

Original Article | **Open Access** | Peer Reviewed



Web3 Tools for Fair Monetization of Open Collaboration Business Models

Aarav Mehta¹ and Adithya Vivek²

¹Weston High School, Weston MA, USA.
aaravme20@gmail.com

²Cambridge Blockchain Society and Black Wallet
Ltd. surya.vivekanandan2014@gmail.com.

ORCID iD:

¹<https://orcid.org/0009-0007-3302-1878>

Address for Correspondence:

Aarav Mehta (aaravme20@gmail.com).

Copyright and Permission:

© 2025. The Author(s). This is an open access article distributed under the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits sharing, adapting, and building upon this work, provided appropriate credit is given to the original author(s). For full license details, visit <https://creativecommons.org/licenses/by/4.0/>.

Article History:

Received: 26 July 2025; Accepted: 28 September 2025;
Published: 15 October 2025

Abstract

Open collaboration business models (OCBMs) and software have existed since the 1950s but have been plagued by work ethic and financial bottleneck due to inadequate monetization schemes. OCBMs provide a range of advantages, primarily in accelerating problem solving & innovation, reducing costs, and enhancing security and transparency. Companies could establish sustainable revenue streams while benefitting from broad tech or platform adoption. However, fair revshare and credit attribution have been persistent problems with OCBMs. Businesses such as Diaspora, Soul Force, Sun Microsystems' Open Solaris, and others have experienced unsustainable OCBM initiatives, especially in the open-source software area. Web3 ethos-based business models and blockchain technologies provide an opportunity to correct and enforce many of the monetization strains associated with open collaboration. By decentralizing operational and governance control, free markets nested within companies that run themselves can be realized. The basic philosophy for a meritocratic monetization system with fair credibility-revshare automation is discussed.

Keywords

Artificial Intelligence, entrepreneurship education, business planning, funding readiness, higher education, South Africa

Volume 16, 2025

Publisher: The Brooklyn Research and Publishing Institute, 442 Lorimer St, Brooklyn, NY 11206, United States.

DOI: <https://doi.org/10.30845/ijbss.v16p11>

Reviewer: Dr. Ioanna Dimitrakaki, Professor of Business Management, International Hellenic University, Greece. ORCID iD: <https://orcid.org/0000-0002-8140-3033>. Email: iondimi@hotmail.com

Citation: Mehta, A., & Vivek, A. (2025). Web3 Tools for Fair Monetization of Open Collaboration Business Models. *International Journal of Business and Social Science*, 16, 158-166. <https://doi.org/10.30845/ijbss.v16p11>

Open collaboration business models (OCBM) and software have existed since the 1950s but have been plagued by failed attempts at sustainable monetization. Generally, with adequate passion or mandates, incentives are not necessary to cultivate open collaboration (OC), but their longevity is limited due to the sustainability of sentimental encouragement [1]. Open collaboration, or open-sourced innovation (OSI), is a system in which externally sourced knowledge and advances are pooled to produce solutions to new, commissioned problems [2]. OC relies on the distributed participation of contributors, making predictive methods for payment and value structures difficult to design [3]. A key application of OC is open-source (OS), a development philosophy where source code, including integrated development environments (IDE) and applications, are made publicly available for access, use, modification, and distribution [4]. As a spinout of OC, this too experiences indirect revenue, lack of valuation metrics, and lack of clarity in revenue share (revshare) between contributors. OC ecosystems, and the OS offerings commonly resulting from them, therefore often face fundamental issues with financial sustainability.

Firstly, the longevity of OC contributions must be ensured, which often requires more than just passion; those who keep the ecosystem afloat must be incentivized to do so [5]. Secondly, reciprocative remuneration struggles to be realized where value must first be defined for work requested, or done [6]. Without clear structures for defining contribution impact and ensuring long-term compensation, many open collaboration models, including open-source projects, suffer from financial instability or over-reliance on external sponsorships.

