

Regional Open Source Software Communities: The View From Dhaka, Bangladesh

Anushah Hossain

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Contents

Introduction	3
Background	5
What do we know about global participation in open source software?	5
What motivates interest in open source software?	7
Methods	9
The Technology Scene in Dhaka, Bangladesh	10
Introduction	10
The Rise of Computer Science	10
Open Source Software Hubs	11
Communities	12
Events	13
Case Study: Mozilla Bangladesh, the ur-community	14
Introduction	14
Origins of Mozilla Bangladesh	15
Growing pains	18
Splintering	20
Mozilla Communities Outside Bangladesh	21
Case Study: Brave Bangladesh, a community getting its footing	23
Introduction	23
The spread of regional communities: from Mozilla to Brave	23
Sustaining interest	26
Code labour	27
Discussion	28
References	30

Introduction

In late 2016, I noticed an interesting re-tweet on my Twitter feed. “*Brave Bangladesh*” an apparent off-spring of the recently launched browser *Brave*, had been actively localizing and evangelizing the software project. *Brave* was a privacy-oriented browser that blocked ads and trackers by default and offered a novel micropayments scheme for online content producers. It was also open source.

As I clicked through to the *Brave Bangladesh* account, I saw that a group of over twenty people from Bangladesh were associating themselves with the *Brave* browser and engaging regularly over social media with the main company account.

I found this surprising. As an emigrant from Bangladesh, I knew some of its past history and current politics — a steadily developing economy, a population with deep appreciation for the Bangla language, frequent internet censorship and shutdowns — and wondered how these conditions had given rise to a community supporting this technology project. Did the act of localization hold any particular significance in Bangladesh? How did the open source nature of the project affect participation? Did the user-first orientation of the browser hold particular appeal in a censorious regime?

I used this observation as an entry point to a larger investigation of the state of technology communities in Dhaka, Bangladesh, with an eye towards open source projects in particular. Recent studies of code repositories show relatively little activity originating from South Asia, compared to East Asia or East Africa where the pace of new contributor growth is beginning to outpace that of the West. Yet social media activity, such as that of *Brave Bangladesh*, suggests some interest in technology projects in the region and can help address such questions as: What type of participation is occurring in South Asia? Why do we see relatively little coding activity?

The impetus to study open source software communities comes from a growing awareness of its place underpinning our critical digital infrastructure — the virtual roads and bridges that allow social, political, and economic activity to flourish online. This code is written to be freely used, altered, and distributed, though the specific conditions vary according to the license used.

Most importantly, open source code has traditionally been produced by unpaid, geographically-dispersed teams of individual volunteers. A lingering fear with open source code has been with regards to its vulnerability to a sort of tragedy of the commons: is there sufficient incentive for individuals to continue maintaining this shared resource? Over the last twenty years, the open source ecosystem has evolved in many ways, including changes in the distribution of contributors on a project, higher demands for maintenance and engagement from the user community, and inflows of funding to support high-profile projects from major technology companies.

This project is one of several funded by the Ford and Sloan Foundations in 2018 that are intended to investigate how the frameworks we use to understand open source software projects need to be updated based on these changes. This project investigates the nature of community in open source projects, how the notion of community might differ across space, and what that means for funders, policy makers, and project leaders seeking to grow open source communities in new locales. The sections that follow give a brief description of the technology scene in Dhaka, Bangladesh, case studies of the two open source projects, and a discussion of what the past and future of open source participation might look like.

We see that “community” in Dhaka, Bangladesh refers not only to the virtual networks of volunteers who share an affinity for a project, but that it specifically refers to a group of individuals who physically meet-up to

perform tasks supporting the project. They often frequently share pre-existing social ties, usually through school. The tasks they most often perform include **localizing** a global software product to make it suitable for Bangladeshi users and **evangelizing** it through presentations and workshops. Only a few leaders interface with the network of other community leaders and paid staff based across the world.

In the past five years, there’s been a Cambrian explosion of “regional communities” in Dhaka, emerging around not just open source projects but proprietary technologies or platforms. This is a result of multiple trends. Some of these are specific to Dhaka: growing interest in the computer science discipline, a desire for students to add extra-curricular expertise to their resumes, a lackluster job market creating additional pressure to do so, and few modern programming resources for students to build their skills. But they are also the result of globalization and the internet: companies entering international markets, seeking product ambassadors and software localizers, recognizing the pool of volunteer labour available to perform these task, coordinating them virtually. Open source projects have not been an exception to these trends, and were believed by some of my interviewees to have accelerated them.

What are the implications of these trends? For one, researchers and practitioners must note the shifting role of volunteers coming from Dhaka and cities like it. Volunteers can not only be conceptualized as occasional code contributors who might grow into core contributors, as the extant literature most often suggests, but also as brand ambassadors or even gig-workers. These frameworks, summarized in Table 1, pose alternate interventions and outcomes.

Table 1. Conceptualizing regional community members

Framework	Recommendation	Outcome
Novice code contributors	Encourage mentorship and social ties with central members; highlight introductory issues for newbies to work on	Evolve participants into “central contributors,” writing and maintaining code
Brand ambassadors	Encourage (localized) promotion of project; offer benefits to ambassadors such as swag, titles	Establish an expanded user base and increased loyalty
Gig-workers or crowd workers	Further modularize tasks; consider systematic compensation and/or recognition for gigwork	Expand the labor force and reach of open source project

But these also raise new calls to action, of ensuring adequate compensation and dignity for work, of investigating the impact of localization and marketing activities done by regional communities, and of continuing to support the development of open source curricula.

Background

I. What do we know about global participation in open source software?

Our knowledge of *where* open source is popular comes from two main sources. One strategy is to assess **adoption** of open source software. This is typically done through tracking of government policies promoting the adoption of FOSS. FOSS promotion can take the form of adopting a Linux kernel as the official operating system for government departments, integrating FOSS tools and philosophies in educational curricula, and using or building FOSS applications for e-governance. Recent studies assessing global popularity by this metric show strong interest across African and Asian countries, though uneven or uncertain levels of implementation (Lewis et al 2010, Linux adopters (2021), Karume and Mbugua (2012)).

A second strategy to measure popularity of FOSS is to map the geographic distribution of **contributors** - data that is typically collected from developer surveys, email archives from open source projects, and from scans of social coding repositories. Many strategies are used to locate developers from these data sets: email domain names, listed addresses/location, manual searching connecting names to other social media sites, geo-IP, and even direct communication confirming one's region. Table 2 summarizes the findings from these contributor distribution studies.

Table 2. Studies of FOSS Contributors

Study	Data	Findings
Dempsey et al (1999)	Analysis of UNC MetaLab Linux Archives	"Strikingly strong European influence"
Ghosh et al (2005)	Self-reported developer surveys	European participation slightly leading US (France (16.5%), Germany (12.4%), USA (10.4%)). OS resembles a hobby more than salaried work. High student participation.
Tuomi (2005)	Analysis of Linux Credits files	Most developers identified with the United States (37%), followed by Germany (17%), the United Kingdom (8%), and Canada (6%)
Spinellis (2006)	Analysis of FreeBSD project	The main development of FreeBSD appears to be happening in North America (46% of the committed lines), Europe (39%), and Asia (10%). The work performed by Asian committers is by an overwhelming proportion (80%) related to the porting and packaging of existing applications.
Tang et al (2006)	Analysis of PostgreSQL and GTK+ mailing lists	US participants contribute most often, but wide global participation evident as well
Gonzalez-Barahona et al (2008)	Analysis of SourceForge private users database and mailing lists from large public repositories	Most active developers from Europe and North America (~40% each), followed by Asia (~10%) Greater geographic diversity apparent in analysis of mailing list discussions, particularly with respect to localization.
Subramanyam & Xia (2008)	Self-reported developer surveys (sourced from SourceForge.net, HuiHoo.org, and	North American developers exhibiting stronger intrinsic motives such as sharing and learning. Chinese developers,

