

# **Ethical Considerations of Free and Open-Source Software**

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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## **Introduction to FOSS**

In the rapidly evolving digital landscape, Free and Open-Source Software (FOSS) stands as a pivotal force behind technological innovation and community collaboration. FOSS encompasses software that is freely licensed for anyone to use, modify, distribute, and study. This model transcends mere cost savings and customization, embodying principles of transparency, collaboration, and freedom. It advocates for software to be treated as a public good, fostering a culture of collective improvement and knowledge sharing.

FOSS has become a critical underpinning of the global tech infrastructure, powering everything from operating systems like Linux to web servers like Apache. Its influence spans across various sectors, highlighting the model's versatility and its significance beyond software development. However, the adoption of FOSS by large technology companies introduces complex ethical considerations that warrant thorough exploration. These entities derive substantial benefits from FOSS—its flexibility, robustness, and cost-effectiveness—raising questions about their contributions to the FOSS community and the sustainability of FOSS projects.

This paper delves into the ethical dynamics of FOSS, particularly focusing on the responsibilities of major tech companies in using and supporting FOSS. We will explore ethical issues such as the sustainability of FOSS projects, equitable compensation for contributors, and the broader impact of corporate practices on the FOSS ecosystem. Through a detailed examination of these topics, alongside case studies like Indeed's FOSS Contributor Fund, this study aims to shed light on the ethical obligations of tech behemoths within the FOSS environment and propose pathways towards a sustainable and equitable technological future.

## **History of FOSS**

The history of Free and Open-Source Software is a compelling narrative of collaboration, innovation, and the quest for digital autonomy. It began in the early days of computing, a time when software was often shared among academics and researchers to advance knowledge and innovation. This ethos of sharing and collaboration laid the groundwork for the FOSS movement, which formally took shape in the 1980s (Fitzgerald, 2006).

A pivotal moment in the FOSS history was the launch of the GNU Project by Richard Stallman in 1983, aimed at creating a completely free Unix-like operating system. This initiative underscored the importance of software freedom—the freedom to use, study, modify, and redistribute software. Stallman's efforts led to the establishment of the Free Software Foundation (FSF) in 1985, which played a crucial role in advocating for software freedom and developing the GNU General Public License (GPL), a key legal framework that ensures software remains free and open (Stallman, 2007).

The 1990s saw the rapid expansion of the FOSS movement, marked by the emergence of Linux, created by Linus Torvalds. Linux, combined with the GNU system, provided a fully operational free software operating system that significantly propelled the FOSS movement forward. This period also witnessed the rise of the Internet, which became a fundamental platform for FOSS collaboration, distribution, and growth (Lakhani & Wolf, 2005).

The term "open source" was introduced in 1998 as a strategy to make the FOSS concept more accessible and appealing to the business world (Nduta, 2023). This marked a shift in perception, highlighting the practical benefits and commercial potential of FOSS, without sidelining its ethical and philosophical underpinnings. The term "Free and Open-Source Software" was coined to encompass both the Free Software (as advocated by the FSF) and Open

Source initiatives, bridging a gap between two movements that, while closely aligned in practice, often differed in philosophy. Free Software emphasizes the ethical and freedom aspects of using software, while Open Source focuses on the practical benefits of a development model that promotes collaborative software development.

Today, FOSS is an integral part of the global tech ecosystem, underpinning much of the Internet, mobile devices, and enterprise software. Its history reflects a powerful movement towards a more open, collaborative, and equitable technological future.

### **Technical Dependencies on FOSS**

The dependence on Free and Open-Source Software within the modern technological ecosystem is profound and pervasive. From startups to tech giants, companies across the spectrum rely on FOSS for critical aspects of their operations, development, and innovation strategies. This reliance is not merely a matter of preference but a fundamental necessity that underpins the infrastructure, tools, and services driving the digital age.

FOSS forms the backbone of the internet and many of the technologies we use daily. Operating systems like Linux power the majority of the world's servers, including those running major search engines, social media platforms, and cloud services. Web servers such as Apache and Nginx host a significant portion of the internet's websites, facilitating global access to information and services (Hernandez, 2019). Moreover, programming languages like Python, PHP, and JavaScript, all of which are open source, are crucial for developing the vast array of applications and services that define our online experiences.

Beyond the infrastructure, FOSS is integral to the development tools and environments used by software engineers around the world. Tools like Git for version control, the Visual

Studio Code editor, and the Docker containerization platform are all open source, showcasing how FOSS not only supports but accelerates technological development and collaboration (Microsoft, 2021).

