METHOD ARTICLE

REVISED Autonomous, bidding, credible, decentralized, ethical, and funded (ABCDEF) publishing [version 2; peer review: 1 approved, 2 approved with reservations]

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Abstract

Scientists write research articles, process ethics reviews, evaluate proposals and research, and seek funding. Several strategies have been proposed to optimize these operations and to decentralize access to research resources and opportunities. For instance, we previously proposed the trinity review method, combining registered reports with financing and research ethics assessments. However, previously proposed systems have a number of shortcomings, including how to implement them, e.g., who manages them, how incentives for reviewers are paid, etc. Various solutions have been proposed to address these issues, employing methods based on blockchain technologies, called “decentralized science (DeSci)”. Decentralized approaches that exploit these developments offer potentially profound improvements to the troubled scientific ecosystem. Here, we propose a system that integrates ethics reviews, peer reviews, and funding in a decentralized manner, based on Web3 technology. This new method, named ABCDEF publishing, would enhance the speed, fairness, and transparency of scientific research and publishing.

Keywords

decentralized science, registered reports, reproducibility, scientific ecosystem, funding

Open Peer Review

Approval Status ✓ ? ?

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Any reports and responses or comments on the article can be found at the end of the article.

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REVISED **Amendments from Version 1**

We have made several text and figure corrections, as noted by the reviewers.
Figure 1 has been revised about "Phase 1". In the text, we have also added descriptions of the ethics review issues behind the proposed system, a supplementary statement about the system (Phase 5), and additional statements about the system's advantages and weaknesses.

Any further responses from the reviewers can be found at the end of the article

Introduction

"By mutual confidence and mutual aid, Great deeds are done, and great discoveries made."—Homer, "The Iliad"

Current scientific endeavors have become complicated and protracted. Science advances by sifting through numerous findings made by many individuals and organizations. However, the current ecosystem of science suffers from various problems. First, researchers spend great amounts of time writing grant proposals to obtain research funding rather than conducting scientific investigations (Herbert et al. 2013). Funding decisions rely heavily on citation metrics, such as researcher h-indexes.[1,2] Second, it is now standard for human and animal research to undergo ethics reviews before being initiated. However, these reviews are usually carried out behind closed doors by ethics committees composed of members selected by each institution.[3] Additionally, such reviews are often ill-suited to evaluate research methods because the committees do not include experts in pertinent fields.[4] Moreover, approved proposals must often be revised due to unforeseen changes in experimental methodology, necessitating reassessment by *post hoc* ethics or peer review.[5] This rework could be prevented if methodological expertise review is done alongside the ethical review. Furthermore, proceeding on the assumption of the current institutional ethical reviews impedes broadening the scope of science, considering that many researchers suffer from the lack of opportunities for institutional review (Ref. 6; Independent researchers seeking ethic...). Third, infrastructure to support reproducibility and transparency has not yet been fully developed,[7–9] although there are a plethora of efforts to advance open science, such as open access, open data/material/code, open review reports, open peer review, pre-registration, and registered reports systems. Finally, there is excessive centralization of authority,[10,11] and funding is often concentrated on limited numbers of scientists and publishers.[12,13]

To address these issues, we previously proposed a new procedure in which three types of peer review (scientific peer review, ethics review, and research funding review) are executed simultaneously on the same document.[14] This time-saving method is promising because it could solve the transparency problems, ethics review problems, and grant acquisition problems mentioned above. Nevertheless, the proposed system still relies on volunteer work of reviewers and influential publishers. Contrary to Homer's assertion, modern scientific endeavor is generally performed in an opaque, unidirectional, biased, and centralized system.

As an alternative to this traditional system, Decentralized Science (DeSci) activities or systems are gaining popularity.[15,16] Multiple scientific entities are beginning to apply Web3 technology, most notably blockchain, to obtain research funding and to publish results.[17] Web3 is a general term for distributed networks where users autonomously exchange information and communicate. These entities are often run by autonomous organizations of scientists, called decentralized autonomous organizations (DAOs). Within a DAO, there is a central organization such as a working group (WG), but decision-making is decentralized, based on Web3 technology. Several DAOs are attempting to address the aforementioned problems.[18,19] Those DAOs deploy a review system created on a public blockchain, *e.g.,* Ethereum, to tackle transparency and incentive problems that have impaired conventional peer review.[18,20] In order to promote ethical behavior and inclusiveness, DAO systems implement a gamification mechanism that allows entire communities to evaluate peer reviews and vote for the best ones. There are also several DAOs that provide open budgets or data, *e.g.*, VitaDAO, GenomesDAO. Such DAOs collect their budgets by distributing tokens as voting rights to determine which projects are to be funded. Open data are held in decentralized storage, *e.g.,* InterPlanetary File System: IPFS, without censorship, and data transactions can be kept in the blockchain as an open ledger. Practically, however, DeSci systems have potential drawbacks. For example, they could damage interests of current publishers. Nonetheless, we hope this emerging movement will solve presently unresolved problems, *e.g.,* payment of incentives to reviewers, stability of reproducibility.[17,20,21]

Here, we propose a system that integrates ethics reviews, peer reviews, and funding in a decentralized manner, based on Web3 technology. This autonomous, transparent, decentralized system would help shape cutting-edge scientific research and boost scientific transparency, efficiency, ethics, and reproducibility. We have already established a decentralized community called MinDAO to realize such a system as a host.

