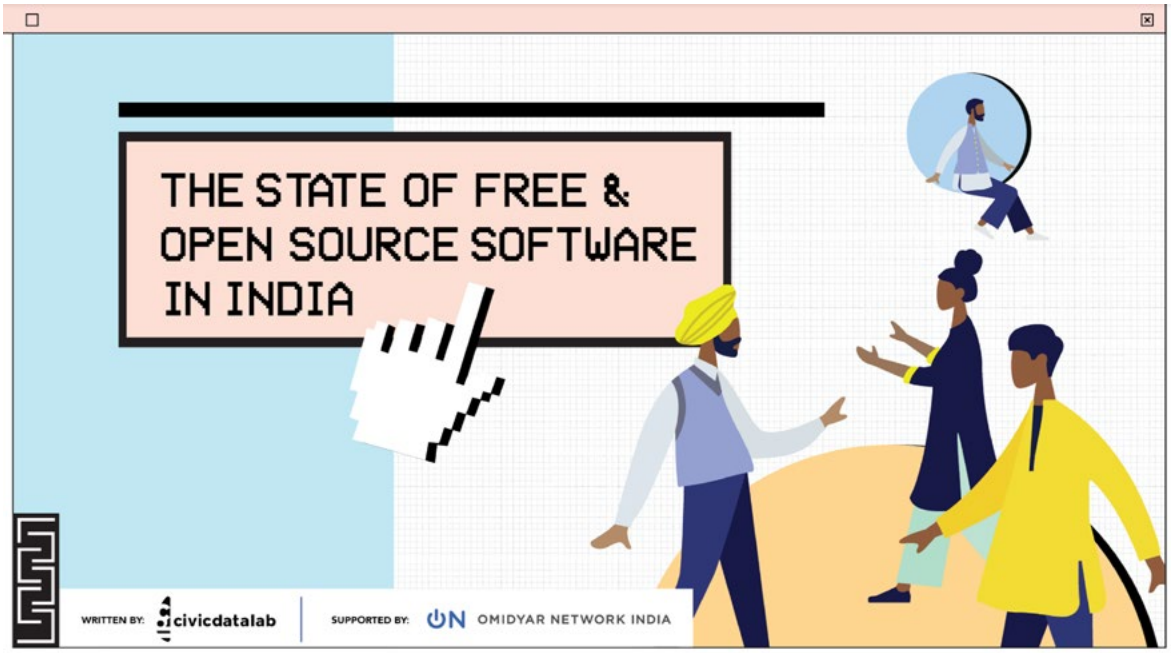
Government and Policies



> All four of our focus countries have at least one federal government policy on OSS.

The level of policy implementation and enforcement varies. Of the four countries, India has the highest level of adoption and the most policies outlining OSS use and production. However, the research report "The State of Free and Open Source Software in India" identified more opportunities for growth.

Figure 12: The State of Free & Open Source Software in India report cover page



Source: https://state-of-foss.in/the-state-of-foss-report.pdf

At the international level, projects such as Linux and ICANN started in high income countries and are now globally applied. Some organizations are working on how the Indian voice in these international OSS standards and policies can be heard.

According to Wainaina Mungai, in Kenya, the Ministry of ICT's

National Plan for ICT explicitly recommends national government ministries and agencies use or produce open source tools. OSS usage greatly varies among ministries, in part because tech companies lobby the government to use their proprietary SaaS, which has persuaded the government away from OSS.

The Mexican national government has OSS policies and has invested in some OSS implementations in the interest of government transparency. As one expert in the country explained, while the federal government is outwardly in support of data transparency and anti-corruption, whether open data or OSS is prioritized depends on the administration in power.

In general, the Mexican federal government has more policies around open data than OSS, the majority of which relate to civic technology. Few of those efforts have trickled down to sub-national governments. Pablo Villareal's team from Mexico's National Digital Platform – one of the federal government's most prominent examples of OSS being used for anti-corruption efforts – is aware of this inherent precariousness and he tries to build safeguards into the strategy. "Our goal is to become a public good, where people are pushing for [the platform] to exist and it becomes a cultural touchstone, so that [it] will transcend our team," he said.