The importance of FOSS extends into the realm of innovation, where its principles of openness and accessibility stimulate technological advancement. By allowing developers to study, modify, and improve upon existing code, FOSS fosters an environment of continuous innovation. This open model has led to the rapid evolution of technologies, from artificial intelligence and machine learning libraries like TensorFlow and PyTorch, to blockchain platforms such as Ethereum. Each of these technologies, built on or facilitated by FOSS, exemplifies how open-source software drives forward-thinking and cutting-edge developments.

The reliance on FOSS also reflects a strategic advantage for companies. It enables organizations to reduce development costs, increase security through transparent code review processes, and accelerate time to market by building on existing solutions rather than starting from scratch (Congdon, 2015). Furthermore, participation in the FOSS community can enhance a company's technological capabilities and reputation, attracting top talent who value openness and collaboration.

In summary, the technical dependencies on FOSS within today's tech ecosystem are extensive and multifaceted. From powering the servers that run the internet to enabling the latest innovations in technology, FOSS is indispensable. Its role in supporting and driving technological development underscores the significance of the open-source model in shaping the future of the digital world.

## **Impact on Software Engineers**

The Free and Open-Source Software (FOSS) movement has significantly shaped the software engineering profession, offering a unique blend of challenges and opportunities.

Software engineers often find themselves in a dual role within this ecosystem: as users who leverage FOSS for creating innovative products and as contributors who enhance and share their improvements with the community. This dual role enriches their technical skills, fosters a sense of community, and occasionally blurs the line between professional work and personal passion for coding.

Software engineers as users of FOSS benefit from access to a vast repository of software solutions that can be customized to meet specific project requirements. This accessibility accelerates development cycles, reduces costs, and allows engineers to stand on the shoulders of giants—building upon the collective intelligence of the global developer community. As contributors, engineers engage with this community, submitting patches, suggesting features, and in some cases, leading project directions. This engagement not only hones their technical skills but also enhances their reputation within the community, often leading to professional growth opportunities.

In addition to the tangible benefits of cost efficiency and innovation, working with FOSS offers engineers invaluable opportunities for skill development and community engagement. The open-source world is vast and varied, exposing engineers to a broad spectrum of technologies and coding practices. This exposure is crucial in an industry characterized by rapid change and evolution, where keeping abreast of the latest technologies and methodologies is key to career advancement. Moreover, contributing to FOSS projects opens doors to a global community of

developers. This community is a rich resource for mentorship, collaboration, and networking, connecting engineers with peers and industry veterans from around the world.

However, integrating FOSS into a company's technology stack is not without its challenges. Engineers frequently encounter integration and compatibility issues when attempting to meld FOSS with existing proprietary or legacy systems. The diverse range of software versions and configurations inherent in the open-source world can complicate these efforts, requiring engineers to invest time and effort in finding solutions that ensure seamless integration.

Another challenge lies in the realm of support. Unlike proprietary software, which typically comes with a dedicated support team ready to assist with any issues, FOSS relies on community-based support. While the FOSS community is often incredibly knowledgeable and willing to help, the level of responsiveness and expertise can vary. Engineers might find themselves navigating forums, mailing lists, or extensive documentation to troubleshoot issues.

Balancing contributions to FOSS projects with work responsibilities is a significant challenge for engineers who are passionate about giving back to the community. Many engineers have a strong desire to contribute to the projects from which they benefit, yet finding the time to do so amidst professional obligations can be difficult. Companies that recognize the value of FOSS to their operations and to the broader tech ecosystem often explore ways to support such initiatives. Allowing engineers dedicated time to contribute to FOSS projects is one approach that some organizations consider. This can support employees in pursuing their passions and indirectly contribute to the health and vitality of the open-source community.

Many engineers view their contributions to FOSS as a fulfilling aspect of their professional lives, allowing them to work on projects that align with their interests and values. These contributions are often driven by a passion for technology and a desire to give back to the

community that has provided them with valuable tools and knowledge. Moreover, contributing to FOSS projects can serve as a portfolio, showcasing an engineer's skills and dedication to potential employers.

In conclusion, the impact of FOSS on software engineers is multifaceted, offering a mix of benefits and challenges that influence their professional development and contributions to the tech industry. Companies that effectively leverage FOSS and support their engineers in contributing back to the community can drive innovation, reduce costs, and foster a culture of continuous learning and collaboration.

### **Ethical Considerations in the Corporate Use of FOSS**

The widespread adoption of Free and Open-Source Software by large tech companies has ignited an ethical debate focusing on the balance between leveraging FOSS for commercial gain and contributing back to its community. This debate is centered around several key issues: sustainability, compensation, and the overall health of the FOSS ecosystem. As corporations increasingly depend on FOSS to drive innovation and reduce costs, the ethical implications of their engagement with the FOSS community come under scrutiny.