ABCDEF publishing

Figure 1 illustrates the scheme of a system we call "Autonomous, bidding, credible, decentralized, ethical, and funded (ABCDEF) publishing." based on MinDAO. See the original concept described in our published article and its supplementary (Mori *et al.* (2022),[14] Supplementary (https://osf.io/rq5vb)) for a detailed, phase-by-phase peer review

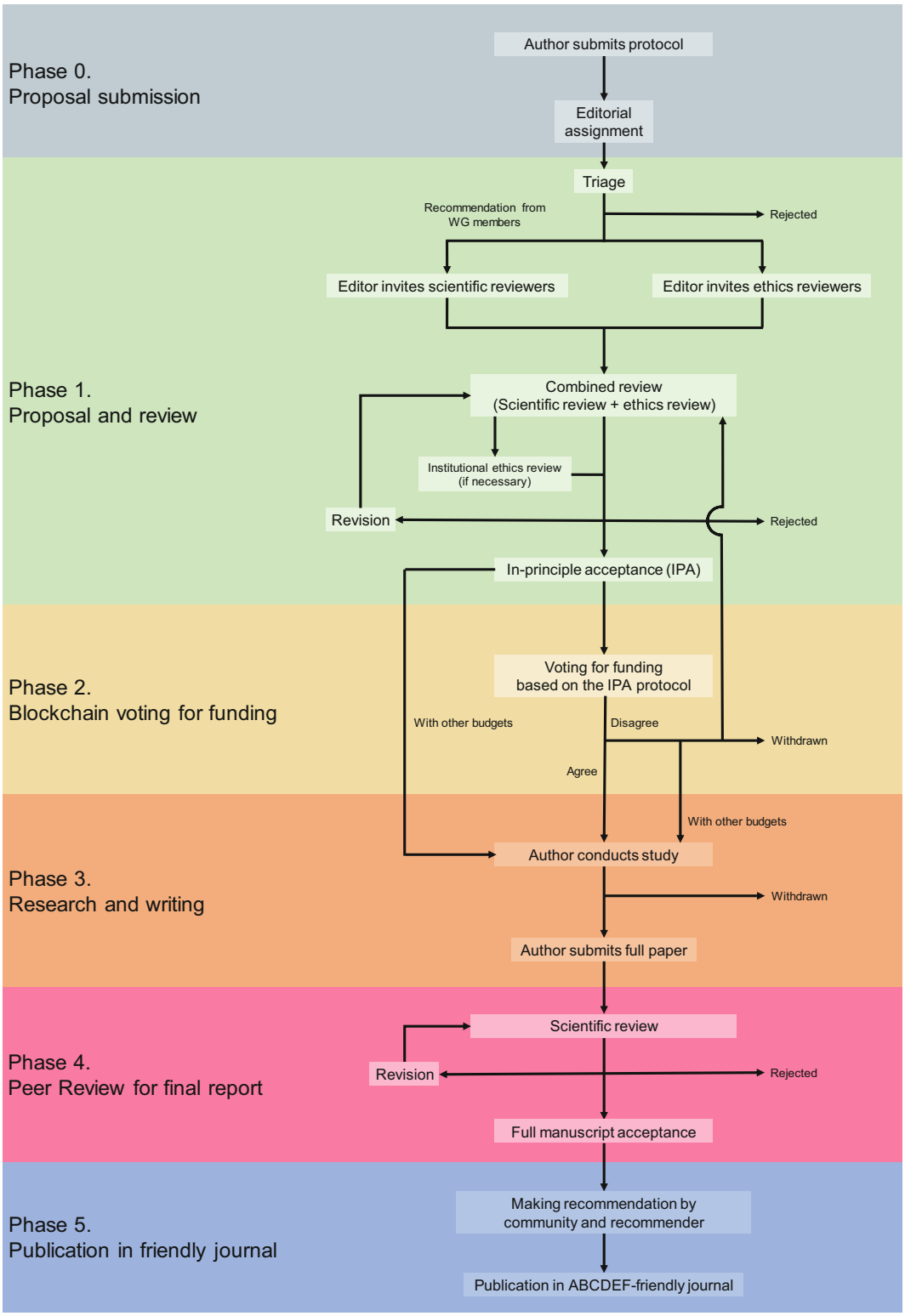

Figure 1. Flow of ABCDEF-publishing.

scheme. After researchers write a research plan, there are five phases from reviewing to publishing. Here are how these phases would work.

Phase 1. Proposal and review

A. *Scientific peer review and registered reports (RR)*

Each research proposal is peer-reviewed by multiple reviewers. In this process, peer reviewers evaluate the value of a research question, the rationale for the hypothesis, and the validity of methods for testing the hypothesis. RRs focus on the quality of methodology prior to data collection. Even in cases of exploratory research, peer reviewers evaluate scientific soundness, feasibility, and methodology of submitted proposals.[22]

B. *Ethics reviews*

Several reviewers specializing in ethical analyses are assigned to each protocol to review ethics of the research. If reviewers have ethical concerns about a submitted protocol, authors must revise it in compliance with reviewer comments and judgments of editors. In cases in which ethical considerations not covered by the protocol are required, *e.g.,* clinical research, the protocol would be examined by author institutions.

Scientific reviewers assess the importance of research questions of a manuscript, the theoretical validity of proposed hypotheses, and whether experimental methods are appropriate for testing those hypotheses. Ethics reviewers assess the protocol for ethical issues. Scientific and ethics reviews are undertaken concurrently. Once the manuscript has successfully passed both reviews and is accepted in principle, authors can proceed to the funding review. If ethics reviewers determine that an institutional ethics review is necessary, an ethics review is conducted at author institutions. In this case, a funding review is possible only after passing institutional ethics reviews.