1. The Vision of OCBMs

OCBMs provide a range of advantages, primarily in fostering innovation, reducing costs, and enhancing security and transparency. By leveraging decentralized collaboration, open collaboration development benefits from continuous peer review, which leads to faster iteration cycles, higher code quality, and rapid vulnerability detection [7]. This collaborative approach significantly lowers research and development costs, as companies can integrate existing libraries and tools instead of building proprietary solutions from scratch. Additionally, the elimination of licensing fees reduces overhead, allowing organizations to allocate resources toward customization, infrastructure, and premium services [8]. For example, in open-source software, transparency ensures that products can be audited for security and compliance, reducing the risks associated with proprietary systems where vulnerabilities may remain undisclosed. Furthermore, the absence of vendor lock-in gives enterprises greater flexibility, enabling them to modify and scale software according to their specific needs without reliance on a single provider [9]. The network effects of open collaboration ecosystems also contribute to competitive differentiation, as a growing community leads to an expanding marketplace of plugins, integrations, and developer contributions that enhance the software's utility. Companies that adopt open collaboration strategies, such as offering dual licensing models, monetizing enterprise support, or providing managed services, can establish sustainable revenue streams while benefiting from broad adoption. As open collaboration frameworks continue to evolve, their alignment with enterprise scalability, security auditing, and composability reinforces their viability as a long-term business model, provided monetization challenges such as contributor remuneration and predictive revenue models are effectively addressed.

2. The Monetization Problem

Despite these potential solutions, OCBMs continue to face fundamental challenges in defining, predicting, and sustaining value contributions within distributed ecosystems. Unlike proprietary software, where ownership and revenue models are straightforward, open collaboration development relies on voluntary contributions, creating uncertainty in both labor supply and financial sustainability [10]. A core issue is the misalignment of incentives between contributors and end users; many developers participate out of passion or for reputation-building, but maintaining long-term engagement requires financial rewards. Without structured compensation, critical contributors may experience burnout or move on, leading to project stagnation or abandonment [11]. While sponsorships, donations, and foundation-backed funding have attempted to address this, these models often fail to provide reliable, scalable income streams.

Another significant challenge is the difficulty in defining and measuring the value of OC contributions, which directly impacts remuneration models [12]. Unlike traditional employment, where work is clearly defined by contracts and salaries, OC contributions vary widely in scope, impact, and necessity. This variability makes it challenging to establish fair value attribution systems that reward contributors proportionally to their work's significance. In the context of Web3 and blockchain, token-based incentive models have attempted to address this by dynamically distributing value through smart contracts [13]. However, these systems introduce additional issues, such as speculative volatility, Sybil attacks, and short-term extractive behaviors, where participants prioritize immediate

financial gain over long-term project health [14]. Without robust mechanisms for meritocratic compensation and predictable funding, open collaboration projects remain vulnerable to financial instability, even in decentralized ecosystems that theoretically support self-sustaining economic models.

3. Historical Review of Failed OCBM Monetization's

A recurring challenge in the architecture of open-source business models (OCBMs) is how to sustain value capture and paying contributors reciprocatively without compromising the foundational norms of transparency, user trust, and community alignment. Fundamentally, contributor alienation can be affected due to unclear governance and monetization trajectories. Diaspora, a decentralized social network, launched with a record-setting Kickstarter campaign in 2010, attracting a wide range of contributors inspired by its ethos [15]; however, the core team failed to establish a clear path for contributor influence or shared monetization. While built on open principles, the platform failed to include contributors in key decisions regarding direction, funding allocation, or product prioritization [16]. Lack of financial or reputational reward for sustained labor led to contributor burnout and fragmentation. A decentralized project that harnesses distributed labor but fails to distribute power or value will likely implode under the weight of its own contributor disillusionment. Additionally, monetization strategies that introduce friction, whether through intrusive interfaces or integrity-compromising practices, can undermine the ecosystems supported [17]. This was illustrated notably with Soul Force, which in the early 2000s, served as a repository for open-source distribution [18]. In the decade following, its pivot toward bundling adware with mass downloads introduced unconsented dependencies. This violated developers' and users' trust and led to significant reputational damage. Technical competence and open-sourced platforms alone are insufficient when ecosystem differentiation is lacking. The case of Sun Microsystems' Open Solaris demonstrated this after its launch in 2005, intending originally to replicate Linux's method to widespread adoption; however, it failed to cultivate the broader developer mindshare or demand necessary for sustainability [19]. The project was terminated following its acquisition by Oracle, particularly due to its failure to establish robust monetization pathways seen often in Linux's distributions via enterprise support models. Thus, despite technical viability, strategic complications caused ecosystem redundancy and a poorly planned roadmap. The lack of a distinct value proposition and misalignment with key adoption pathways resulted in its faltering.