	Sarovar.org)	who are driven by intrinsic motives, are drawn toward projects that are larger in scale, more modular, and universal in nature. In contrast, Indian developers with similar project preferences are mostly motivated by extrinsic motivations.
Takhteyev and Hilts (2010)	Analysis of Github users and public repositories	Developers are highly clustered and concentrated primarily in North America and Western and Northern Europe, though a substantial minority is present in other regions.
Freytag and von Engelhardt (2010)	Analysis of SourceForge public repositories	“OSS seem to be a phenomena of the developed world: in 2006, 85% of the active developers lived in one of the OECD countries and have together posted 88% of all messages.” Differences do not disappear when adjusted for GDP per capita or internet penetration
Bird and Nagappan (2012)	Analysis of Firefox and Eclipse repositories (via Github and Bugzilla)	“While almost half of the contributions for Firefox come from the California Bay Area, the other half is distributed worldwide, with a focus on Europe and North America.”
Graham et al (2015)	Analysis of Github, Wikipedia users and commits	North America and Europe each account for over one-third of the total number of GitHub users and the rate of participation. A majority of the remaining third of GitHub users (17% of the total) are located in Asia. The Middle East, North Africa and sub-Saharan Africa stand out with the lowest levels of participation and combined the regions are home to fewer than 1% of GitHub users and commits.
Mombach et al (2018)	Analysis of most popular GitHub projects	USA = 42% of projects. The Asian countries have the highest percentage of domestic projects, including China (76%) and Japan (73%). By contrast, the country with the highest percentage of international projects is Finland (47%), followed by Canada (41%) and Brazil (40%).
Forsgren (2020)	Analysis of Github public and private repositories	Percentage of active users: 34% North America, 31% Asia, 27% Europe, 5% South America, 2% Africa, 2% Oceania Top % growth in contributors since last year: Nigeria, Hong Kong, Saudia Arabia, Bangladesh, Egypt

The main finding amongst the studies is the predominance of North American and Western European contributors to open source projects, usually summing to 50–80% of all contributors and contributions. India, Brazil, and Japan typically appear in the ranked lists within the top 15 countries (Tang et al (2006), Gonzalez-Barahona et al (2008), Freytag and von Engelhardt (2010)). We see that even in studies where the percentage contribution is adjusted by level of internet access or by GDP, the relative ranking of countries is qualitatively unchanged (Gonzalez-Barahona et al (2008), Freytag and von Engelhardt (2010), Graham et al (2015), Mombach et al (2018)).

Over the past ten years, we see a shift in choice of data set from SourceForge to Github. The latest reports from Github.com, which have the advantage of access to private repository information, show a slowly shifting topography, with countries in Asia and Africa rising in percentage change in contributors year over year. In 2020, Bangladesh appears in the top five for this metric for the first time. Some scholars have questioned the universality of Github data, as alternative social coding platforms may be preferable in certain geographies.

Subramanyam and Xia (2008) present evidence in support of this point, finding and surveying clusters of code contributors from China and India on the web sites HuiHoo.org and Sarovar.org respectively.

Much of the research on contributors take the *code* contributor as the object of study. But what of the work that occurs outside of the code repository? In one of the earliest texts on open source, Raymond (2001) lists the various roles in “hackerdom”: writing open source code, testing and debugging, publishing documentation, keeping infrastructure working (mailing lists, standards, archival sites), and “serving hacker culture itself” (evangelizing). Takhteyev’s (2012) study of Brazilian developers also highlights the manifold ways in which supporters of an open source project may contribute to it: by subscribing to the mailing list, by documenting it on a public wiki, or by purchasing a domain name at which to host project information.

Lakhani and von Hippel (2003) examine one non-code role -- the “mundane but necessary” task of field support-- for the Apache web server software project. More examination of non-code roles in open source projects is found in the marketing literature. Casalo et al (2010) discuss the important role of users as a mixture of consumers, producers, and promoters of open source software, what they term “prosumers”. They emphasize the importance of the promoter role - despite the fact that free software products are mostly developed by a set of computer programmers, they have started to behave as brands in order to attract new consumers and create consumer desire. Michlmayr (2009) connects the dynamic of users as promoters and drivers of brand loyalty with the creation of the community manager role in FOSS projects. As FOSS communities grow in size and commercial interests enter in the sector, this role becomes ever more important.

There are few efforts to consider geographic differences in contributions to open source software, inclusive of these different forms of participation. Verma et al (2005) use the Linux User Group (LUG) as the sampling frame for their comparative study of the US and India, as it includes both contributors and users of open source software.

Takhteyev and Hilts (2010) also operationalize a broadened definition of participation in their study of the geography of Github. Using Crowston & Howison’s (2005) framework of open source project involvement as a layered onion (core contributors at the center, bug reporters and fixers, and users and fans of the project in the periphery), they find that significantly more people from outside of Western Europe and North America may be users or followers of a project, but are less likely to be core contributors to them. Doing such cross-sectional analysis has the potential to highlight otherwise uncounted interest and participation in open source.

II. What motivates interest in open source software?

The characterization of FOSS community members as novice or potential code contributors is the framework most commonly utilized in the extant literature. Participants in FOSS projects begin as one-time code contributors, localizers, bug-seekers, or support providers; through appropriate mentorship and socialization, however, they may become central contributors. This framework then lends itself to research questions such as, “What barriers hinder contribution to OSS projects?” or “Why do contributions cease after an initial period of activity?” (Steinmacher et al 2015). While recognizing that individuals come to participate for a variety of reasons -- to scratch one’s own itch, to build reputation, to socialize -- the implicit assumption is that the governance structure of the project can be adapted to encourage fuller participation, with the end goal of performing more “central” activities such as code writing and maintenance. No experimental studies have been done to date, however, that offer guidance on how fuller participation may be achieved, and analyses of existing communities find inconsistent relationships between project characteristics and participation levels. These relationships also vary by locale.

Eric Raymond's *The Cathedral and the Bazaar* provides one of the first descriptions of the hacker/open source ideology. It is captured simply by, "Hackers solve problems and build things, and they believe in freedom and voluntary mutual help." They are motivated by idealism and reputation, and do not care for money.

Anthropologists Chris Kelty and Biella Coleman find similar intrinsic motivations driving contributions to open source software. Kelty (2008) emphasizes that the interactions and production of software by hackers is motivated by the desire to create an alternative scheme of power, free from existing authorities and forms of organization. He calls this a "recursive public" - vitally concerned with its own independent existence. Coleman (2012) highlights the remarkably cooperative channels through which hackerdom is lived - though individualistic, the culture is marked by humour, creativity, and generosity. Though not explicitly bounded, the field sites of these studies, however, predominantly feature Western hacker communities.

The few studies that do look outside of the West find an alternate set of motivations and ideologies surrounding open source. Subramanyam and Xia's (2008) comparative study of the US, India, and China finds that North American developers tend to exhibit stronger intrinsic motives, such as sharing and learning. This accords with the characterizations presented by Kelty and Coleman. In developing countries, the authors note an absence of "geek culture," in which the majority of developers grew up writing programs. In contrast, developers in the Global South tend to be drawn to the field for its high income potential and find the appeal of open source software in its accessibility in contrast to proprietary software. Open source is frequently recognized by developers and governments in these regions as being low cost, open, secure, and having limited switching costs.

This finding is echoed in Takhteyev's (2012) study of software culture in Rio de Janeiro, a metropolitan city that Takhteyev argues bridges the Global North and South. In Rio, some programmers use open source software because they subscribe to its vision, he writes. For others, it is simply an unremarkable element of today's software culture. Others use it because it works well and does not cost money.

Chan (2004) finds active tension between the free software philosophies espoused in the Global North and South. When free software activists in Peru begin lobbying their government to adopt the technology, as a means to improve the functioning of the state and its relation in global markets, their activism is condemned by North activists for overly politicizing the technology. Northern activists claimed that the advantages of free software should be self-evident and encourage its voluntary merit-based adoption, rather than by advocacy.

Finally, the appeal of open source software may vary across geography for practical reasons. Verma et al (2005) highlight the relative importance of language compatibility in India compared to the US, where a key advantage of open source software is its ability to be localized for non-English-speaking contexts.

Methods

Existing studies of participation in open source software projects rely mainly on survey or scan to measure contribution. While these approaches may achieve a wider sample, they are limited in the sense that they rely on singular metrics of contribution, measured, for example, through activity on a public code repository or by number of user support questions answered. Relatedly, they rely on a consolidated corpus, such as a mailing list or repository. Self-reported surveys may be biased or miss eliciting broader incentive structures or environmental conditions affecting participation because of their bounded scope. The bulk of existing studies also employ a narrow definition of open source contributor, focusing mainly on code committers.