However, broader support for OSS from the Mexican government is rare, according to technologists in the country, in part because of a lack of technical expertise. Jesenia Rodriguez from the Inter-American Development Bank's Innovation team explained, "Technical capacity in government, especially at the city level, is limited and complicated." This makes it harder to properly implement related OSS programs and policies.[47]

47 Jessica Rodriguez is an officer of the Inter-American Development Bank. The opinions expressed by Ms. Rodriguez do not necessarily reflect the views of the IDB, its Board of Directors, or the countries they represent.

In Egypt, experts still discuss an event in 2012/13, when the federal government entered into an agreement with Microsoft to purchase around USD 40 million worth of licenses. The move was widely criticized by OSS advocates in the country; they argued a better investment would have been in the Egyptian economy to develop OSS locally. In response, the Egyptian Ministry of ICT announced a national strategy to support OSS use. Despite a lack of visibility of the strategy, it has spurred some movements to adopt FOSS in the country.

Of the four countries, the Egyptian federal government has the most stringent data policies, which may have slowed down private sector support of OSS use and production. One exception is the "Digital Egypt" initiative of the Ministry of ICT, which is mandated to digitize government services and build student capacity in tech. Experts confirmed that multiple initiative projects use or have produced OSS. Some experts cautioned that Egyptian government policy advocating for OSS does not always directly lead to new OSS projects.

Spotlight on India: Government-Adopted OSS / DPGs

The Indian government has invested heavily in the adoption of OSS in recent years, including in DPGs. As Surendrasingh Sucharia from the EkStep Foundation explained, part of that motivation is because of large India's population, which results in many societal problems existing at scale. Developing a DPG could support a solution to a problem that affects 200 million people, making OSS development cost effective. An expert pointed out that the government's motivation in funding OSS is also security. "The Indian government used to think of OSS as less secure, but now

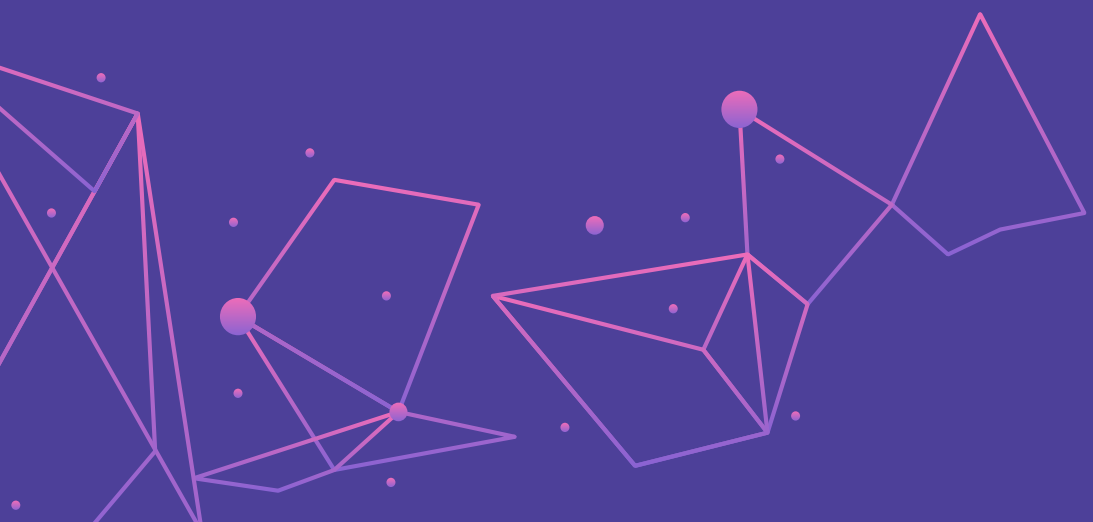
it thinks of it as more secure because there are more people monitoring OSS code," they said.