Contributor-value mismatch can be especially detrimental to an enterprise when decentralized contributions are structured in a corporatized way. For example, Mozilla Firefox's ecosystem has seen a constant erosion of community contributors, especially developers for their extensions [20]. A key friction point has been the increasing centralization of decision-making and reliance on a singular revenue stream, namely, Google's web search partnership. Within this model, minimal monetary support was provided to extension developers and other independent contributors [21]. The immediate fall in financial sustainability and lack of ability to offer any strategic input has deteriorated much of the original momentum, coupled with layoffs within the company. Similarly, the case of Elasticsearch shows how collaborators and contributors can be structurally undercompensated despite creating high-value infrastructure. Elasticsearch became widely adopted, but cloud providers, especially AWS, began offering it as a managed service without reciprocating proportionally in code, funding, or governance [22]. The resulting scenario was that contributors' labor directly enabled commercial profit for third parties without receiving any of the upside. In response, Elastic re-licensed the project under SSPL in 2021 to block further free-riding. The incident underscores a systemic flaw: when monetization is decoupled from contribution, collaborative ecosystems become extractive, undermining sustainability and pushing maintainers into protective, often controversial, actions.

4. The Web3/Blockchain Prospect

4.1 The Ethos

Financial sustainability for open-source enterprises is envisioned through the implementation of Web3 business models and the blockchain technologies that enable them. By integrating the ethos of co-ownership, recognition of real value-add, reciprocal remuneration, and transparency in accounting for decentralized contributors, blockchain-based incentives can introduce mechanisms that verify and reward contributions fairly. Automated, permissionless, and trustless fintech platforms built within blockchain ecosystems, such as tokenized governance, decentralized finance (DeFi) tools, and smart contract-based payouts, are often seen as solutions to the longstanding monetization problems of open-source enterprise [23]. These systems allow for programmatic and immutable compensation structures that adapt dynamically to contributors' impact, reducing reliance on traditional gatekeeping mechanisms.

Protocols that can automatically assess a solution's true value add to an addressed problem or task can calculate rewards proportionally. This can establish reciprocative compensation, where open-source contributions solve can earn rewards without uncertainty of the value generated [24]. It also enables collaboration between multiple actors. Job posters can predefine value metrics, allowing decentralized, blockchain-based systems to validate solutions without bias. Additionally, co-authorship and ownership rights can trigger value-driven royalties, further incentivizing open-source contributions.

Web3 aims to shift control away from centralized entities with whom biases and large-scale malfunctions are a continuous risk. Placing power in the hands of individuals, particularly in recognition of their valuable contributions to the collective enterprise, can achieve more equitable value distribution, alongside greater transparency, enhanced privacy, and greater system trust [25]. By removing single points of control and eliminating intermediaries, this can also shift data ownership back to the hands of the source generating individuals - and enable more direct interactions.

4.2 Schema for a Reciprocative Compensation Apparatus using Blockchain Tools

In designing a free market-based, meritocratic monetization system, fundamental challenges emerge. Enabling reciprocative compensation, or compensating contributors in proportion to their realized value add, is at the core of this issue, and must be balanced with sustainable returns for the hosting platform. Sustainable financing hinges on fair value recognition, which must be possible before a job's completion; however, when value is uncertain, poorly measured, or unacknowledged by relevant parties, contributors' risk not receiving dues matched to their actual value add. Similarly, in a party of collaborative efforts, rewards may not be earned in proportion to each member's contribution [26]. As a result, remuneration may not be reciprocative to the output effort, deliverable, contribution, quality or any other metric used to characterize performance and value add. Unbiased and accurate mechanisms are required to ensure fairness and transparency.