I instead take an ethnographic approach to studying regional open source software communities that unifies multiple data sets: behavioural and informational interviews with participants; public chat logs from multiple social media channels; and field notes from attending virtual and in-person events. Rather than strictly bounding the scope of the study, I take Burrell's (2009) suggesting of defining my field site as a network, tracing out connections from initial entry points. In this case, I take the members of *Brave Bangladesh* as my entry point, and follow through to the *Mozilla Bangladesh* community, additional regional communities in India and South East Asia who interact with Bangladeshi communities, as well as other local organizations such as the Google Developers Group (GDG), Bangladesh Open Source Network (BdOSN), Bengali Linux user groups, and the Brave and Mozilla companies based in North America. The advantage of this strategy is that observations of the primary sample---computer science undergraduate students who constitute most of these communities---may be more aptly described in the context of their social world. This is particularly valuable for studying a phenomenon or group that is distant from the researcher or intended audience.

I initially intended to model the factors that motivate participation in open source through close study of two projects: the Brave browser and the Mozilla project. These projects differed in their governance and funding structures, maturity of the organization, and market penetration in Bangladesh,¹ but both were open source. My initial research involved interviews and observation of these communities, conducted virtually and physically during a two week visit to Dhaka in August 2019.

When my analysis began to suggest a broader phenomenon driving the formation of regional communities in the technology sector, I expanded my scope to include members of other organizations, including student clubs, professional organizations, and formerly-active technology user groups. I conducted additional interviews through August 2020 and include details from those to situate the activities of Brave and Mozilla regional community members. In total, I conducted 32 individual interviews and one focus group of ten individuals. Participants were questioned on how they participated in their technology group, why they got involved, what they understood as the group's mission, how they characterized other participants, and how they characterized the IT sector in Bangladesh, particularly with respect to opportunity for young people. I completed a two-week trip to Dhaka, Bangladesh in August 2019 to conduct the in-person focus group, attend meet-ups and trainings on university campuses, observe the Dhaka environment, and establish connections for further interviews. At the end, the majority of interviews were conducted remotely.

The analysis below includes a description of Dhaka, case studies of two open source software communities, and a discussion of the broader technology-community culture in the region. The discussion of these communities offers a glimpse into both the history and sociology of Bangladesh's technology ecosystem, with an eye towards open source software.

¹ The Firefox browser peaked at 50% of browser market share in Bangladesh in 2012, but dropped to less than 10% from 2016 onward. The Brave browser has <1% market share by public data, but this figure may be underreported due to difficulties identifying its fingerprint.

The Technology Scene in Dhaka, Bangladesh

I. Introduction

Bangladesh is the tenth-most dense country in the world, with a population of 166.3 million people, nearly 30% of whom are between 10–24 years old (UNFPA 2021). Bangladesh gained independence from Pakistan in 1971 and has since sought to establish a secular democracy. While most citizens' mother tongue remains Bangla, many students attend school that teach partially or primarily in English. It is also common to consume culture in a variety of languages, such as Urdu and Hindi, because content from neighbouring South Asian countries filters into Bangladeshi televisions.

Bangladesh's capital city, Dhaka, resembles major Asian cities along several demographic, infrastructural, and economic metrics, but it lags in terms of engagement with the global information economy. While its neighbor, India, has seen major growth in its IT sector since the economy opened in 1991, Bangladesh has been slower to follow. Despite government petitions to international technology companies to open offices in Dhaka, most elect to set up regional offices in India or Singapore. The technology sector in Bangladesh owes its growth instead to citizens creating start-ups to serve the domestic population and an increasing amount of freelance work serving a global clientele.

Technology access is not a major impediment for most of the middle-class population who feature in this study. Internet access has improved over the past ten years, such that 60% of the country is now connected via mobile or desktop (IWS 2021). Mobile phone ownership is high and data is cheap. Students I talked to reported that most of their classmates have laptops, or at least a PC in their home. The major universities in Dhaka also have computing facilities available to their students on campus.

This level of access is not true across the subcontinent, or even in Bangladesh outside of Dhaka. One recent graduate I interviewed, for example, attended engineering college in a smaller Indian city. The engineering syllabus had been established in the 1980s when the university opened, and was updated for the first time in 2013, the year Akhter² began school. The first year dorms did not have WiFi. Students only had their mobile data. They were always nervous their mobile money was going to run out. Akhter did not have a laptop for many years. He could not install software. There were few educational materials outside of Khan Academy to aid him in his studies. "It was rather tough then," he told me.

Most students live in multi-generational households and are expected to contribute to child and elder care, household chores, and family rituals. The larger apartment buildings in Dhaka have their own generator, but for many, the regular rolling outages can disrupt internet service and concentration. Co-working spaces and coffee shops have emerged in wealthier neighbourhoods over the last five years, and these provide some reprieve from the hectic nature of Dhaka for those that have access to them.

II. The Rise of Computer Science

University education is common for the rising middle class; students select from over twenty-five public and private universities, most of whom now offer a Computer Science and Engineering (CSE) degree. Interest in the computer science discipline has risen in the last five years in Bangladesh, a trend common across the world.

² Names have been changed unless referencing a public figure.

Popular discontent amongst the student population derives from the lack of updated curricula to prepare them for modern programming and the lack of lucrative jobs. Nasrin, an undergraduate student leader of women in computer science told me, “When I was thinking of my major, I thought of CSE. My first thought was that it has a good future. Tech is improving day by day. I won’t have to worry about my career, about my salary.” She found the initial coursework difficult and felt unsupported by faculty, but steadily improved. She realized that women, in particular, required additional encouragement and support to realize their abilities in the field. Nasrin created an organization that held workshops and career panels for her fellow female students. While she has learned a lot from these experiences and grown her interest in UX design, she plans to get an MBA after her undergraduate studies and switch fields. “I want to encourage [the other girls] in CSE, but where are the jobs for them? The market for it?” When asked what she thought of open source software, Nasrin replied that she had never heard of it.



Figure I. University of Asia Pacific computer lab, located in Dhaka, Bangladesh

Previous studies have questioned why the influx of students studying computer science has not led to an accompanying rise of interest in open source software. A 2018 study based in the United States found that students tended to know about and appreciate the philosophy and value of open source, but held misunderstandings about how they might participate. Students were unclear about licensing, felt imposter syndrome, were unsure of how to read a large codebase, and undervalued the act of writing bug reports. They were introduced to open source software, and its communities, typically through personal exploration or through student groups (Red Hat Community 2018).

Many of these challenges are echoed in Bangladeshi CS student communities. Those that are introduced to open source software learn of it through their peers. But a more foundational issue exists in lack of awareness about

open source at all. Students feel time-pressured to complete their coursework, lack collaborative spaces for coding, and have not generally been introduced to modern programming languages or projects. The possibility of a career working in open source software is not only distant, but inconceivable.

Amongst the recent graduates interviewed, many suggested that interest in computer science will wane in coming years as the realities of the job market filter down to incoming students. A common refrain was that, out of one hundred CSE students in a given year, only a handful of them would continue on to programming jobs. The remaining students would be split between applying to Masters and PhD programs abroad in computer science, or switching fields.

What set apart the students that won the coveted programming positions? They were typically star students in their university, and made efforts to self-teach modern programming languages. In Bangladesh, the major employers are mobile operators such as Robi or Grameen Phone, and a small cohort of upcoming startups such as Pathao, an Uber-inspired delivery and rideshare service. Other students would move to the UK, Canada, or East Asia for jobs or degrees.

III. Open Source Software Hubs

When one searches for “open source Bangladesh” the most prominent result is the Bangladesh Open Source Network (BdOSN). BdOSN was founded in the mid-2000s with the initial intention of advocating for Bangla-language computing—much of which was done using and localizing open source tools—in local government and industry. The organization has evolved over time. Today, its initiatives focus on improving programming skills across the university student population, with a focus on empowering women engineers. BdOSN does this through introductory workshops on programming, job hunting, and interviewing; by hosting hackathons and programming contests; and by maintaining a job search page on Facebook that connects start-ups with engineering talent.

What does this have to do with open source software? It might not seem like much, but one member of BdOSN leadership says this work is a necessary precondition. “How many people in the whole network [of 10,000] make open source contributions? Maybe twenty.” He sees this as a symptom of a stalled digital economy and inadequate school curricula. Another FOSS veteran who runs a digital camp on open source software reports that hundreds of students enroll every year, but genuine interest in open source has dropped precipitously over the past five years. Students are most interested in claiming a certificate and adding a line to their resume, he writes.

Why is there not more interest in contributing to open source, or even in learning to code? Aside from the lackluster job market, much of the training material is not accessible. One BdOSN organizer noted, “There’s no Django in Bangla, or full Python, or data science in Bangla. No free courses in Bangla. Bangla is easier for us but most material is in English—that’s the key factor.” While the eager and resourceful are able to find mentors to learn from or consume English-language material, more local-language content would be a rising tide for aspirational programmers across Bangladesh.