At the state level, the Government of Kerela has had success with setting up the International Centre for FOSS (ICFOSS), an autonomous organization to promote and consolidate the OSS it uses and produces. The organization brings together academic, government, and private industries.[48] There are tensions between state and the national government in India, particularly around OSS adoption in healthcare systems and standards. The Ministry of Electronics and Information Technology is exploring how OSS policies can be supported at the community-level. The agency also supports several FOSS initiatives.[49]

IIIT-Bangalore, the Gates Foundation, Tata Trusts, Omidyar and NORAD funded a tool called MOSIP, which is a modular OSS digital identity platform that can be customized and rolled out in low resource settings.[50] These same benefactors plus Nandan Nilekani Philanthropies are also behind DIVOC, the vaccination open credentialing platform that the Indian government adopted.[51] The Sunbird Foundation certified the building blocks of its Diksha OSS for education infrastructure, which the Indian federal government has deployed at scale, with more than 4 billion learning sessions logged.[52] The investments in DPGs have grown to the point that firms like Samagara exist primarily to support implementation.[53] Experts note, however, that the Indian federal government has not been systemic in its OSS adoption, but rather heavily encouraged by private and organizational funders to open source and reuse its software.

48 https://icfoss.in/
49 https://www.meity.gov.in/content/major-foss-initiatives
50 https://identityreview.com/mosip-open-source-national-id-system-gains-momentum-in-africa-and-asia/
51 https://divoc.dev/divoc-in-action/india/ and https://egov.org.in/ and https://divoc.egov.org.in/
52 https://diksha.gov.in/ and https://sunbird.org
53 https://www.samagragovernance.in/

Sustainability and Finance



Intellectual Property

In our first research report, we found that the primary concern among software developers producing OSS is the loss of intellectual property and therefore their competitive advantage with potential customers/clients. In fact, 34% of all people surveyed marked this as a concern. In LMICs, where income is less guaranteed, this concern is even more pronounced, especially in the burgeoning Kenyan tech startup scene. Patent protections in Kenya are weak, which makes the enforcement of licenses difficult. “With economic struggles, there’s a scarcity mindset,” remarked one expert.

Tech companies in India said a main concern with OSS is the cost to maintain a clean code base and sustain a community. An increasing number of corporate tech companies are experimenting with OSS business models, but most OSS contributors in the country are individuals and find it costly to sustain without a direct revenue stream. This is true in social sector tech as well. One staff member at a social sector tech firm said that even though their company is interested in making everything OSS, the reality of losing SaaS subscription revenue is too difficult to overcome.

Egyptian software developers mentioned that they don’t have time to contribute to anything on the side of their work. With a relatively nascent tech industry, some startups also don’t see the direct benefit of open sourcing their code or algorithms. Amr Saleh, a tech entrepreneur from Egypt who started the tech company Welnes, pointed out another issue: “Venture capitalists in the US require that hardware have a patent,” he said. Securing a patent for hardware or copyright for code is effectively required for many Egyptian startups since funding from abroad is financially critical.

Perceptions of OSS

As similarly outlined in our previous research project, many social sector organizations across the four focus countries have negative sentiments around OSS. Karim Hosny, a Senior Software Engineer at GitHub, said that there's a cultural perception that OSS is bad, or it wouldn't be free to use the code. Jose Rodrigo Moran from UNDP mentioned a similar culture perception across Mexico and other Latin American countries. "If it's free, it's not as good quality," he explained. Experts in Kenya echoed similar cultural beliefs, adding that having a point person to blame for anything going wrong with a tech system gives most proprietary tools an advantage over OSS.

However, Karim also pointed out that perceptions among computer science students in Egypt are changing. Previous generations of software developers hacked into software because they couldn't afford the licenses. "This generation of students doesn't want to spend time cracking software or stealing anything," he said. Instead, with the proliferation of OSS, they can turn to code that is meant to be repurposed and/or modified.

Paul Aguilar is the Head of Security for SocialTIC, an organization in Mexico dedicated to supporting the tech needs of social impact organizations.[54] While Paul's experience with OSS in the social sector in Mexico was similar to Pratima's experience in India, he shared this observation:

> "In rural communities and indigenous communities, especially where they have resistance communities, you will find more OSS utilization. It's the communities that have the least that tend to experiment with OSS."