Constraints to value recognition and financial decentralization reduce as one moves from first economic principles to OCBMs. The schema for achieving a reciprocative compensation apparatus is described:

Step 1: Misaligned or Absent Compensation

Public goods are underfunded and rely on passionate contributions by distributed participants, or open-source skills, knowledge, or techniques sharing [27]. This brings about free rider effects, by which beneficiaries enjoy goods or services with potential intellectual/social, or economic incentives, while the benefactors are left bereft of the latter. Whether or not acceptable to a contributor, a system built on this model generally fails to sustain itself where there is a benefactor(contributor)-user(beneficiary) relationship. Regardless of absent value capture, value itself is difficult to measure due to lack of a financial equation.

At this stage, blockchain can be used to record contributions, such as via Git commits, PRs, and issues, on-chain to prepare for future value recognition [28]. This may include off-chain verifiable data at the source of solution creation, logging API and data then anchored on-chain. IPFS could be used for storage of contributions and decentralized identity used to validate a contributor's efforts, further used for validating payment dues.

Step 2: Competitive Compensation with Persistent Value Misalignment

Compensation may be made available to contributors but set at rates controlled to ensure central platform profitability. This may appease contributors, especially at competitive rates in a larger free market of contesting businesses; however, market rates may attract contributors whilst failing to reflect the actual marginal impact or deeper utility. Marginal utility can go ignored and the pricing power of labor can be subsequently distorted. This is an effect of the principal-agent problem, where the former, a hosting party with greater executive authority, sets standards according to their prioritization [29].

There remains difficulty in measuring the actual value add of content contributions or work due to the unilateral metrics set by the hosting platform.

Step 3: Internal Competition for Compensation

Centralized payment logic can collapse under command as the principal-agent problem is allowed to persist; therefore, decentralization of the compensation logic may allow for actors within the internal ecosystem to compete amongst each other, differentiating returns by performance. The issue with this is that any algorithmic differentiator,

or indeed, secondary metrics (such as viewership, reputation, governance stake, etc.) in work submitted by a contributor is still defined by the principal [30]. The methods themselves will rely on perceived value, measured by secondary performance metrics, as opposed to ascertainment of problem-solving capacity or value attribution by the task creator.

Methods successfully illustrate comparative value but the perception of any denomination is still based on the host platform's independent value attribution.

At Step 3, governance rights to bid on certain projects can be linked to the holding of the platform's tokens. The job poster could validate the rigor or urgency of their task by competitively staking tokens as an escrow for contributors to answer. In the case that multiple contributors collaborate on a solution, multi-sig treasury management may be useful to ascertain percentage contribution, for example, using Gnosis Safe's tools that link decentralized wallets [31].

Step 4: Decentralized Job Posting-Funding

Decentralization of the funding apparatus changes the paradigm from a principal-controlled pricing arrangement to an agent-controlled approach, where job posters themselves are responsible for value attribution. Here, perceived value is functionally justified, as the free market is now peer-to-peer between benefactor and beneficiary. The host platform undertakes the role of optimizing communication between them or providing tools to enable the adequate development of solutions, and their publication [32]. Transaction costs can be reduced via open demand markets, and the principal-agent problem can be partially disintermediated by limiting revshare to facilitating internal processes.

Some spillover value may occur as competitive job posters and opportunities are priced beyond perceived commission value to acquire the optimal contributors.

Step 5: Programmable Meritocracy, Proof of Contribution and/or Value Add Value recognition must be executed in a systematic way, requiring automated data analytics against established metrics. The automated publication of performance requirements satisfied and their matching to compensation provides transparency. Incentives can then be aligned as contributors optimize their behaviours to achieve meritorious achievement, which can include depth of solution, accuracy, and more.

Measurable impacts are possible and are rewarded in proportion to what has been achieved. Signals of quality are machine-read and can push the system to coordinate success across the distributed ecosystem of contributors. However, pricing mechanisms may be overly simple and cause larger, more compelling contributions to go unrecognized within the solution created.

Verifiable credentials using on-chain decentralized identity and soulbound tokens, can represent the immutable contribution history of agents [33]. This can be paired into a larger Proof-of-Contribution consensus mechanism to score performance to ensure merit. If DAOs similarly place a stake in job postings, then an independent attribution of value for the quality of work done can be ascertained, reducing bias by the posters themselves.