Some of these issues are comparable to those facing other developing countries in Asia. A FOSS conference leader in Vietnam shared how, in her country, people are interested in software, but are just not aware of open source. Though infrastructure is no longer a barrier—even the most remote parts of Vietnam have internet access, communicating in the English language remains a challenge. Her organization was aiming to build

interest in FOSS by working at the grade school level to incorporate FOSS into the ICT curriculum, from its philosophy to tools that can be used in the classroom.

One successful program in India and Bangladesh over the years has been Google Summer of Code (GSOC), to which college-age students can apply for summer internships in technology companies. Many of the participants in GSOC gain experience with open source software through their internship. Google provides the stipend and the host company provides the mentorship and a well-defined project. These opportunities are viewed as a chance to build one's career, learn how the inside of a company works, and see how professional code is structured. It is also a chance for cross cultural exchange. "This is when industry experts from the US and Europe are able to help students understand the code better," said a former mentor to the program.

IV. Communities

The notion of FOSS communities in South Asia today derived over time from the formation of early Linux User Groups (LUGs) in the late 1990s and early 2000s. LUGs formed in much the same way across the globe. News of the new open source operating system carried across media sites, such as Slashdot, and passed in stacks of disks to load onto a new machine. LUGs were gatherings of people trouble-shooting each others' errors and learning to operate this new system. Many were simultaneously educated in a novel set of principles of collaboration, open access, and free distribution—the early philosophy of free software.

In many cases, these groups became interested in localizing the operating system and accompanying packages in their native language. Such was the case with early open source interest groups on the Indian subcontinent. As these groups grew, they tended to spill over into emerging open source and open access projects, spanning from Mozilla to Wikipedia to Redhat. One long-term open source follower reflected how many people were involved in both Linux and Firefox development: "They kind of co-evolved culturally, especially in the early 2000s. A lot of the people invested in accessibility work came to Mozilla."

Ambassador programs, now common to technology companies such as Google, Facebook, and Twitter, are thought to have begun with open source software communities. "The first was Sun, then Mozilla," one FOSS veteran recalled, "In 2006, 7, Sun was flying their ambassadors to different hotels, giving goodies and money. Fedora had ambassadors too, people who were already talking about Fedora everywhere, but there was no money there."

Today, communities in Bangladesh are mostly structured around organizing events. Events most often consist of speaker panels and workshops, and bug-testing or localization sprints. The intention is to recruit new members into the clubs, while giving opportunities for seasoned members to hone their leadership skills and add experience to their resumes. Community leaders will typically interface with the company or central organization for their software project, be it Mozilla or Brave or Google, to determine the objective for each event and acquire a budget. Budgets for each project vary, but can include food, stickers, t-shirts, and other swag. The community leader then finds a venue and publicizes the event through physical posters on the university campus and online posts in relevant social media groups.

V. *Events*

A description of Dhaka is incomplete without an acknowledgement of the relentless stream of traffic that pervades everyday life. A journey of ten kilometres can take over an hour in typical weekday traffic. Roads are shared amongst buses, automobiles, scooters, motorcycles, pedestrians, and cattle with little differentiation between them. Traffic dictates the pattern of business and leisure. Students will stack classes on just a few days to minimize trips to university campuses; workers will rise early or stay late to avoid a rush hour that turns into many.

For hobbyist meet-ups, such as those formed around technology projects, this means that events are scheduled to occur in rotation across parts of the city. An organization will repeat the same event on each major university campus in Dhaka over the course of several weeks so that students do not have to make an additional trip outside of their campus. Major events, such as Google I/O, occur once per year and are held on weekends when there is less traffic so that people from across the country can make the journey. A similar dynamic is true for major Indian cities. One interviewee gave the example of the Python meet-up in Pune, India, that would change the venue every month from the East to West side of the city as people were unwilling to brave traffic and cross the city to attend.

Events occur in smaller cities and villages outside of Dhaka (population: 8.9 million) as well, from Chittagong (population: 2.6 million) and Rajshahi (population: 450,000), to Sylhet (population: 500,000). These events occur at the frequency of once per year, rather than one per week in Dhaka. Rashik, a frequent speaker from the Google Developer Group, says that events outside Dhaka typically have 25-50 people, but each person expresses greater enthusiasm and sustained interest; this contrasts with Dhaka events that range in number from 50-100 attendees, but from whom maybe only ten will go on to attend further events or contribute towards the project.

It remains to be seen how the move to virtual events during Covid-19 lockdown will impact participation in technology communities moving forward. Throughout 2020, virtual events have continued apace, with attendees frequently numbering in the hundreds for introductions to new programming techniques and tools.

Case Study: Mozilla Bangladesh, the ur-community

I. Introduction

The Mozilla project has had the largest and longest presence of any technology community in Bangladesh. The regional community was founded in 2007, growing from a handful of initial recruits to over ten thousand people claiming membership today. At its peak, hundreds of volunteers from Bangladesh were actively contributing to projects, making it one of the most prominent Mozilla communities in the world.

The project holds a critical place in the history of open source software. It had been founded when the Netscape Communicator, a proprietary browser at the time, released its source code to the public. The move was celebrated by the open source community—then primarily a niche community of Linux enthusiasts—as legitimizing the open source model across the software industry. A version of that browser was released in 2002 as Phoenix 0.1, which was further developed and released as Firefox 1.0 in 2004.

In the years since Mozilla's founding in 1998, the project has matured significantly. It is now a hybrid organization in which the majority share of the Mozilla Corporation is owned by the non-profit Mozilla Foundation. Mozilla is most known for its flagship product, the Firefox web browser, but the organization is host to many other projects, from the Rust programming language to the Thunderbird email client.

“Community” had been a central part of the browser's development in its early history. A long tail of volunteers not only submitted pull requests and built the software locally on their computer (more common features of open source participation today), but also joined regular calls to provide input on the browser's direction and the project's community values. A memorable milestone for many Mozillians' was the full-page spread for the Firefox browser that appeared in the New York Times in December 2004, paid for entirely by Mozilla supporters and featuring every one of their names.

Over time, the Mozilla Corporation and Foundation have established a greater separation of duties, in which the Corporation works full time on development of technology products, and the Foundation focuses on its mission of promoting an ‘Open Web.’ Community members sometimes fall between the two organizations - volunteer code contributors working in conjunction with paid engineers within the Corporation; volunteer regional community leaders coordinating social programs with paid staff in the Foundation.

In Bangladesh, Mozilla's shifts from being a decentralized network to a bureaucratic organization have both grown and fractured the local community. At present, the Mozilla Bangladesh community is split in two: there is the overarching Mozilla Bangladesh group, and a Mozilla Bangladesh QA (Quality Assurance) group.

The QA group focuses solely on bug-testing, the most technical activity its members could find for contributing to the Mozilla project. It also follows the current events-based model popular amongst technology communities in Bangladesh today, in which introductory trainings are held in rotation across Dhaka to recruit new members and evangelize the product. The overarching Mozilla Bangladesh group has become less active in recent years, though still meets occasionally for localization sprints and software launch parties.

In many ways, the QA community represents the new FOSS contributor from the Global South, who is excited by in-kind payments, seeks experience and credentials to add to his resume in a competitive job market, and sees the FOSS community as a bridge through which he might enter the world of global elites.

But this new FOSS contributor presents a stark contrast to the previous generation, who experienced greater personal autonomy and held different expectations of reward.

One veteran community member of the broader Mozilla Bangladesh community felt the current relationship between Mozilla and the QA team was exploitative. He explained, “[Mozilla] brags about [our numbers], but does not oversee it, does not train volunteers in anything beyond bug testing. We don’t need people to do QA in Bangladesh. They [Mozilla] have so much money. Let them employ us. I will not do it. I am not a free employee for you.”

The following sections trace the origins of this fissure within the Mozilla Bangladesh community. Though specific details speak to the experience of a single FOSS project in a single city, Dhaka’s experience with Mozilla highlights several broader tensions within a maturing, globalizing open source ecosystem. Today, uneven flows of money, disparate local ideologies, and changing leadership structures raise a set of new challenges for every open source project.



Figure 2. Screenshot of Mozilla Facebook Groups in August 2019

II. *Origins of Mozilla Bangladesh*

The original and over-arching Mozilla Bangladesh group was created in 2007 when a Mozilla executive recognized a hobbyist localizer by his username at a regional conference called FOSS.IN, held in Delhi, India that year. The group founder recalls her saying, “You do such excellent work! You should join our cause!” He was confused - he was already localizing the browser. But the executive had responded no, Mozilla was more than the browser - it was a “movement for a free and open web.”