54 https://socialtic.org/

Foreign Investments

Most of the OSS projects encountered in this research in Egypt, Kenya, and Mexico were primarily funded by foreign investors. Experts said the influx of foreign funding has largely set the OSS tone. Egyptian technologists receive a lot of funding from Gulf nations, as well as European development agencies like GIZ. The World Bank and UN specialized agencies are the primary OSS funders in Kenya. Most OSS work in the social sector in Mexico is funded by international organizations and PDN, a government agency. International pressure to focus on government corruption is one reason why OSS in Mexico has a strong CivicTech focus.

(Un)Sustainable Funding

Funding for OSS for social good projects is most sustainable in India, in large part due to committed individual funders. Staff from Omidyar added that its founder, Pierre Omidyar, is keen on OSS due to transparency and openness. The Omidyar Institute has donated significant funding and research labor for OSS efforts in India, including the creation of MOSIP. A challenge to OSS funding in India is that for-profit companies are not eligible for most grants, and many organizations that work on OSS in the country are for- profit.

Generally in Egypt, social sector tech is in the early stages, with the UN being a primary promoter. However, UNDP in Egypt said they were only able to provide guidance in the early stages of companies and organizations, not provide actual seed funding. Mariam Shokralla, a health tech consultant from Egypt who lives in Amsterdam, echoed this point, saying the number of social

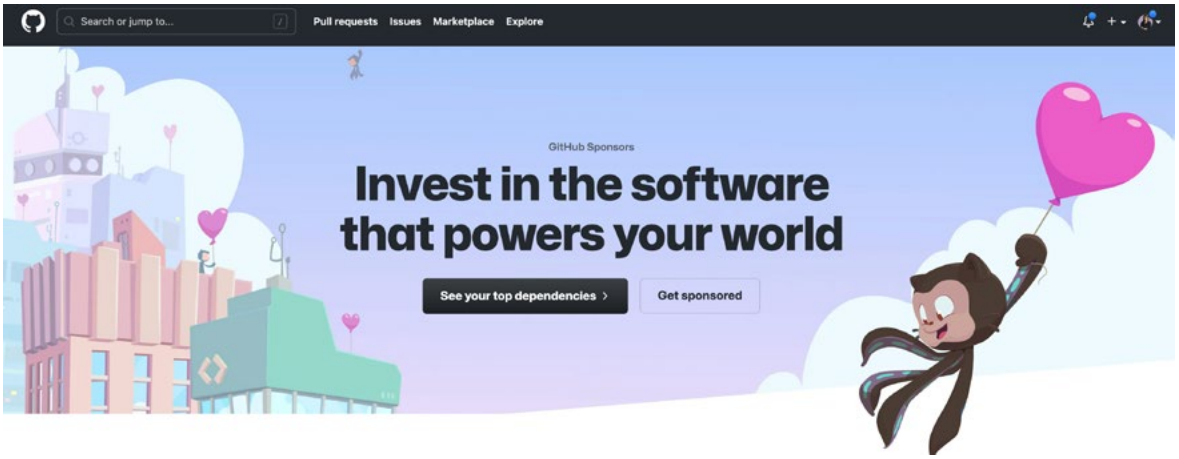
sector tech companies in early ideation stages far outnumber the companies that have actual funding.

OSS for social sector work in Kenya and Mexico is almost entirely grant funded. Unlike in India, Kenya does not have private organizations or individuals who are willing and able to subsidize OSS work in the social sector. In Mexico, a very limited number of firms have been able to make money for OSS development in the social sector. Technologists in all four countries, especially in India, said grant funding for social sector OSS tools will likely decrease and the organizations that maintain the tools will need to transition to SaaS and/or implementation consulting.

One way to create an OSS funding stream is through GitHub Sponsors, which allows individuals or companies to directly donate to individuals, companies, or individual repositories that contribute to OSS.[55] As of August 2022,

> GitHub Sponsors now supports people who reside in India, Kenya, Egypt, and Mexico.