Phase 2 Blockchain voting for funding

Once a protocol is accepted in Phase 1, voting for funding begins. The desired amount of funding is announced at the time of Phase 1 Peer Review. Voting on Phase 1 protocols occurs at this point, and funding is awarded from pooled funds. Community members evaluate Phase 1 protocols on their potential for scientific advancement and benefit to the public, and grants are made to protocols that meet these criteria. Voting is conducted primarily by community members possessing tokens. Although votes of individuals with more tokens have greater weight, they apply a voting system, such as quadratic funding, to minimize bias[23] (see the below details). Even if members disagree with funding for the protocol, researchers can proceed to the next phase using their own grants if they have them. Alternatively, researchers can revise their protocols and resubmit them for Phase 1 scientific review to be voted on again (Figure 1). Also, DAO members who have the right to vote can require additional actions in both cases, *i.e.,* agreeing or disagreeing with comments by DAO members. If members disagree, but ask authors to revise their proposals, researchers can modify their protocols to obtain a grant.

In the traditional system, funding based on popularity and performance assessed with indicators such as the h-index is not necessarily a problem. However, funds are biased toward a small subset of researchers, and funding allocation may be skewed away from early-career researchers. To solve this issue, we will apply "quadratic funding," limiting the percentage of famous and accomplished researchers receiving funds by route ($\surd$).[23] Quadratic Funding optimizes matching funds by prioritizing projects according to the number of voters. This ensures that funds are spent on projects that truly benefit the scientific community at large, not just a few prominent researchers.

Under this mechanism, the total amount of funding for a given issue is "the square root of each donation for that issue, *i.e.*, the square of the total amount". Even small donations are strongly encouraged and funding democratically balances funds for the public good. After a successful funding vote, researchers can be supported by pooled funding sources. Participation in voting is restricted to credibility gained *via* activities[24] or Token holdings.

Phase 3 Research and writing

This is the phase in which actual research and writing proceed, following the same flow as typical funded research. As described below, methods, experiments, and analyses conducted here are tied to the Phase 1 protocol in the blockchain. Therefore, deviations from or additions to the RR protocol and ethical review are explicitly indicated. Researchers conduct their studies following procedures accepted in Phase 1. Procedures are linked to the Phase 2 article using the blockchain. Therefore, if researchers deviate from their original protocol, this is apparent to readers.

Table 1. Details of tokens and funding in each phase.

	When do tokens or money move?	Who obtains tokens or money?	What kind of tokens or money are used?
Phase 0 Submission of proposals	Assignment as reviewer	Anyone invited as reviewers	License token
Phase 1 Proposal and review	Peer-review completed	Reviewers	MinDAO token
Phase2 Blockchain voting for funding	Agreement to protocol	Authors	Money withdrawn in a pool of MinDAO for funds
Phase 3 Research and writing Phase 4 Peer Review for the final manuscript	Peer-review completed	Reviewers	MinDAO token
Phase 5 Publication in the friendly journal	Paying article processing charge (APC)	ABCDEF-friendly journal	MinDAO token or Money

Phase 4 Peer review for the final report

This is a review resulting from protocols proposed and accepted in principle in Phase 1. Reviewers evaluate the quality of modifications and protocol deviations or ethical violations. In the event of rejection, after consultation, researchers would be asked to return the funds. Of course, peer reviewers should attempt to improve manuscripts by providing constructive discussions, as in traditional scientific peer review. Authors resubmit a Phase 2 article after data collection and analysis that contains the "Introduction" and "Methods" from the initial submission together with the "Results and Discussion" section. After the Phase 2 scientific evaluation is finished, the final manuscript will be published.

Phase 5 Publishing in a friendly journal

The paper is published as a journal article. The community and the recommender make acceptance decisions as in Peer Community In (PCI) (https://peercommunityin.org/),[25] and ABCDEF-friendly journals accept manuscripts selected, based on these recommendations.

Detailed handling of tokens and funds is described in Table 1. Through these five phases, transparency is ensured as the research process proceeds. Scientific reviewers and ethics reviewers would be invited by the community based upon license tokens, guaranteeing the quality of reviewers. Possible incentives for reviewers arising at each phase could include the following. Each reviewer/author would have a track record in the form of non-fungible tokens, which could be presented as credit for acquiring funding.[26] Incentives would be paid in tokens built on the blockchain. This incentive system is similar to that proposed in previous studies.[18,20] Researchers could also pay open access fees with tokens or other funds. Those grants would be provided from pooled funds. Funds would be handled by utilizing multiple funding systems, including donations or investments as external funding, and pooling funds with support from funding DAOs with quadratic funding and retrospective public goods funding. Another approach to grants involves journals of funding organizations initiating grant projects and allowing the submission of manuscripts to them.[27,28] There could also be a type of bounty for other community members *via* programmed, self-executing contracts, so-called smart contracts.

Advantages and opportunities

This section highlights advantages that this system would bring to the academic community. First, ABCDEF Publishing combines advantages of conventional review methods and blockchain-based techniques. It reduces the burden on researchers and provides incentives for all peer-review processes from the perspective of DeSci. Our past proposal integrated RRs, ethical reviews, and grant reviews. Also, as mentioned above, some previous articles have suggested incentivizing reviewers using blockchain-based tokens. ABCDEF Publishing would integrate all of these methods to improve efficiency, fairness, and transparency of the review process. Specifically, since a record of details of this review (who reviewed it and how, *etc.*) is kept on the blockchain or in decentralized storage, this authentication assurance is also important. This transparency enables funders to validate the security of their funding. Also, it maintains a record of how the budget was used. Use of funds can be documented. Furthermore, the blockchain would be able to link ethics statements and hypotheses that are registered in the RR system with methodologies and results. In addition, as seen in previous RRs, the ABCDEF system will accept submissions along with pilot data, replications of previous studies, and collections of various experiments and studies, allowing each content to be tied to the blockchain for reference. If that linkage is not made, it is possible to know that the method and analysis did not explicitly satisfy the registration.