He returned to Dhaka and formally began the Mozilla Bangladesh community. Initially the group was still focused on localizing Mozilla products. But they would also organize coffee chats for students where they would

talk about Mozilla’s mission and how the project differed from others on the Internet. These meetings would draw in a handful of attendees. Other regional communities were being established at this time around the world. In China and Japan, formal non-profits were established, which had much the same charge as Mozilla Bangladesh - to localize and evangelize Mozilla products. These activities bore similarity as well to Linux User Groups, of which several new Mozilla recruits had been members.



Mozilla Affiliate in Japan Kicks Off

August 18, 2004

Mozilla Japan to promote adoption of Mozilla products

August 18, 2004 (the Internet) – The Mozilla Foundation and Mozilla Japan today announced the launch of the Mozilla-Japan.org web site and the creation of Mozilla Japan, a non-profit organization that will promote, develop and help deploy Mozilla products in Japan.

Mozilla Japan will focus on a number of critical efforts:

- The organization will work on the internationalization and localization of Mozilla products and will be responsible for official Japanese localized versions of Mozilla Firefox, Mozilla Thunderbird and the Mozilla 1.7 Internet suite.
- Mozilla Japan will contribute to the development of Mozilla technologies.
- Local experts will assist in the deployment of Mozilla products and provide support to both end users and enterprises.
- Mozilla Japan will cultivate and assist Mozilla business partners and educate local users about Mozilla products.

Figure 3. Snippet of Mozilla Japan press release

Mozilla introduced several new programs in the 2010s as its popularity grew. The number of communities was growing worldwide; Mozilla had gained steady funding through a search engine partnership with Google, allowing it to hire full-time staff to work on engineering and marketing; and the Foundation was shifting its explicit focus to the “people-side of the Web.”

Three new initiatives made their way to Bangladesh: the Mozilla Reps program, which created formal roles for local community leaders to interface with paid Mozilla staff; the Webmaker initiative, an internet literacy tool for emerging markets; and Firefox OS, an open source mobile operating system also aimed at emerging markets.

The mid-2010s when these initiatives were active are remembered by most volunteers as the golden age of Mozilla Bangladesh. There was a flurry of volunteers joining the regional community, as well as a clear bounded projects for them to join from Mozilla. A former Mozilla Bangladesh leader reminisced about how they would chat together with other Mozillians on Internet Relay Chat. “Someone would say, ‘Let’s work on the Web of Things!’ I didn’t really understand but they’d say *cholo, cholo* (“come on, come on”), so I’d try it.” She did not contribute heavily to Mozilla’s Web-of-Things project, *Sensor Web*, but recalled that the experience had been enough to spike her interest in the topic. For her undergraduate thesis, she decided to work on Internet-of-Things (IoT) protocols, and later found employment as an IoT engineer.

Table 3. Timeline of Mozilla Milestones³

March 1998	Netscape Communicator source code released to public
November 2000	The first Netscape open source product is released: Netscape 6
September 2002	Phoenix 0.1 released
July 2003	Mozilla Foundation is created
November 2004	Firefox 1.0 released
December 2004	Community-sponsored full-page Firefox ad appears in New York Times
August 2005	Mozilla Corporation is created
2007	Mozilla Bangladesh community created
October 2009	First Mozilla Festival (“MozFest”)
February 2011	Mozilla Reps program announced
July 2011	Firefox OS project announced
May 2012	Mozilla Webmaker launched
July 2013	Firefox OS launches
September 2014	Firefox OS released in Bangladesh
October 2014	Webmaker visit to Bangladesh
March 2015	Mozilla QA Bangladesh community created
December 2015	Firefox OS development shut down

Another mentioned Bugzilla, Mozilla’s interface for tracking software bugs, which was an entry point for new community members. The engineering team would leave small bugs for beginners to find and begin learning from. Slowly, they would become more familiar with the codebase and grow more enthusiastic about open source practices. This was a common tactic in open source projects. The Mozilla Bangladesh team would check Bugzilla each night and work on solving bugs.

The Mozilla Bangladesh group had some women at this stage, but not nearly approaching equality in number to men. At one point, a WoMoz (Women in Mozilla) sub-community was created to encourage more women in tech to become active, but it was difficult for the student leaders to establish and sustain another community amidst other schoolwork. The community faded after a few years. A former WoMoz leader points to other women’s organizations that emerged contemporaneously and have managed to stay afloat. Women Techmakers in Google was an endowed organization, with community leaders who received funding from Google for their roles, and day-jobs running a start-up for which they sought skilled graduates. As an observer put it, “their [the leaders’] professional and voluntary goals were aligned.”

³ Expanded from <https://wiki.mozilla.org/Timeline>

III. Growing pains

But at the same time, stories of excess began to proliferate throughout the CSE student communities. The Reps program had started as a designated product evangelism role, but soon became the dominant mechanism through which swag and funding for events was disbursed from Mozilla to regional communities. The funding would sometimes be not enough (for example, to feed 100 attendees at an off-schedule community Iftar event), and at other times too much. It became known that Mozilla Reps received over \$500 American dollars (USD) for events, which amounted to about 40,000 Bangladeshi taka (TK). (For reference, a multi-course meal at a good restaurant might cost about 500 TK per person). But if they bought from food suppliers in bulk, or perhaps even cooked the meal oneself, the event organizer could pocket upwards of 10,000 TK. This skimming off the top, enabled by the Reps program, was thus seen by some as corrupting the community.

The Webmaker initiative, for which Bangladesh was one of four field sites chosen for ethnographic research, also represented the first time the Mozilla Bangladesh community saw Mozilla employees flying in and out of Bangladesh — people who they didn't recognize by username, staying conspicuously in top-of-line hotels, and then leaving.

Tension came to a head with the Firefox OS project. Firefox OS was an open source operating system for mobile phones that was to be sold on dedicated device, and loaded with native applications. From 2013 to 2015, Mozilla attempted to design an operating system from scratch to lower the costs of mobile phones for emerging markets, as the existing iOS and Android operating systems were too bulky and expensive to produce on low-cost devices. This lofty goal made Mozilla a subject of interest within open source and across the larger telecommunications industry.

The magnitude of this project required the involvement of engineers, marketers, and designers employed by the Mozilla Corporation and Foundation, but also the partnership of mobile operators. In Bangladesh, the team nominally consisted in equal parts of Grameen phone, the local internet service provider, the Mozilla Corporation and Foundation, and the community of Mozilla Bangladesh volunteers.

In practice, Firefox OS required the efforts of hundreds of Bangladeshi volunteers over several years of development. The Mozilla Bangladesh community was responsible for helping market the product nationally, managing relationships with government, telecommunications providers, and press. Volunteers helped build a Bangla-language keyboard for the device, without which it was believed the phone could not be launched successfully in Bangladesh. They also helped localize the interface, applications, and marketing materials to ensure it would be received warmly amongst a population most comfortable in their native language.

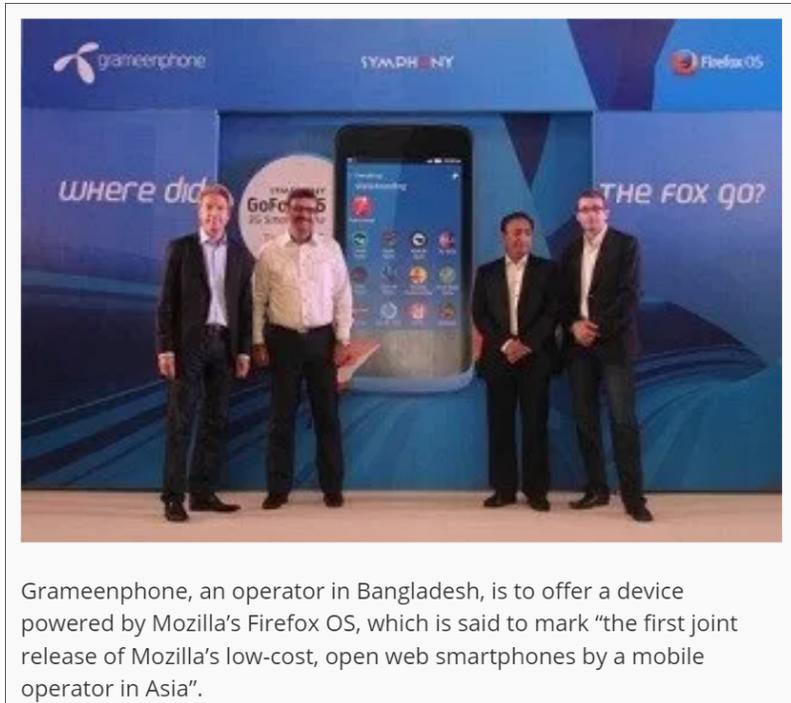


Figure 4. Screenshot from Mobile World Live news article on Firefox OS

But within a year of its release, Firefox OS was declared a failed project, as it had not gained substantial traction with user bases across the world. Reflections written by Mozilla employees have since identified various issues explaining its downfall: there was never a clear enough vision of the target market; there was a lack of enthusiasm from local partners; it was too ahead of its time; engineering and design teams were misaligned; the price was too high for the target audience.