Step 6: Market-Driven Bounty Systems & Recursive Long-Tail Returns

Pricing discovery is essential, requiring mechanisms to quantify a diversity of margins satisfied, such as labor costs, problem/job worth, externalities (impact of commercialized problems and prospective revshare opportunities), and more. This means that competing contributors may also end up bidding on jobs whose problems are not clearly defined, or whose scopes of impact are hidden [34]. While this may play to the benefit of the job poster, contributors who are better able to make an impact may not be commissioned for the right job.

Creating bounties for contributors that reflect the true value of a problem can more transparently publish needs and attract the right talent [35]. For instance, metadata retrieval, algorithmic precision, context-specific solutions, coding eloquence fixes, and more may be aspects whose values may carry over to further impacts. Providing bounties for which modules within a job are solved can generate greater revenue for both the host platform and the contributor, while producing better solutions for the poster. Job posters and contributors can then sync via dynamic demand and transaction costs can be reduced depending on the job primitive. This can also diversify the manner of compensation generated, as each problem is tokenized [36]. This can include collateral with payment attached, equities, royalties, or additional forms of revshare in addition to the fixed base commission. Incentives become much more powerful.

Finally, permissionless bounty posting can be implemented and tied to the previous DAO governance to independently attribute value in each bounty. This can encourage job posters to more meticulously record the

modular bounties of a problem/task, by which revshare for agents increases with the amount of locked liquidity. A token streaming protocol can be used in tandem with a soul bound NFT (smart contract linked to the original commission) to return royalties to contributors for commercialized solutions. Smart contract wrapping to measure impact contributions via oracles and solution usage counting can validate this in a trustless way.

5. Conclusion

A fairly monetized open collaboration and open-source business model can be systematically realized through blockchain infrastructure by progressively aligning incentives, reducing information asymmetry, and automating value attribution according to fair recognition parameters. Beginning with basic token payments, decentralized contribution, collaboration, and bounties, smart contracts can enable escrow, permissionless task creation, and secure treasury disbursement. As systems mature, verifiable reputation and soul bound tokens can be used to reflect independent DAO's assessment of performance or percentage contributions, especially with bounties, to generate more unbiased division of compensation. This method of allocating merit can enable contributors to be rewarded proportionally to impact, and not just the percentage of contribution to a problem. This further opens opportunities for more long-tail revenue generation and revshare by allowing co-ownership rights of commercialized solutions, doing justice to larger, impactful elements embedded within the solution built for a job. Recursive funding and retroactive compensation are then possible, building value based on downstream events, and governed by the various, aforementioned on-chain metrics for transparency. These mechanisms can form a Web3 economic stack that replaces more arbitrarily priced centralized labor structures with more programmable, independently merit-assigned, trustless, and market-based compensation methods. Consequently, open collaboration business models can be monetized in fairer ways that are often conceived, with financial sustainability for the host platform.

Conflict of Interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Funding Information: No funds, grants, or other support were received during the preparation of this manuscript.

Ethical Standards: This article does not contain any studies with human participants or animals performed by any of the authors.

Author Contributions:

Adithya Vivek: Conceptualization, Literature Review, Drafting of Manuscript

Aarav Mehta: Conceptualization, Literature Review, Drafting of Manuscript

References

1. De Nito, E. (2016). *Business models and organizational performance*. [Bradford, England]: Emerald Group Publishing Limited.
2. Bertram, C.D. (2008). *FACTORS THAT EFFECT INTERAGENCY COLLABORATIONS: LESSONS DURING AND FOLLOWING THE 2002 WINTER OLYMPICS*. [Thesis] Available at: <https://calhoun.nps.edu/server/api/core/bitstreams/d5ff1485-855b-4fed-80ff-bd666cdbcac0/content>.
3. Shubik, M. (1962). Incentives, Decentralized Control, the Assignment of Joint Costs and Internal Pricing. *Management Science*, 8(3), pp.325–343. doi: <https://doi.org/10.1287/mnsc.8.3.325>.
4. Pénin, J. (2011). Open source innovation: Towards a generalization of the open source model beyond software. *Revue d'économie industrielle*, (136), pp.65–88. doi: <https://doi.org/10.4000/rei.5184>.
5. Canedo-García, A. and García-Sánchez, J.-N. (2022). Exploring the Instrumental and Emotional Supports for Sustainability and Social Participation. *Sustainability*, 14(16), p.10377. doi: <https://doi.org/10.3390/su141610377>