Figure 13: The GitHub Sponsors homepage



55 Please visit https://github.com/sponsors for a complete list of supported countries.

Sustainability through Community Building

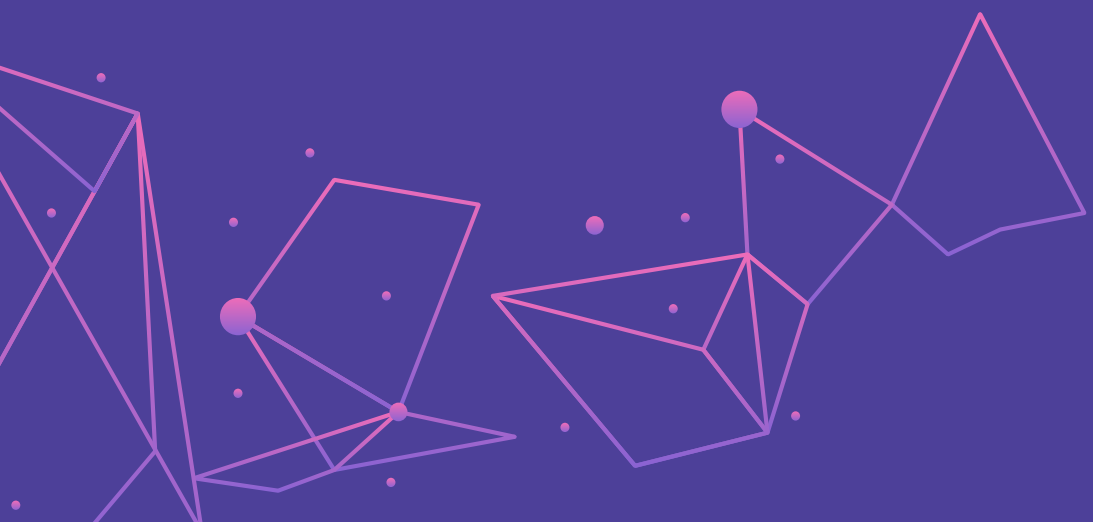
"Sustainability is linked to the community," Surendrasingh Sucharia of the EkStep Foundation said. Community building for any OSS project is difficult, especially those in the social sector because of unstable funding. Angshuman from Thoughtworks said that OSS for social good communities do very little to evangelize community because that comes at a cost that nearly no funders will pay.

To fill this need, Indian OSS leaders are turning to students, including non-traditional students, who are eager to contribute to projects and build their portfolios. Thoughtworks, for example, is a highly sought out employer in India and created a program called Vapasi. As Gurpreet Luthra explained, the program helps women technologists return to the workforce with refreshed skills after they've had a career break. Part of the Vapasi curriculum is based on open source projects.[56]

Gaurav Godhwani from CivicDataLab said the organization tried something similar as part of their open source initiative called Justice Hub, by getting student volunteers from various law universities in India to crowdsource crucial data.[57] He said, "We wanted to create a dataset that profiles the backgrounds of High Court Judges from across India, so we onboarded student volunteers who spent five weeks of their summer break collating this information from various digital archives, and publishing this data. The data curation exercise was followed by rounds of data validations that involved manual and automated checks to ensure that the quality of datasets is not compromised." The data is available publicly.[58]

56 https://www.thoughtworks.com/en-in/careers/program/talk-tech/vapasi
57 https://justicehub.in/initiatives/summer-of-data-2021
58 https://github.com/justicehub-in/summer-of-data-chapter-1

Opportunities



There is ample opportunity for OSS technology funders, educators, and project managers in LMICs to learn from all four countries. One idea taking shape in India is to have high-net worth technologists from the country provide private investments into DPGs or other OSS tools that have a high social impact. Likewise, growing Egyptian, Kenyan, and Mexican ex-patriate technology communities in Europe, North America, and Australia may be able to create additional funding streams that local technologists need to build more sustainable OSS tools and communities.

All the country-specific expert sessions the researchers and authors of this report conducted had a high engagement. On several occasions, all the experts we interviewed mentioned a desire to connect with OSS developers in the other countries. One opportunity for GitHub could be to host learning exchanges among country experts to highlight common struggles and how they could be overcome.