When the decision was made to shut down Firefox OS from inside the Corporation, volunteer communities across the world felt distressed and betrayed. A former employee from inside the Foundation describes it as being the moment when the community first had to confront their downsized role: "They had been contributing to a project where they had no direct ability to shape it."

There was lasting impact to the Mozilla Bangladesh community. For them, Firefox OS represented the peak and crash of their volunteer work with Mozilla, and illuminated the extent to which the goals of Mozilla aligned with the realities of Bangladeshi users. "They threw a lot of money at India, Bangladesh. Flying people back and forth, putting them up in five-star hotels. Flying people who are not contributing. In India they painted a bus with Firefox designs for 20 or \$30,000 USD. They'd have 30,000 rupee breakfasts, drive around during their visits." recalled one volunteer from India. Another Bangladesh community member noted, "They stayed at the Radisson, the best hotel in Bangladesh. They come, have meetings, for nothing. First seven people come, and then another ten. The corporation works in a corporate manner."

One former volunteer spoke of the personal sacrifices he made for Mozilla over the course of that project. For one year ahead of the Firefox OS launch, he was the face of Mozilla to local authorities in Bangladesh. He would be called to attend meetings alongside the paid staff visiting from the U.S. and UK. "When the Firefox OS launch happened, and then failed, I lost my name in the ICT sector in Bangladesh. Everyone thought, oh, he's the

person who spearheaded the Firefox OS launch. What was I getting during all this? No allowance, no salary. Only the cost of travel and accommodation. I was a volunteer. If I didn't do it, someone else would do it."

IV. Splintering

In the aftermath of Firefox OS, the Mozilla Bangladesh community began to splinter. Some were disillusioned with project work. Interpersonal strife came to a head. The Mozilla Bangladesh community returned to doing mostly localization. And it was within this context, that the QA community emerged.

The QA group formed in 2015 by a relative newcomer to open source software and the Mozilla community. The founder had attended a handful of Mozilla events, organized primarily around localization, but he longed for more "technical" work. He found Quality Assurance was an activity promoted by Mozilla, but which had no presence in Bangladesh. He began promoting events around it and recruiting students directly into his group.

When we spoke, I was informed that the Mozilla QA community in Bangladesh is the largest QA community in the world. But the structure is rather unique. Most QA teams under the Mozilla project are not regionally bound, as in the Mozilla Bangladesh QA team—they are organized by product (e.g. Mobile, Web). Individual contributors interested in QA work generally link up to a geographically dispersed team.

In Bangladesh, however, only the group leader interfaces regularly with international colleagues; he plays the role of mediator, communicating the latest tasks and opportunities back to his local team. The team has around ten core leaders who run regular trainings at university venues across Dhaka, and sometimes beyond. It also has anywhere from 50 to 100 volunteers that it facilitates in doing bug testing of bi-weekly software releases.

A newcomer to a QA training can expect to learn how to use Mozilla's bug tracking platform, Bugzilla, set up a testing environment on their machine, and run through pre-set demarcated tasks. But before that, they will be presented with a one-hour introduction to the concept of the Open Web. What does it mean for information to be free? For source code to be open? For internet users to have rights? By the end of the training, attendees will boast a heightened web literacy, greater facility in using Mozilla infrastructure, and the understanding that the Mozilla project is their ally in keeping the web accessible.

Not all of the students who attend a workshop may continue to be deeply involved — a current leader estimates maybe a handful out of every hundred will stay in touch — but those that do are rewarded with travel perks, swag, and networking opportunities. A former Mozilla community member told me, "At least during my batch, my team members didn't have any expectation of getting a job from this role. But the networking was strong."

The QA community leaders are soft-spoken computer science students from several of the public universities in Dhaka. Most of them joined the QA community after offhandedly attending a welcome event at their university. Many of them wanted to add an extracurricular activity to their formal education. Some were looking to bolster their CVs. Others wanted to find a new social group. They grew in confidence from leading their own workshops in front of fifty other students there to learn about QA and the open Web. As one member put it, "The soft skills are important. You can't put it mathematically."

Each was surprised by how tightly-knit the community was. They found themselves staying up into the night on group video calls, checking hundreds of features before the next release of the Firefox browser the following day. Sometimes the releases would coincide with cultural or religious events, but the community found ways to accommodate their multiple allegiances. During Ramadan, they would gather over video chat, working late into the night, pausing for midnight prayers, then resuming until dawn prayers. Mozilla QA community members

notably called each other in the most familiar Bangla register, *tuy*, rather than the standard hierarchy of *apni* for elders and *tumi* for those younger.

The QA team was proud of glowing feedback they received from Mozilla employees, who in turn were surprised by the high activity coming from Bangladesh. They revelled at the fantastic locations they would get to visit in Bangladesh and beyond to attend Mozilla leadership trainings. For one team retreat, Mozilla QA Bangladesh booked rooms in the “most luxurious hotel” in Cox’s Bazaar, a beachside city in Bangladesh. Twenty-four of the core QA team were invited. They rented a limousine to and from the hotel, maxing out the event budget of reportedly \$13,000 USD. One attendee reminisces, “It was the best event, that I’ll never [sic] find in my life.”

Another team member noted the opportunity to travel for conferences and trainings presented a mark of status: “In my family, I’m the only person who has gone to the US and UK. I’m excited a bit by the travel. It’s prestigious for parents. Even for me, with a Bangladeshi passport, when I go into some countries, I talk to people, and say, ‘Hey, I’m doing things with Mozilla’. And they say, ‘Oh you are with Mozilla!’”

Other perks of QA work included swag, a highly coveted currency. Community members could readily price the cost of shipping a branded tote bag to Bangladesh, and each had strong aspirations of owning one. Smaller trinkets include stickers, badges, and t-shirts.

Most of the QA team has entered into a relationship with Mozilla that has been strictly demarcated from the start. They know of Mozilla as a large, complex organization, from whom there are known tasks and rewards. The social rewards — relationship building, reputation — occur in part across the broader Mozilla network, but more noticeably between members within the community based in Dhaka. And while a new generation slowly becomes versed in open source philosophies, how and whether the messaging translates to tinkering remains to be seen.

V. *Mozilla Communities Outside Bangladesh*

The experiences of Mozilla Bangladesh echo those of India, Indonesia, Brazil, and other outposts that grew tremendously in the early 2010s before beginning to splinter and slow. In Bangladesh and India, the Mozilla regional communities have become just one possible extra-curricular option for students, among many seeking brand ambassadors and localizers. The technology ecosystems in the Global South are changing, with many new international and homegrown players beginning to have a presence. Where former Mozilla community members in Bangladesh had only one active community to join, now there are hundreds to which they can migrate.

But there are changes in Mozilla’s governance as well that contribute to decline of “community.” The Reps program still exists, but is shifting in design to become a leadership training program. Others point towards the Rust programming language community, which continues to follow an open governance model. But a former paid community manager notes that open source governance has become more a feature of history rather than current practice. “Obviously the code is open source. But participating is much more like volunteering for Habitat for Humanity. You can show up, become a foreman, gain skills. But there’s no open governance structure connected to the broader Mozilla product.”

It has also become “hella hard” to contribute code to Mozilla, an employee admits. In their data, they do see some of those volunteer contributions coming in from North America, Russia, and parts of Europe. In Asia and North Africa, what they tend to see is rather “mission-driven Mozillians,” those who feel an affinity for the project and contribute through evangelism.

Another points to the decline of IRC as a contributing cause for today's splintering. "There's no 'blessed' platform, so it's hard to know where to go." Some volunteers used Telegram, which also worked on the Firefox OS phones some of them used (acquired during the initial marketing push that targeted volunteers). Others today use Whatsapp, or in the case of Bangladesh's communities, Facebook.