6. Huizingh, E.K.R.E. (2011). Open innovation: State of the art and future perspectives. *Technovation*, 31(1), pp.2–9. doi: <https://doi.org/10.1016/j.technovation.2010.10.002>.
7. Levine, S.S. and Prietula, M.J. (2014). Open Collaboration for Innovation: Principles and Performance. *Organization Science*, 25(5), pp.1414–1433. doi: <https://doi.org/10.1287/orsc.2013.0872>.
8. E. Tisserant, Bessard, L. and Mário de Sousa (2007). An Open Source IEC 61131-3 Integrated Development Environment. *IEEE International Conference on Industrial Informatics (INDIN)*. doi: <https://doi.org/10.1109/indin.2007.4384753>.
9. Heindel, T. and Weber, I. (2020). Incentive Alignment of Business Processes. *Lecture Notes in Computer Science*, 12168, pp.93–110. doi: https://doi.org/10.1007/978-3-030-58666-9_6.
10. J. -G. Young, A. Casari, K. McLaughlin, M. Z. Trujillo, L. Hébert-Dufresne and J. P. Bagrow, "Which contributions count? Analysis of attribution in open source," 2021 IEEE/ACM 18th International Conference on Mining Software Repositories (MSR), Madrid, Spain, 2021, pp. 242-253, doi: 10.1109/MSR52588.2021.00036. keywords: {Analytical models; Conferences; Taxonomy; Refining; Computer bugs; Finance; Data mining; open source software; contributions; teams; github},
11. Hilton, M., Tunnell, T., Huang, K., Marinov, D. and Dig, D. (2016). Usage, costs, and benefits of continuous integration in open-source projects. *Proceedings of the 31st IEEE/ACM International Conference on Automated Software Engineering*. doi: <https://doi.org/10.1145/2970276.2970358>.
12. Olya, H., Altinay, L. and De Vita, G. (2018). An exploratory study of value added services. *Journal of Services Marketing*, 32(3), pp.334–345. doi: <https://doi.org/10.1108/jsm-12-2016-0415>.
13. J. Opara-Martins, R. Sahandi and F. Tian, "Critical review of vendor lock-in and its impact on adoption of cloud computing," *International Conference on Information Society (i-Society 2014)*, London, UK, 2014, pp. 92-97, doi: 10.1109/i-Society.2014.7009018. keywords: {Cloud computing; Interoperability; Standards organizations; Organizations; cloud computing; vendor lock-in; enterprise migration; data; API's; interoperability; portability; standards},
14. Sugden, R. (1985). Consistent conjectures and voluntary contributions to public goods: why the conventional theory does not work. *Journal of Public Economics*, 27(1), pp.117–124. doi: [https://doi.org/10.1016/0047-2727\(85\)90032-5](https://doi.org/10.1016/0047-2727(85)90032-5).
15. Miller, C., David Gray Widder, Kästner, C. and Vasilescu, B. (2019). Why Do People Give Up FLOSSing? A Study of Contributor Disengagement in Open Source. *IFIP advances in information and communication technology*, pp.116–129. doi: https://doi.org/10.1007/978-3-030-20883-7_11.
16. Lutz, F.G., Delgado, N.A. and Petrini, M. (2024). The dark side of impact measurement: complexities and drawbacks. *Social enterprise journal*. doi: <https://doi.org/10.1108/sej-03-2024-0049>.
17. Kapil Singi, Vikrant Kaulgud, Bose, C., Choudhury, S.G., Sanjay Podder and Burden, A.P. (2020). Are Software Engineers Incentivized Enough? An Outcome based Incentive Framework using Tokens. *Xplore*. [online] doi: <https://doi.org/10.1109/iwbose50093.2020.9050262>.
18. Κουρουμίδης, Σ. (2020). Tokenomics and the intrinsic value of cryptocurrencies. *Lib.uom.gr*. [online] doi: <http://dspace.lib.uom.gr/handle/2159/27701>.
19. Tuzes-Boloni, K., Borsay, Z., Sulyok, C. and Simon, K. (2018). Diaspora Mapping and Collaboration Platform for Expatriates. 2018 IEEE 16th International Symposium on Intelligent Systems and Informatics (SISY), [online] pp.000027–000032. doi: <https://doi.org/10.1109/sisy.2018.8524836>.
20. Ellis, A. (2017). Non-inclusive and non-deliberative: initiatives and referenda in comparative perspective (T). University of British Columbia. Retrieved from <https://open.library.ubc.ca/collections/ubctheses/24/items/1.0384572>
21. Chu, A., Arunasalam, A., Ozmen, M.O. and Celik, Z.B. (2022). Behind the Tube: Exploitative Monetization of Content on {YouTube}. [online] www.usenix.org. Available at: <https://www.usenix.org/conference/usenixsecurity22/presentation/chu>.
22. M. Davari and M. Zulkernine, "Analysing vulnerability reproducibility for Firefox browser," 2016 14th Annual Conference on Privacy, Security and Trust (PST), Auckland, New Zealand, 2016, pp. 674-681, doi: 10.1109/PST.2016.7906955. keywords: {Security; Heart rate variability; Software metrics; Correlation; Software; Predictive models; Vulnerability; security failure; Hardly Reproducible Vulnerability (HRV); software metrics; machine learning; Random Forest}, Ransbotham, Sam. WORKSHOP on the ECONOMICS of INFORMATION SECURITY an Empirical Analysis of Exploitation Attempts Based on Vulnerabilities in Open Source Software. 2010.