Second, decentralized management would remove control from the hands of a few powerful administrators, leading to promotion of diverse research that contributes to science and more neutral evaluations of science and researchers. In addition, ABCDEF publishing would also benefit researchers whose institutions do not have ethics review boards and independent researchers who do not belong to specific institutions.[29,30] This system would enable such researchers to review their protocols from an ethics perspective quickly and easily. Although there is already an independent ethics review committee for such researchers, they must submit documents that are almost identical in content to those submitted for academic peer review in Stage 1 in their own format. Our proposal system could exclude the barrier by integrating all stages. Moreover, ABCDEF publishing would construct a reputational system based on activities of researchers/participants in a decentralized system of reviewers, independent of institutions and publishers (as in the Tenorio-Fornes proposal[20]). Such a reputation system would allow independent researchers to be reviewed and to expand the review process range by themselves. The system of DeSci would also improve efficiency of all publishing procedures by decreasing office work using smart contract techniques, as previously proposed.[20]

These advantages would allow ABCDEF-Publishing to achieve real distributed, citizen science. Nonetheless, ABCDEF Publishing does not seek to ignore or eliminate publishers, as has been claimed regarding the previously proposed DeSci system.[18] On the contrary, the credibility and reputation of publishers are critical and need to be supported. The previous proposal also recommended a review method using a DeSci system that is organized and transparent, while working with publishers.[20] We must respect the traditional scientific system that enables articles to be scientifically validated. Using ABCDEF Publishing, publishers could develop a more effective and efficient publishing system that would be mutually beneficial. Thus, it could help reform the complex systems of some journals, and indeed existing publishers are beginning to implement DeSci-based initiatives (*e.g.*, https://twitter.com/ScisetsComm).

Potential weaknesses, threats, and solutions

There are five potential pitfalls for ABCDEF Publishing.

1) It is still possible that a WG and some members of the DAO will hold too much power. Therefore, establishing a more democratic method of DAO management, depending on the number of non-fungible tokens (NFTs) owned, is crucial. The ideal is to employ a managerial system that is genuinely autonomous and decentralized.

2) As is often the case with token economics, tokens are unstable. Linking internal tokens ($MIN in our case) to current stablecoins is one option, *e.g.*, USDC, USDT. Stablecoins are digital assets focused on price stability. Due to price volatility brought on by the lack of underlying assets, crypto assets have not yet been used as a form of payment. Stablecoins were created to spread and boost the utility of these assets.

3) One concern is that fraudulent accounts, fabricated peer reviews, and fake contributions could appear. This issue is widely known as the Sybil attack, a type of attack on a computer service with many pseudonymous identities and enormous influence. Two types of defenses are proposed to thwart such abuses. One system is to evaluate risks of accounts using transaction data on the blockchain with machine learning. Another system uses non-exchangeable tokens linked to specific people, so-called soulbound tokens.[31,32] Moreover, it can lower the overall risk if they are tied to other accounts (e.g., ORCID, google accounts, github accounts). These systems allow us to predict risks of accounts and subtract the influence of potentially risky accounts. However, such proposals are still under development.

4) Another concern is about pairwise coordination of contributions in projects. For example, collaborators or unfriendly competitors work on the same project together in an attempt to control DAO decision-making. A similar idea in funding design is proposed to prevent such cases by controlling contributions based on social networks.[33] Another technique to minimize the contribution level to the cap has recently been used when users assist one another based on their shared activity history.[34]

5) There may be instances in which these approaches fail, having various impacts, even on specific fields or where RRs are unnecessary, as in the humanities. Thus, a flexible flow, such as skipping RRs, might be required to rescue projects in some circumstances.

6) Increased transactions may impact “gas fees”, which are transaction costs in the public blockchain. DAOs often utilize a public blockchain like Ethereum, which requires gas fees for each transaction to maintain its services on the blockchain. The gas fee fluctuates according to the number of transactions within a certain time window, since the number of transaction times is limited, and the price incentivizes people to optimize timing of token trades. DAO activities can be hindered by such matters since they accrue high costs. Some off-chain solutions

are proposed to mitigate such issues. In some solutions, including optimistic rollups and zero-knowledge rollups, security is derived directly from the public blockchain. Other solutions, such as sidechains and plasma chains, create new chains, and their security is distinct from the security of the public blockchain. In this manner, the number of transactions per second increases, and increased transactions do not hinder DAO activities due to a substantial reduction in gas fees.

7) Compatibility of reviewer reputational systems is also a matter of concern. Our proposed system envisions integrating a reputation system for reviewers using the blockchain. However, the reliability of the reputation system is undeveloped and uncertain. Instead of integrating this system, we should create a trusted pool of reviewers and make it as functional as the traditional peer review system first of all.

8) With ABCDEF publishing, which utilizes blockchain technology, there are limitations to how it can address environmental concerns, but there are also potential solutions to mitigate its impact. There are efforts to develop more energy-efficient blockchain algorithms and explore alternative energy sources, such as renewable energy, to power blockchain networks. Additionally, some decentralized publishing platforms are exploring using off-chain solutions to reduce the energy consumption required for transactions. While there are limitations to how ABCDEF publishing can address environmental concerns, there are potential solutions to mitigate its impact, such as developing more energy-efficient algorithms and promoting the reuse and recycling of electronic devices. It is important to continue exploring and implementing these solutions to ensure that the benefits of blockchain technology can be realized while minimizing its negative impact on the environment.