Some staffers I interviewed expressed discomfort with disparate levels of pay received and effort expended across the project's staff and volunteer community, many of them suggesting alternate reward schemes or hierarchies for future projects of this scale and complexity. But it is difficult to discuss issues of compensation around what is explicitly a volunteer, hobbyist organization.

As one former staffer noted, "What makes anyone volunteer for anything? People want to be part of a group, they want to learn stuff, they want to give back to a community, they want to help moms with phones. If it involves something they love, there are a lot of enriching aspects to that." Recalling the experiences with Firefox OS, however, he added, "But it's a little weird that a big tech organization can use that for product development."

Mozilla is indeed a large tech organization, and its involvement in South Asia has room to evolve. In the past, Mozilla's grant program MOSS had struggled to find open source projects to support in the region; such programs present one opportunity for renewed engagement as Asian cities continue to grow.

In many ways, Mozilla is not a standard open source projects, and these findings do not directly generalize to others -- it is known to be one of the largest, multifaceted organizations in the broader ecosystem. Close study of it reveals that specific policy decisions and individuals have shaped the relationship between the project core and the volunteer periphery in contingent ways, worthy of deeper dedicated investigation.

But at the same time, there are aspects of this story that do reflect the broader open source ecosystem. We witness the highs of "community" and the promise of open source for those looking to transcend local technological and social constraints. We also see the level of negotiation that must occur between paid and volunteer, Global North and South, in navigating issues of compensation, dignity, and autonomy.

Case Study: Brave Bangladesh, a community getting its footing

I. Introduction

The Brave browser project was announced in mid-2015 by Brendan Eich, former CEO of Mozilla and creator of the Javascript programming language, and Brian Bondy, a former colleague of Eich's at Mozilla. The Brave browser was envisioned as a privacy-oriented browser in response to the heavy tracking and advertisements present by default on many modern browsers. In contrast, the Brave browser was designed to have user-oriented privacy features set by default, including ad-blocking, tracker-blocking, default HTTPS, and other features. One of its key innovations was a pay-to-use model in which users pay content creators with built-in cryptocurrency payments (the Basic Attention Token, or "BAT") as an alternative to existing advertisement-generated revenue. The browser itself was free to use and open source, built atop the Chromium engine, and hosted on Github. The project constitutes part of the emerging, decentralized Web 3.0.

How do new projects catch on, build global communities? News of the Brave browser spread through online channels such as Twitter and HackerNews in early 2016. Early marketing frequently highlighted Brave employees prominent in open source, privacy, and broader internet communities. These figures were often cited as the motivating forces behind the formation of regional communities in Jakarta, Indonesia, Dhaka, Bangladesh, and major cities in India.

Brave's community outreach strategy developed in several stages. The initial thrust came from then-Head of Product, who reached out to Mozilla India's community leader (a volunteer). The two worked together to craft a community development strategy that would be appropriate to the Indian subcontinent. When asked what features make the region distinctive, the Mozilla India leader pointed to the high level of involvement from students, the cultural expectation for in-person events, and a desire for visible accolades and titles to reward participation. The plan was to establish a "Brave ambassadors" program to serve as a formal community development program, but resource constraints early in the Brave project's development tabled the plan until later on.

In the absence of a formal program, regional groups began to form ad hoc. Such groups were partially spurred by the organic interest the project was receiving from volunteers around the world. Some of these individuals were formerly trained in forming regional communities, through projects like Mozilla or Fedora, and began approaching Brave asking how they could support their regional community. The story of Brave highlights the relevance of existing networks for growing a new community, and how expertise passes from one to the next.

II. The spread of regional communities: from Mozilla to Brave

The first of these groups was what became the **Brave Indonesia** community. In the words of a Brave company employee, it "seemed like random luck." In the early days of the project, Brave team members had had their heads down working on building the browser and had not yet had time to organize meet-ups in San Francisco, where some of the company and a concentration of American technologists were based, or cultivate them elsewhere in the world.

But the Brave Indonesia group was slightly more than random luck. It was created by Viking Karwur, a web developer who led the Mozilla Indonesia community between 2004 and 2014. During this time, Mozilla Firefox was the number one browser by downloads in Indonesia, Viking recalled with pride during our interview. He

had also cultivated a relationship with Brendan Eich during this time, after meeting him at Viking's first trip abroad for a Mozilla workshop in Whistler, Canada in 2010. Viking eventually stepped down from his role as Mozilla community lead in 2014 to turn towards other responsibilities—a shift that coincided with Eich stepping away from Mozilla due to public outcry around his political donations.

But Viking kept up with technology news and stepped back into his familiar community-building role when he heard of Eich's new project in 2016. His Brave Indonesia community works to evangelize the browser, appealing to Indonesian audiences' sense of fairness and privacy with respect to technology, and redoing marketing materials with Batik prints to localize the product. They also work on translation and support, answering questions about the Brave product for newcomers on community pages.

Several of these Brave Indonesia community members overlap with the *Mozilla* Indonesia community. Many of them have degrees in computer science and an interest in technology or design, but may not have found employment in those fields. The community also has more early and mid-career volunteers, not primarily students as is the case in Bangladesh.

In India, a Mozilla volunteer was attending the annual meet-up of Mozilla volunteers from across India. At these gatherings volunteers would discuss their achievements of the past year, plan for the coming year, and discuss milestones and tactics. It was in this setting that a volunteer noticed that another was using the Brave browser. He asked what it was—at the time, everyone was using Firefox—and from this initial encounter the Mozilla volunteer went on to found the **Brave India** chapter. One of their current volunteers told me, “the basic integral fact to know about Brave in India is its association with Mozilla. Most of the Brave volunteers are also Mozilla volunteers.”

In **Bangladesh**, the regional community was similarly founded by a former Mozilla volunteer. Moh had been involved in Mozilla for two years, contributing heavily to projects such as Firefox OS. The Mozilla Bangladesh community was in its “golden age” at the time. Everyone was making substantive contributions to projects; there were over ten events per month and regular working sessions after classes. Moh was teaching workshops all over the country and managing 30 other students as a Firefox Ambassador at the time. But slowly interpersonal conflict arose within the Mozilla Bangladesh community. The Firefox Ambassador program ended.

Around this time, Moh learned that Brendan Eich, known to him from Mozilla, had begun a new browser project. He downloaded the newly launched Brave browser in early 2016 and noted its speed improvements over the Firefox browser. Given the growing conflict and lack of opportunity within the Mozilla Bangladesh community, he and several others decided to switch over to a new community supporting the Brave browser.

Other emerging Brave communities around the world had been drawn in for a variety of factors. Some were interested in cryptocurrency, in blockchains; others were following browsers; still others were privacy-focused. Regardless, the pull was often the mission, and as such, followers were often keen to evangelize the product in their region.

Brave company employees, from their vantage point, were surprised by the early support they received from followers of their team and product from around the world. They pointed not only to quick formations of communities in India, Bangladesh, and Indonesia, but also activity from individual fans and code contributors from Europe. The small team sought to engage with excited community members over Reddit, Slack, Rocketchat, Telegram, Zen Desk, and Telegram, pruning and nurturing these virtual forums in turn according to level of activity, toxicity, and moderation features on each.

Brave India and Indonesia were already active due to experienced community managers who had existing closer ties to Brave employees. The most obvious way to begin contributing for Brave Bangladesh was to localize. This could be done without explicit communication with the Brave team, as they were making use of the localization platform Transifex that tracked translations for distributed teams, free to use for open source projects.