23. M. Debe, K. Salah, M. H. Ur Rehman and D. Svetinovic, "Monetization of Services Provided by Public Fog Nodes Using Blockchain and Smart Contracts," in IEEE Access, vol. 8, pp. 20118-20128, 2020, doi: 10.1109/ACCESS.2020.2968573. keywords: {Blockchain; Internet of Things; Smart contracts; Cloud computing; Computational modeling; Quality of service; Pricing; Blockchain; public fog nodes; fog computing; pricing models; monetization; automated payments},
24. Chesbrough, H., Lettl, C. and Ritter, T. (2018). Value Creation and Value Capture in Open Innovation. *Journal of Product Innovation Management*, 35(6), pp.930–938.
25. Shenfeld, D.K., Navathe, A.S. and Emanuel, E.J. (2024). The Promise and Challenge of Value-Based Payment. *JAMA internal medicine*, 184(7). doi: <https://doi.org/10.1001/jamainternmed.2024.1343>.
26. Krishnamurthy, S., Ou, S. and Tripathi, A.K. (2014). Acceptance of monetary rewards in open source software development. *Research Policy*, 43(4), pp.632–644. doi: <https://doi.org/10.1016/j.respol.2013.10.007>.
27. Filippi, P. de and Hassan, S. (2014). Measuring Value in the Commons-Based Ecosystem: Bridging the Gap Between the Commons and the Market. *Hal.science*. [online] doi: <https://hal.science/hal-01265214>.
28. Goertze, B. and Pitt, J. (2012). Original file was NineWaysToFriendlyAI_v6.tex. [online] jetpress.org. Available at: <https://jetpress.org/v22/goertzel-pitt.htm>.
29. N. S. A. A. Bakar and C. V. Boughton, "Validation of measurement tools to extract metrics from open source projects," 2012 IEEE Conference on Open Systems, Kuala Lumpur, Malaysia, 2012, pp. 1-6, doi: 10.1109/ICOS.2012.6417648. keywords: {Java; Complexity theory; Manuals; Software measurement; Software; Inspection; software measurement; metrics extraction tools; open source systems; object-oriented metrics},
30. Davarakis, C.T. and Harissis, A.V. (1997). GNOSIS Tool for Computer-based Training. *Human Comfort and Security of Information Systems*, pp.144–152. doi: https://doi.org/10.1007/978-3-642-60665-6_15.
31. Cayuqueo, A., Riquelme, G., Loyola, L., Acosta, J., Guitera, G. and Mateo, W. (2024). Industry 5.0. IIoT platformas enabler for smart manufacturing. *Unlp.edu.ar*. [online] doi: <http://sedici.unlp.edu.ar/handle/10915/171746>.
32. Arcenegui, J., Arjona, R. and Baturone, I. (2023). Use Case Examples of Ethereum Non-Fungible Tokens Tied to Assets Using ERC-4519. 2023 IEEE International Conference on Omni-layer Intelligent Systems (COINS), [online] pp.1–6. doi: <https://doi.org/10.1109/coins57856.2023.10189330>.
33. Zhang, W. and Ma, J. (2024). Framing under power asymmetries: A cross-level examination of the early-stage product design process. *Design Studies*, [online] 91-92, p.101250. doi: <https://doi.org/10.1016/j.destud.2024.101250>.
34. Qiu, H.S., Li, Y.L., Padala, S., Sarma, A. and Vasilescu, B. (2019). The Signals that Potential Contributors Look for When Choosing Open-source Projects. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW), pp.1–29. doi: <https://doi.org/10.1145/3359224>.
35. Huilian, S. and Qiu (2022). Understanding and Designing Mechanisms for Attracting and Retaining Open-Source, Software, Contributors, [online] Available, at: <http://reports-archive.adm.cs.cmu.edu/anon/anon/home/ftp/usr/ftp/isr2022/CMU-ISR-22-109.pdf>.
36. M. Madine, K. Salah, R. Jayaraman and J. Zemerly, "NFTs for Open-Source and Commercial Software Licensing and Royalties," in IEEE Access, vol. 11, pp. 8734-8746, 2023, doi:10.1109/ACCESS.2023.3239403.