The sustainability of FOSS projects is a pressing concern. Many of these projects are the backbone of the digital infrastructure upon which global corporations rely, yet they often lack the financial and human resources necessary for their maintenance and development. The “tragedy of the commons” scenario looms, where widespread reliance on FOSS could lead to its degradation if not adequately supported by those who benefit most from it. Ethically, companies that derive significant value from FOSS are challenged to contribute to its sustainability,



ensuring that these essential resources remain robust and secure for all users, not just for their commercial interests (Forbes, 2022).

Compensation for FOSS contributors is another ethical consideration. While the ethos of the FOSS movement embraces volunteerism and community collaboration, the substantial commercial benefits reaped by large corporations from FOSS projects raise questions about fair compensation. The disparity between the value created by FOSS contributors and the benefits accrued by companies highlights a potential ethical imbalance. As highlighted in an insightful commentary, "This all boils down to a situation where you have many profit-generating companies using software that some programmer volunteered to write. That software contributes to that company making even more money. But the developer sees none of it because they are just an author on some git commits, and aren't on the company's payroll. This is Volunteering as a Service (VaaS). It is quite literally a free lunch at the expense of hard-working individuals" (Stringer, 2024). This scenario emphasizes the need for companies to contemplate how to equitably share the economic gains derived from FOSS, whether through direct financial support, donations to project maintainers, or investments in FOSS development.

The health of the FOSS community is intrinsically linked to the continuous innovation and development of open-source software. Large tech companies play a significant role in this ecosystem, with the potential to influence project directions, priorities, and governance. Ethically, there is a tension between the commercial interests of companies and the values of the FOSS community, which prioritizes openness, collaboration, and accessibility. Ensuring the health of the FOSS community involves respecting these values, fostering an inclusive environment, and supporting the growth and diversity of contributors. It also means avoiding

practices that might co-opt FOSS projects for proprietary ends or that undermine the community's ethos.

The crux of the ethical debate lies in finding a balance between commercial gain and contributing back to the FOSS community. This balance is not merely a matter of corporate goodwill but a strategic imperative for the sustainability of the FOSS ecosystem and, by extension, the tech industry at large. Companies that actively contribute to FOSS not only help sustain the projects they depend on but also contribute to a vibrant, innovative, and resilient software landscape.

In the context of balancing commercial interests with community contribution, it's crucial to consider that "many developers are writing and providing libraries in their free time. Contributing is, sadly, mostly done during personal time or seen as a hobby, and it's rarely part of a company's policies to have employees contribute to open source during work hours" (Norblin, 2023). This quote underscores the need for corporations to reassess their policies toward FOSS engagement. By institutionalizing support for FOSS contributions during regular work hours, companies can directly support the sustainability of these projects, thereby fostering a more ethical approach to leveraging open-source software. This alignment not only bolsters the FOSS community but also enhances the company's own innovation capabilities by maintaining a vibrant and diverse software ecosystem.

The ethical considerations surrounding the corporate use of FOSS highlight the complex interplay between commercial interests and the values of the FOSS community. As the tech industry continues to evolve, fostering ethical practices in the use and support of FOSS will be crucial for ensuring the sustainability, fairness, and health of this invaluable resource. Companies have a pivotal role to play in this ecosystem, and their actions can significantly impact the future

of open-source software. By thoughtfully engaging with FOSS, companies can contribute to a technology landscape that is innovative, inclusive, and sustainable.

### **Indeed Contributor Fund Case Study**

Indeed's FOSS Contributor Fund is a pioneering initiative that supports open-source projects essential to the company's operations and the broader technology ecosystem. The program enables employees to nominate open-source projects they use for financial contributions, effectively democratizing the decision-making process regarding corporate philanthropy in technology. In a podcast with journalist Adam Stacoviak, Duane O'Brien, Head of Open Source at Indeed, elaborates on the initiative, stating, "The FOSS Contributor Fund is a way for us to reach out to anyone at Indeed who uses open source and involve them in the process for deciding which open-source projects we support with financial donations. Anyone at Indeed has the capability to nominate an open-source project that we use to receive a \$10,000 donation" (Stacoviak & O'Brien, 2020). This inclusive approach ensures that contributions reflect the genuine tools and technologies that employees value and rely upon.