9) Some scientists might insist there are strict regulations and accredited committees to review research with human subjects or animals in many countries. Such committees usually do not process applications before studies are granted. Also, they might think there are huge differences between grant and ethics applications and an introduction plus the method section of a research publication. These criticisms are not strange to researchers accustomed to the current process. However, as we have argued in our earlier paper,[14] the process of applying for a grant and then conducting an ethical review may be one factor that has led to ethical deviations. Therefore, ABCDEF proposes the reversal of such a process. Moreover, as for grand and ethical considerations that require more than the background and methods section of the paper, those issues can be addressed by providing information as Supplementary information in the registered report. Of course, our proposed system may require the cooperation of existing IRBs in various situations. Additionally, this system must gain recognition from such institutions IRB and other relevant entities. The arrangement that enables cooperation with the respective institutional ethics review committees and publicity of our proposed system should be considered as issues to be addressed in the future.

Conclusion

We believe that ABCDEF publishing can effectively solve a panoply of problems facing the scientific community today. At the time of writing, we are just beginning to construct this system, which is community-based and developed on the blockchain. Most importantly, it will be realized as a large-scale movement involving various stakeholders, including scientists, publishers, and citizens.

Data availability

OSF: ABCDEF publishing. https://doi.org/10.17605/OSF.IO/NSVZD.[35]

This project contains the following extended data:

- Supplementary Information.pdf

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Open Peer Review

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Tae-Sul Seo
Korea Institute of Science and Technology Information, Daejeon, South Korea

In the article, the authors proposed a procedure in which three kinds of peer reviews, including a scientific peer review, an ethical review, and a funding review, are executed simultaneously based on Web3 technology. The procedure includes five phases: proposal and review, blockchain voting for funding, research and writing, peer review for the final report, and publishing in a friendly journal. However, the article has several substantial problems below.

1) It has no novel ideas except to integrate several scholarly steps using blockchain technology. The core concept of the article, performing three types of peer reviews simultaneously, is too ideal. The authors should not insist but provide evidence for the efficiency of the Trinity review than the traditional one.

2) Besides, blockchain-based peer review systems are not a new approach. We can find several novel articles dealing with blockchain-based ecosystems for publishing. Please see below articles:

[Ref-1]
[Ref-2]

3) The title of the article exaggerates. For example, the article doesn't explain the bidding process. Blockchain technology doesn't guarantee the credibility of research by itself. The title should be 'a combined procedure for research funding review and publishing based on Web3'.

References

1. Avital M: Peer Review: Toward a Blockchain-enabled Market-based Ecosystem. *Communications of the Association for Information Systems*. 2018; **42**: 646-653 Publisher Full Text
2. Janowicz K, Regalia B, Hitzler P, Mai G, et al.: On the prospects of blockchain and distributed ledger technologies for open science and academic publishing. *Semantic Web*. 2018; **9** (5): 545-555 Publisher Full Text

Is the rationale for developing the new method (or application) clearly explained?

Yes

Is the description of the method technically sound?
Yes

Are sufficient details provided to allow replication of the method development and its use by others?
Partly

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?
No source data required

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: open peer review

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 28 November 2023

https://doi.org/10.5256/f1000research.156966.r212394

Timothy M. Errington
Center for Open Science, Charlottesville, Virginia, USA

The authors have addressed all of my concerns.

Is the rationale for developing the new method (or application) clearly explained?
Partly

Is the description of the method technically sound?
Partly

Are sufficient details provided to allow replication of the method development and its use by others?

Partly

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?
Partly

Competing Interests: I am an employee of the Center for Open Science (https://cos.io), which advocates for publishing workflows such as Registered Reports, which is a major feature of this proposed work.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 19 September 2023

https://doi.org/10.5256/f1000research.142922.r199372

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David Mellor
[1] Center for Open Science, Charlottesville, Virginia, USA
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In "Autonomous, bidding, credible, decentralized, ethical, and funded (ABCDEF) publishing" the authors provide a solution to current systems in scientific research that rely on slow, linear review processes for grants, publication, and ethical review by building on their previous work ("Trinity Reviews") to propose a system that incentivizes participation in the process through blockchain technology. While I believe there are a number of benefits to the proposed system, I also see a number of challenges to overcome that could be addressed in this manuscript.

The first, and most substantial shortcoming is the fact that the proposed workflow (Fig 1), will, for most researchers, still require a linear review process, with all of the shortcomings that that entails. In my experience, few researchers submit studies for ethical review unless they are required to do so. The "Institutional ethics review (if necessary)" box is functionally required, and changes by that process are likely to affect the study design, which would require an additional line in the author's figure from that box back up to editorial review after triage. Overcoming that inefficiency should be a more central purpose of this publishing model, and doing that would

require working with the ethics review committees in individual universities. In the U.S., they are beholden to government guidelines, and so there could be substantial challenges to integrating them into this process.

Another limitation is that the funding review is still, in all cases, separate from the publishing and ethics review. As before, concerns that arise from the funding perspective cannot be addressed without editorial agreement if the "in-principle acceptance" is to be honored (in other words, any changes have to be approved by the editor, who may request additional reviewer insight).

If all three sections: editorial, ethics, and funding can be combined, then I would see substantial benefit to this system. Even if the funding section remains seperate (because in this model it is more distributed and focused less on review but rather on up and down votes of being worthy of funding), I still think there is need to integrate institutional ethics review with the scientific review.

My final set of comments are minor points that I think can be easily added to this manuscript:

1. What type of funder is this model designed for? Are you proposing that a private research foundation support it, a government agency? It will be important to understand that funder perspective and motivation for participating in order for this model to work. Their considerations (such as funder intent for private foundations, or legal requirements and taxpayer oversight for government agencies) must be taken into account so that there is a chance for them to participate.

2. In item 7, you note that this is compatible with reviewer systems. Please describe how you would overcome compatibility issues with MULTIPLE systems. Currently, ethics reviews, funder reviews, and article reviews all use different systems, and that is a major barrier to a combined workflow such as you describe.