Author Biography

Aarav Mehta, junior at Weston High School with a strong research interest in economics, business strategy, and emerging technologies. My current work focuses on the monetization and competitive implications of open collaboration business models for small and medium enterprises. I serve as an intern researcher at the Cambridge University Blockchain Society, where I explore the applications of blockchain and decentralized systems in economic and organizational contexts. I plan to pursue undergraduate studies in economics or business, with the goal of contributing to the growing body of research at the intersection of technology, markets, and entrepreneurship.

Dr. Adithya Vivek is a research engineer, innovator, and strategist specializing in advanced materials, robotics, and blockchain technologies & deployment strategy. He is the current Black Wallet Director of International Relations & Innovative Strategies (IRIS) and holds a PhD in Engineering from the University of Cambridge, where he was also the 3-year Head of Research at Cambridge Blockchain Society (CBS). He is now an adjunct Head at Cambridge Blockchain Labs (CBL) and patron of the CBS. His technical expertise is in microengineering for applications in biomedicine, industrial materials, sensors, bottom-up tissue engineering. His most recent research involved the action performance engineering of artificial muscles with theory on the integration of smart material

continuum devices. With a strong background in nanomaterials, biomaterials, and advanced manufacturing methods for smart materials, his outlook has expanded to advisory on a host of frontier technologies that now also require hybrid technologies and business development of compelling solutions. Dr. Vivek also engages in strategic initiatives in DePIN and Web3 business models including for public infrastructure. A significant aspect of his focus is reinvention of incentive structures and tokenomics imperatives, philosophically tested and translatable to practical architectures for which he actively conducts consultancy and directing. Currently, he also works across mechanical design for devices, decentralized energy solutions, and aerospace projects. He is passionate about pioneering interdisciplinary solutions at the intersection of science, technology, and business, which grants him nuanced dealmaking & oversight value to both public and private projects.

Disclaimer/Publisher's Note: The views, opinions, and data presented in all publications are exclusively those of the individual author(s) and contributor(s) and do not necessarily reflect the position of BRPI or its editorial team. BRPI and the editorial team disclaim any liability for any harm to individuals or property arising from the use of any ideas, methods, instructions, or products mentioned in the content.