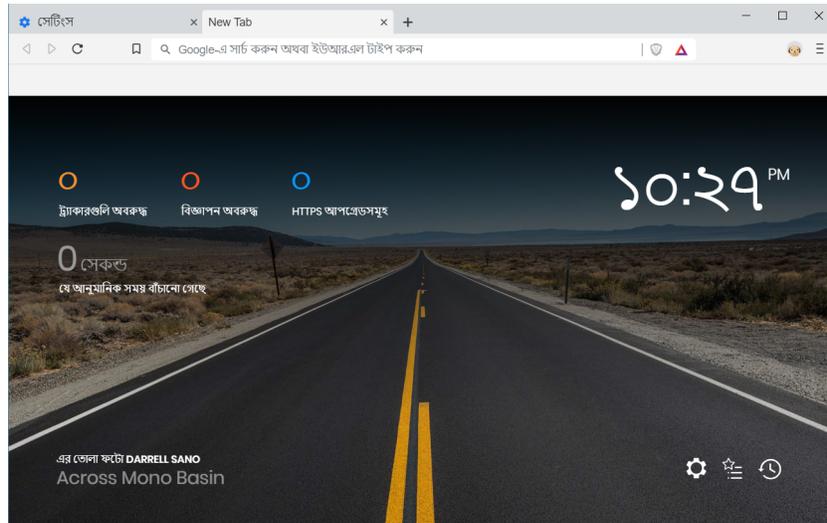


Figure 5. Brave browser localized into Bangla

They localized the browser quickly, organizing in-person meetups at the local KFC or Pizza Hut. These venues are accessible to the middle class, and an emblem of economic globalization, but not entirely everyday, marking the meet-ups as somewhat special affairs. The community would coordinate together on their internal Facebook page, which Moh managed in addition to the external Facebook page Brave Bangladesh, which supporters could “like.” He also managed a public Twitter account for Brave Bangladesh, which frequently retweeted posts by the Brave company account—proper. The Brave Bangladesh group peaked at around 200 online members, of which ten or so showed up to in-person localization events. Most of these members were students—friends of the Brave Bangladesh leadership team or those already involved in other student organizations such as Computer Club or the Mozilla community. There were expectations for two-hour events like the distribution of swag, t-shirts, and food. “Food is too much to expect from companies these days,” said Moh. “It’s great but we don’t expect it. But the swag, they need to provide that. If they don’t do that, we can’t do it with our own money.”



Figure 6. Group photo from browser localization meet-up

The expectations and practices for a regional community were by this point routine – every offshoot of the Computer Club or Mozilla Bangladesh community was doing similar things. Notably, localization was an activity that was required and available not only to open source projects, but also proprietary ones.

III. Sustaining interest

After two browser localization sessions, however, Brave Bangladesh activity dropped off, as did Brave India's. Why? "There was nothing to do," explained Moh. "Not everyone likes localization. And even there, we need to be communicated some expectations or recognition. So we lost interest." We spoke a year after the Brave Bangladesh community had disbanded; by this time, Moh admits, the Brave company had begun to better coordinate its volunteers. But, the majority of activity seemed to revolve around the BAT cryptocurrency, which he was hesitant to promote due to cryptocurrency's outlawed status in Bangladesh. (This was the only evidence I found of Bangladesh's national politics with respect to internet censorship intersecting with the project's popularity.)

A leader from Brave India characterized their relationship with the center this way: "The initial relationship with the Brave team was good, because they were looking towards building the community. Now they are mostly looking at the ground level, now focusing towards code, and only looking to the technical people. They are only limited to Github communities, only code labour, not towards promoting the Brave browser."

These responses suggest that the role of volunteers has categorically become one of evangelism and localization, and requires high-touch coordination from staff to achieve sustained participation. Recognizing this, Brave's roadmap moving forward as of mid-2019 had been to move towards greater structure by providing tangible personal and professional incentives to encourage participation. For instance, gamifying contributions with badges and flairs. Another goal is to establish formal programs that volunteers can add to their resumes and for

which they could attain letters of reference from the company. Volunteers will occasionally ask for payment in BAT. The company does not do that, but they do try to send as much merchandise, or “swag,” as possible. Another form of both compensation and engagement is to fly keen volunteers out to conferences as ambassadors for the project. Several loyal volunteer leaders from Spain were invited to be on the floor at the 2018 World Mobile Congress alongside company staff as a way to recognize and reward their efforts. These practices bear similarity to the forms of recognition and compensation offered by Mozilla in the more recent years of its involvement in Bangladesh.

A common challenge that the community managers faced, true for technology projects beyond Brave, was gauging how much they could rely on unpaid volunteers. People would hear about the project, reach out, and commit to hosting meet-ups. But life would often get in the way—school work, families, jobs— and they would disappear. Over time, with more dedicated staff, time, and financial resources, the company began to improve their workflow. Their goal was to make volunteer leaders feel continuously engaged and supported. They moved from pinging people on Rocketchat, the project’s preferred forum at the time, to group emails, then eventually to monthly Zoom calls. The last strategy appeared to have broken through. Dedicated forum threads were also made for regional leaders to stay in touch at all times. Welcome materials such as a syllabus, instructional videos on the regional leadership role, and quizzes were designed to better prepare regional leaders and also appropriately elevate the seriousness of the position.

IV. Code labour

Does this mean that volunteer code contribution is non-existent or participation is curbed off and directed towards evangelism or localization? Not quite. The Brave team makes an effort to engage—and employ—star contributors as soon as resources allow. But these contributors have not yet come from Bangladesh. In one case, staff would see a username pop up again and again on community pages, diligently answering questions. They reached out to the user only to discover that the account belonged to a sixteen year old based out of Sweden. His interest and ability led to his promotion into a moderator role, entry into a planning and organizing chatroom, and greater mentorship from project staff. Other times, contributions have led to hires. I was told of one of the first hires, from Slovenia, who had been consistently submitting pull requests— “not fiddly typos,” but “big stuff.” Because he had a passion for the project and the necessary skill set, he was hired as soon as Brave had the money.

On the company side, resources are understandably the chief constraint in terms of product development, community management, and hiring. One employee explained, “the sticking point is just hours in the day. We’re trying desperately hard to run a three-way race: keeping up with Chromium and staying secure; developing core features; putting out fires.” Addressing a common concern within start-ups and open source projects in particular, he noted that many of the employees had families—they are trying to be hyper-aware of burnout culture. “A lot of us have come from companies that don’t respect that.”

These are important conversations, but don’t have much purchase in Bangladesh. The possibility of code contribution to the Brave project did not seem top of mind for volunteers, despite the fact that a few of them were writing their own open source packages in their spare time. The reason for the apparent lack of code contribution to Brave seems to lie somewhere between volunteers needing greater encouragement and direction -- something that made a difference for Mozilla in its heyday, and a factor that has been identified in the extant literature -- and simply having different expectations for what regional community members do -- “promoting the browser”.

Discussion

Dhaka, Bangladesh is like many growing cities in the Global South: a sizeable tech-savvy population representing a potentially large market, lacking localized content, and still establishing connections to global information markets.

The technology scene is marked most by these distinguishing features:

- 1) While open source projects have traditionally been viewed as virtual communities, the communities in Dhaka, and South Asia more broadly, have **important physical components**. Physical meet-ups are the sites of trainings, recruitment, and coding sprints.
- 2) The primary activities of regional communities at present are **localization, bug-testing, and evangelism**. These tend to be modular tasks offered to regional communities as ways to participate in software projects.
- 3) **Regional communities** are primarily made up of university students, who respond to the desire to socialize, become a leader, and build professional networks.
- 4) The **homegrown software industry is nascent**, with little explicit discussion of open source software therein.
- 5) **Computer science education is growing** in popularity, but requires updating to modern tools.

For interveners -- policy makers, community managers, funders -- there are several opportunities to support and engage with these communities, including bolstering human capital by offering educational materials, mentorship, and training/employment opportunities and localizing and translating software and documentation into Bangla for ease of use.

The findings of this study suggest that the path for honing a new generation of open source code contributors is uncertain, both because of specific historical experiences working on open source projects, as well as structural shifts in the local economy and global tech sector.

The findings also suggest that contributions towards open source projects do occur in Dhaka, Bangladesh, but under a broader definition of "contribution" that includes marketing, education, and translation. As these activities become more commonplace and better recognized, interveners may consider taking steps such as offering formal rewards or titles, or even financial compensation for skilled work.

This is a descriptive, exploratory study focused on two open source projects in one city, and so cannot speak definitively to broader global trends in the open source ecosystem. But the findings do suggest that researchers studying open source should be mindful of geographic variation in what motivates participation, and what forms participation may take, particularly outside of the code repository. The findings here also encourage more study of the latest generation of open source projects, in which the leadership structures and philosophies depart from earlier generations captured in the extant literature. Future work might explore an evolving consciousness around gigwork/crowdwork -- where is the line separating fulfilling hobby-work from exploitation of labour, for example? How can the interests of volunteers and paid staff be better aligned? And what alternate configurations of work might give more dignity and opportunity to the Global South?

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Opening photo courtesy of [Bryon Lippincott](#)
Figure 1 courtesy of [Tony Cassidy](#)

About the Author

Anushah Hossain is a PhD candidate at the University of California, Berkeley. She studies the intersection of language, computing, and identity, with a focus on South Asia. She has previously worked as a mixed methods researcher on projects evaluating the social impacts of information technologies for clients such as the Gates Foundation, the Hewlett Foundation, and USAID and alongside scientists at the International Computer Science Institute. She has BAs in History and Economics and an MA in Energy and Resources from the same institution.

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