3. In item 3, you note a concern about fraudulent accounts. Would it be possible to use simpler verification systems, such as possessing an ORCID and a human reviewer verifying your identity and credentials?

Is the rationale for developing the new method (or application) clearly explained?

Yes

Is the description of the method technically sound?

Partly

Are sufficient details provided to allow replication of the method development and its use by others?

Partly

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?

No source data required

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?

No

Competing Interests: I am an employee of the Center for Open Science (https://cos.io), which advocates for publishing workflows such as Registered Reports, which is a major feature of this proposed work.

Reviewer Expertise: Open science, meta-science, policy, ecology, citizen science

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 02 Oct 2023

Kaito Takashima

2-1. In "Autonomous, bidding, credible, decentralized, ethical, and funded (ABCDEF) publishing" the authors provide a solution to current systems in scientific research that rely on slow, linear review processes for grants, publication, and ethical review by building on their previous work ("Trinity Reviews") to propose a system that incentivizes participation in the process through blockchain technology. While I believe there are a number of benefits to the proposed system, I also see a number of challenges to overcome that could be addressed in this manuscript.

Reply: Thank you for your compliments on our proposal. Below, we provide responses to each point that you point out.

2-2. The first, and most substantial shortcoming is the fact that the proposed workflow (Fig 1), will, for most researchers, still require a linear review process, with all of the shortcomings that that entails. In my experience, few researchers submit studies for ethical review unless they are required to do so. The "Institutional ethics review (if necessary)" box is functionally required, and changes by that process are likely to affect the study design, which would require an additional line in the author's figure from that box back up to editorial review after triage. Overcoming that inefficiency should be a more central purpose of this publishing model, and doing that would require working with the ethics review committees in individual universities. In the U.S., they are beholden to government guidelines, and so there could be substantial challenges to integrating them into this process.

Reply: As you see in the reply to Reviewer 1, we proposed the system as a community for researchers for whom institutional ethics review is not possible in the first place, as we indicate in our previous (Mori et al., 2022) and present papers. As you pointed out, there would be situations where our system needs the cooperation of existing IRBs, and we need to be recognized by the committees. On the other hand, as the previous researchers indicated in the following paper, it is a stark fact that many researchers are unable to conduct research because they do not have their own ethics review board, or because the cost of asking an independent review board is impractical. Your point is important that we

have added it as an issue in "Potential weaknesses, threats, and solutions". Simultaneously, we have added the point that proceeding on the premise of the current institutional ethics reviews are themselves an obstacle to broadening the scope of science in the Introduction section:
https://psycnet.apa.org/doiLanding?doi=10.1037%2Fpst0000166
https://explore.bps.org.uk/content/report-guideline/bpsrep.2021.inf180/chapter/bpsrep.2021.inf180.12

***Introduction
"Furthermore, proceeding on the assumption of the current institutional ethical reviews impede broadening the scope of science, considering that many researchers suffer from the lack of opportunities for institutional review."

***Potential weaknesses, threats, and solutions- item9
"Of course, our proposed system may require the cooperation of existing IRBs in various situations. Additionally, this system must gain recognition from such institutions IRB and other relevant entities. The arrangement that enables cooperation with the respective institutional ethics review committees and publicity of our proposed system should be considered as issues to be addressed in the future."

2-3. Another limitation is that the funding review is still, in all cases, separate from the publishing and ethics review. As before, concerns that arise from the funding perspective cannot be addressed without editorial agreement if the "in-principle acceptance" is to be honored (in other words, any changes have to be approved by the editor, who may request additional reviewer insight).

Reply: Basically, it is not envisioned that the funding phase will be reverted back to another previous phase after the IPA. If the (funding) voters feel that there are any problems with the research protocol/content at voting, they can simply not vote the project. If the researcher wants to modify the protocol and still receive funding from the system as a result of rejection, they can withdraw and resubmit the manuscript to our system. This part is not considered a limitation, but rather, the review of research funding is an evaluation and voting process, and asking for specific comments on the content and modifications would be very complicated; it may discourage anyone from joining the funding voting.

2-4. If all three sections: editorial, ethics, and funding can be combined, then I would see substantial benefit to this system. Even if the funding section remains separate (because in this model it is more distributed and focused less on review but rather on up and down votes of being worthy of funding), I still think there is need to integrate institutional ethics review with the scientific review.

Reply: As we replied to your comment above, we do not require institutional review in our framework only, but at the same time we understand that some studies should actually be required.

2-5. My final set of comments are minor points that I think can be easily added to this manuscript:

What type of funder is this model designed for? Are you proposing that a private research foundation support it, a government agency? It will be important to understand that funder perspective and motivation for participating in order for this model to work. Their considerations (such as funder intent for private foundations, or legal requirements and taxpayer oversight for government agencies) must be taken into account so that there is a chance for them to participate.

Reply: Thank you for your important remark As for funders, we are assuming private research foundations, government agencies, or investors, as you have indicated. The format of the fund could be in the form of other DAOs, crowdfunding, or, as reviewer 1 gave us previous examples, the system launching a grant project with an open call for proposals. However, this model is not limited to these specific funders or formats, but aims to support research projects with a wide range of funders and diverse funding sources.

2-6. In item 7, you note that this is compatible with reviewer systems. Please describe how you would overcome compatibility issues with MULTIPLE systems. Currently, ethics reviews, funder reviews, and article reviews all use different systems, and that is a major barrier to a combined workflow such as you describe.