Areas to explore

The following research questions were proposed by one or more country experts:

- What are the problem statements that affect the most people in each country and how can OSS help address those needs?
- What are sustainable funding models and opportunities, and innovative business models for social impact OSS in each country?
- What technical aspects are similar across DPGs, including common frameworks, programming languages, stacks, and governance models?
- What data can be sourced on investment type, amount, duration, and purpose of OSS tools in each country?

Recommendations

The level of dedication, innovation, and engagement across all four countries is impressive. Experts in each country emphasized they are continually working on common OSS challenges, such as funding, sustainable community engagement, brain drain, government policies, and engaging more (people who identify as) women and other underrepresented groups. Beyond these common challenges, we found issues in each country that may benefit from the following recommendations.

India

The researchers and report authors found it was challenging to understand which OSS initiatives were connected to and funded by which organizations or people, despite many of the major projects and tools mapping back to a small core group. A recommendation for the Indian OSS social sector community is to clarify the relationship among these funders, organizations, programs, and tools, which may encourage wider community engagement and help future funders and developers understand gaps.

Kenya

One recommendation for Kenyan OSS maintainers is to create more resources on how OSS licenses can be effectively used if legal enforcement remains weak. For example, what are the community or professional implications for not complying to an OSS license? A second recommendation is for GitHub to amplify

government funding and services, such as the ICT Authority's initiative, HudumaWhitebox portal, which provides support services for software developers.

Egypt

Even with detailed searches in Arabic and English, it was difficult for the researchers and report author to find information online about OSS production in Egypt. While this may be because OSS in the country is relatively nascent, one recommendation for Egyptian OSS developers is to create more publicly visible project documentation on platforms with machine readable text so that browser based tools can detect and translate the text into other languages.

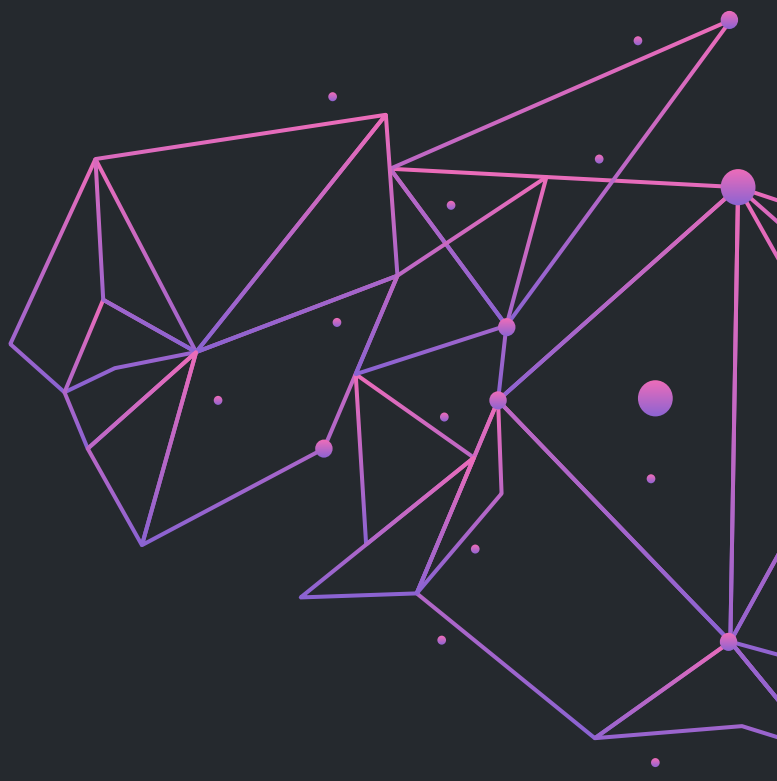
Mexico

Experts pointed out that a main challenge of OSS in Mexico is financial backing and broader government support for OSS projects and policies. One expert mentioned how difficult it has been to sustain projects in the long-term with shifting government priorities. One recommendation is for OSS policy experts in Mexico to communicate the positive economic impact of OSS so that it is favored across state governments and the Mexican national government.

GitHub

Thank you!

GitHub would again like to thank the experts interviewed for their insights, feedback, and dedication to OSS for the betterment of society. The Tech for Social Good team looks forward to continued engagement with OSS communities in these countries.



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