The fund was designed not only to provide financial assistance but to foster a deeper connection between Indeed's engineers and the open-source community. Each month, employees who make contributions to open source can vote on which projects receive the donation, ensuring that the fund addresses current and relevant needs within the community. In its first year, the FOSS Contributor Fund distributed \$120,000 across various projects. In the following year, the commitment was increased to \$160,000, reflecting both the program's success and Indeed's dedication to sustaining the open-source ecosystem.

This initiative also promotes transparency and fairness in the selection process. To be eligible, projects must have an OSI-approved license and must not be affiliated with any Indeed employee, avoiding potential conflicts of interest and ensuring the funds go to genuinely independent community projects. O'Brien describes the impact of the fund on the company and the open-source ecosystem: "It's a little sloppy to think about it this way, but I think about making sure that the supply chain for open-source software is stable. If you rely heavily on an open-source project, you want to make sure that it has what it needs to survive and to be sustainably developed and to be well-maintained" (Stacoviak & O'Brien, 2020).

Moreover, the fund has significantly enhanced the visibility of projects that are crucial to specific teams or operational needs within Indeed, which might otherwise remain unnoticed. This aspect of the fund has proven essential for supporting smaller or less well-known projects that are nevertheless vital to the company's operations.

Through the FOSS Contributor Fund, Indeed not only contributes financially but also sets a precedent for corporate responsibility in the open source domain. The fund's model demonstrates a scalable and effective approach to integrating support for open source within corporate practices, enhancing the company's operational capabilities and its standing in the technology community.

## **Future Prospects of FOSS**

The future of Free and Open-Source Software appears bright and increasingly integral to the technological landscape. As digital transformation accelerates across industries, the reliance on FOSS for infrastructure, development tools, and innovative solutions is expected to grow.

This growth is underpinned by a recognition of the value FOSS brings in terms of cost efficiency, flexibility, and the fostering of collaborative innovation.

Emerging technologies such as artificial intelligence, machine learning, and the Internet of Things (IoT) are becoming ever more reliant on open-source platforms and tools. This reliance not only speeds up development cycles but also democratizes access to cutting-edge technology, enabling startups and established companies alike to innovate at scale. Moreover, the ethos of open source, with its emphasis on collaboration and sharing, is likely to influence broader business and organizational practices, encouraging transparency and collective problem-solving across sectors.

However, the sustainability of FOSS projects remains a critical issue that the community and supporting corporations will need to address. Ensuring that maintainers and contributors are supported—whether through funding, recognition, or other means—will be vital to the health and continued innovation of the FOSS ecosystem.

Furthermore, as FOSS becomes more ubiquitous, issues of security and governance will take on new urgency. The community and its corporate partners will need to evolve robust models for managing these challenges, balancing openness with the need for security and effective management.

In conclusion, the trajectory of FOSS is set towards greater influence and adoption, driven by its foundational role in technology development and innovation. Addressing its challenges head-on will ensure that FOSS remains a vibrant and sustainable force in shaping the future of the digital world.

## **Conclusion**

As this paper explores the rich landscape of Free and Open-Source Software (FOSS), it brings to light not only the vast contributions of FOSS to the technological world but also the ethical considerations that arise from its corporate use. It is clear that the principles of transparency, collaboration, and freedom that underpin FOSS continue to fuel innovation and community engagement, while also posing significant challenges and opportunities for ethical engagement by large technology companies.

The case studies and discussions presented highlight the critical role of corporate responsibility in the sustainability of FOSS projects. Indeed's FOSS Contributor Fund exemplifies how companies can actively participate in the FOSS ecosystem, not merely by utilizing these resources but by contributing to their growth and vitality. This model showcases a pathway for other corporations to follow, emphasizing that substantial benefits accrued from FOSS should be met with substantial support, be it through financial contributions, community involvement, or developmental support of FOSS projects.

Looking ahead, the future of FOSS is inherently tied to how well the tech community, including large corporations, navigates these ethical landscapes. By fostering an environment that values the contributions of individual developers and supports the health of the overall FOSS ecosystem, companies can help ensure that FOSS remains a vibrant and sustainable force in the ever-evolving world of technology. This ongoing commitment will be crucial in maintaining the innovative spirit that FOSS embodies, ensuring it continues to be a cornerstone of technological advancement and a beacon of open collaboration.

Furthermore, the ethical considerations discussed serve as a vital reminder of the responsibilities that accompany the integration of FOSS into corporate strategies. As companies benefit from the cost-efficiency, innovation, and robustness of FOSS, they must also consider their impact on the sustainability of these projects and the communities that maintain them. Ethical engagement involves not only financial contributions but also respecting the ethos of the FOSS community—promoting a culture that values contributor compensation and project longevity over mere profit.

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