Reply: We apologize for the misleading wording here. We don't want to say that limitation 7 here is compatible with the traditional peer review system, but rather that we are advocating the creation of a reliable reviewer pool and making it as functional as the existing peer review system. As you pointed out, it is difficult to prepare reviewer pools for each of ethics and grant scientific review, but by working with the existing community and using a unified format for evaluation, we could bring the three types of reviews together. The sentences has been revised to be clear as follows:

***Potential weaknesses, threats, and solutions- item9
"Compatibility of reviewer reputational systems is also a matter of concern. Our proposed system envisions integrating a reputation system for reviewers using the blockchain. However, the reliability of the reputation system is undeveloped and uncertain. Instead of integrating this system, we should create a trusted pool of reviewers and make it as functional as the traditional peer review system"

2-7. In item 3, you note a concern about fraudulent accounts. Would it be possible to use simpler verification systems, such as possessing an ORCID and a human reviewer verifying your identity and credentials?

Reply: We think it is possible. More to the point, it is possible to automatically create a non-exchangeable ID in the form of a combination of ORCID and soulbound tokens, not by human hands. However, the problem of fraudulent accounts has already been pointed out even with ORCID (Teixeira da Silva, 2021. .https://doi.org/10.1016/j.jemep.2021.100692), and tying them together may not solve the problem. Rather, we suggest that it would be more realistic to establish a more reliable ID by linking researcher information and research history with a decentralized token such as the one proposed in our manuscript. However, it might lower the overall risk if it can be tied to not only ORCID but also other accounts e.g.,

google accounts, github accounts, and so on. We add the combined method to prevent fraudulent accounts as follows:

***Potential weaknesses, threats, and solutions- item9
"Moreover, it might lower the overall risk if it can be tied to other accounts (e.g., ORCID, google accounts, github accounts). "

References

Teixeira da Silva, J. A. (2021). Non-compliance with ethical rules caused by misuse of ORCID accounts: Implications for medical publications in the COVID-19 era. Ethics, Medicine, and Public Health, 18, 100692.

Competing Interests: No competing interests were disclosed.

Reviewer Report 31 August 2023

https://doi.org/10.5256/f1000research.142922.r193287

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Timothy M. Errington
[1] Center for Open Science, Charlottesville, Virginia, USA
[2] Center for Open Science, Charlottesville, Virginia, USA

This manuscript describes a vision of an alternative publishing process that would combine various emerging features being deployed to decrease bias and increase efficiency using a decentralized approach. Below is a list of recommendations for the author to consider.

In the introduction, why do the authors say “Accordingly, much research effort is wasted.”. This point is on ethical reviews. Are the authors suggesting there is waste because of having to review modified ethics protocols due to unforeseen changes? That doesn’t seem like waste per se, it’s important to revisit ethical protocols when deviations occur. And the unforeseen aspect doesn’t seem like waste because it was unknown during the initial protocol. I think the authors are trying to say there is research waste because those unforeseen changes by the authors might have been caught if methodological expertise was done alongside the ethical review in the first place. I’d suggest rewriting this to make that clearer. As a note, I also am unsure if I see that as waste – more inefficiency in a system.

In this model it assumes research progresses in single study/experimental settings, but most research papers currently are a collection of multiple studies/experiments. How will that work in this system? For example, Registered Reports can be submitted with pilot data – or the Registered Report study might be a replication of previous research. How does that work in this system?

For Phase 1, section B – this does not seem to align with how most research is done. The ethical reviews being independent of the institutional ethical review committees seems like it is adding an additional layer of review. In most journals that implement Registered Reports it is an expectation that the ethical review has already occurred, so approval is in place if the study is given IPA. Some research even requires initial ethical review at the grant review stage. I agree that having ethical and scientific review running in parallel is a good idea since these two areas are different and can influence each other, but if I'm understanding the diagram correctly, it seems like a lot of review might go into the process before it reaches the institutional review committee, which would only add additional revisions of the scientific peer review if ethical considerations need to change. Why not have the institutional ethics review running concurrently with the scientific review opposed to this institutional independent ethics review?

Related to this, in the 'Advantages and opportunities' section that this approach would help researchers who do not have institutional affiliations or institutional ethics committees. There already exists independent ethic review boards (e.g., BRANY) to help with this situation, which are similar to the institutional ethics reviews, how would this be integrated?

For Phase 2, funding – have the authors considered different workflows for having the funding and protocol peer review done? There are pilots experimenting with having a Registered Report reviewed by funders and journals. Here is a feasibility study of different models (https://doi.org/10.12688/wellcomeopenres.17028.1) and here is a journal consortium model being implemented (https://www.cos.io/consciousness).

Finally, I think the article format is not appropriate for this article. This reads more like an opinion article (https://f1000research.com/for-authors/article-guidelines/opinion-articles) than a methods article (https://f1000research.com/for-authors/article-guidelines/method-articles). For example, the last sentence of the paper makes quite a strong statement (i.e., 'it will be realized') without any evidence – but the authors are of course open to having that opinion of what they believe could happen (e.g., 'we believe it could be realized').

References

1. Clark R, Drax K, Chambers C, Munafò M, et al.: Evaluating Registered Reports Funding Partnerships: a feasibility study. *Wellcome Open Research*. 2021; **6**. Publisher Full Text

Is the rationale for developing the new method (or application) clearly explained?

Yes

Is the description of the method technically sound?

Partly

Are sufficient details provided to allow replication of the method development and its use by others?

No

If any results are presented, are all the source data underlying the results available to ensure full reproducibility?

No source data required

Are the conclusions about the method and its performance adequately supported by the findings presented in the article?
Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 06 Oct 2023

Kaito Takashima

1-1. This manuscript describes a vision of an alternative publishing process that would combine various emerging features being deployed to decrease bias and increase efficiency using a decentralized approach. Below is a list of recommendations for the author to consider.

Reply: Thank you for the important insights. Below, we provide responses to each recommendation or question.

1-2. In the introduction, why do the authors say "Accordingly, much research effort is wasted.". This point is on ethical reviews. Are the authors suggesting there is waste because of having to review modified ethics protocols due to unforeseen changes? That doesn't seem like waste per se, it's important to revisit ethical protocols when deviations occur. And the unforeseen aspect doesn't seem like waste because it was unknown during the initial protocol. I think the authors are trying to say there is research waste because those unforeseen changes by the authors might have been caught if methodological expertise was done alongside the ethical review in the first place. I'd suggest rewriting this to make that clearer. As a note, I also am unsure if I see that as waste – more inefficiency in a system.

Reply: As you pointed out, the explanation was misleading. We revised it as follows:

***Introduction
"Moreover, approved proposals must often be revised due to unforeseen changes in experimental methodology, necessitating reassessment by post hoc ethics or peer review.5 This rework could be prevented if methodological expertise review is done alongside the ethical review. "

1-3. In this model it assumes research progresses in single study/experimental settings, but most research papers currently are a collection of multiple studies/experiments. How will that work in this system? For example, Registered Reports can be submitted with pilot data – or the Registered Report study might be a replication of previous research. How does that work in this system?

Reply: Thank you for pointing this out. We apologize for the lack of explanation. We consider this system to be based on a Registered Report (RR) as we described in the manuscript. Therefore, the system naturally accepts such cases as you have suggested. We clearly explain in the manuscript that we accept such cases in the Advantages and opportunities as follows:

Advantages and opportunities
***"In addition, as seen in previous RRs, the ABCDEF system will accept submissions along with pilot data, replications of previous studies, and collections of various experiments and studies, allowing each content to be tied to the blockchain for reference."

1-4. For Phase 1, section B – this does not seem to align with how most research is done. The ethical reviews being independent of the institutional ethical review committees seems like it is adding an additional layer of review. In most journals that implement Registered Reports it is an expectation that the ethical review has already occurred, so approval is in place if the study is given IPA. Some research even requires initial ethical review at the grant review stage. I agree that having ethical and scientific review running in parallel is a good idea since these two areas are different and can influence each other, but if I'm understanding the diagram correctly, it seems like a lot of review might go into the process before it reaches the institutional review committee, which would only add additional revisions of the scientific peer review if ethical considerations need to change. Why not have the institutional ethics review running concurrently with the scientific review opposed to this institutional independent ethics review?

Reply: We apologize the position of "Ethical Review at the Institution" in the figure is confusing. In our proposed framework, undergoing ethical review at the institution was considered a special case. This primarily occurs when an ethics review is conducted simultaneously with the initial scientific review, and it is recommended that reviewers cannot make a clear judgment, or it is recommended to undergo an institutional ethics review as well. Therefore, in line with the original concept, it is not in its current position but should be included within the Phase 1 Combined Review and the revision loop. We have modified Figure 1 to align with the original intention.

1-5. Related to this, in the 'Advantages and opportunities' section that this approach would help researchers who do not have institutional affiliations or institutional ethics committees. There already exists independent ethic review boards (e.g., BRANY) to help with this situation, which are similar to the institutional ethics reviews, how would this be integrated?

Reply: Indeed, there is already an independent ethics review committee for those who do not have an ethics review committee within their affiliation. However, as pointed out in the background of our manuscript, the researchers must submit documents that are almost identical in content to those submitted for academic peer review in Stage 1 for even such institutions in their own format. When considering this structural and inefficient problem, our proposal system could exclude the barrier to undergoing an ethics review. Also, we'd appreciate it if you check our reply to Reviewer 2. We add the related sentence in the section as follows:

***Advantages and opportunities
"Although there is already an independent ethics review committee for such researchers, they must submit documents that are almost identical in content to those submitted for academic peer review in Stage 1 in their format. Our proposal system could exclude the barrier by integrating all stages."

1-6. For Phase 2, funding – have the authors considered different workflows for having the funding and protocol peer review done? There are pilots experimenting with having a Registered Report reviewed by funders and journals. Here is a feasibility study of different models (https://doi.org/10.12688/wellcomeopenres.17028.1) and here is a journal consortium model being implemented (https://www.cos.io/consciousness).

Reply: Thank you for sharing this very innovative and important precedent! The direction that journals and funders, such as the ones you mentioned, are taking in setting up grant projects and having manuscripts submitted to them is a very compatible. For your question, we have not considered the sperate flows between funding and RR peer review because it might waste the time of researchers. This is one of our motivation to propose the system. However, the precedential funding system which you introduced can be applied in our case with necessary modification. We added the possibility of combination in the Phase 5 explanation as follows:
“Another approach to grants involves journals of funding organizations initiating grant projects and allowing the submission of manuscript to them (Clark et al. 2021; Center for Open Science)”

1-7. Finally, I think the article format is not appropriate for this article. This reads more like an opinion article (https://f1000research.com/for-authors/article-guidelines/opinion-articles) than a methods article (https://f1000research.com/for-authors/article-guidelines/method-articles). For example, the last sentence of the paper makes quite a strong statement (i.e., ‘it will be realized’) without any evidence – but the authors are of course open to having that opinion of what they believe could happen (e.g., ‘we believe it could be realized’).

Reply: We initially submitted the article as an Opinion article, but changed it to Methods article after consulting with the Editor on the submission. While we agree with your opinion, we would like to leave the final decision to the Editor.

References
Clark, R., Drax, K., Chambers, C. D., Munafò, M., & Thompson, J. (2021). Evaluating Registered Reports Funding Partnerships: a feasibility study. Wellcome Open Research, 6, 231. https://doi.org/10.12688/wellcomeopenres.17028.1

Competing Interests: No competing interests were disclosed.