pevo

Decentralized Open Access and Evaluation

WHITE PAPER

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I.Abstract

PEvO (**P**ublish and **Ev**aluate **O**nchain) aims at creating a platform for open scientific publication and interactive evaluation which uses the blockchain technology, namely the Steem blockchain. Combining scientific communication and blockchain allows constant reviews and updates and permanent insight into all steps - one of several features the established peer-review-process is lacking. What makes this approach different from open access solutions emerging inside a niche[1] is its decentrality: no central repository and no single administrator or owner exist. Everyone can contribute by providing a server. The code will be open source, allowing everyone to "fork" PEvO and set up a similar service with different settings.

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[1] e.g. subscription journals with an open access option ('hybrid' journals), tied to article processing charges

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1. Point of departure

It is the established practice that scientists and scholars publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge [Chan et al. 2002]. Scientists also provide the journals with reviews and editorials for free (within their working time, without any personal benefit) and leave the design of the evaluation process to journals and publishing companies [Kriegeskorte/ Walther/ Deca 2012].

In turn, the publishing companies owning the journals require payment, and restrict the evaluation of papers by relying on 2–4 pre-publication peer reviews, which they keep secret [ibid.]. The publishing companies are under intense criticism for exaggerated and exorbitant price policies, privatising the profit of the (mostly) publicly funded research. The subscription rates for the journals increase from one year to the next whereas the budgets of libraries tend to decrease and the number of scientific publications explodes. The structure is centralized around few 'big players'.

Fischer/ Ritchie/ Hanspach (2012) criticize "academia's obsession with quantity". They state that:

> "Where incentive structures fail to deliver conditions that most academics believe are needed to best stimulate insights, these structures must be challenged and changed, from the scale of individual research groups to supra-national science policy". [Fischer/ Ritchie/ Hanspach 2012]

The call for open access is not new. The declaration of the Budapest Open Access Initiative for instance dates back to 2002 [Chan et al. 2002]. The initiative points out that "open access [...] gives readers extraordinary power to find and make use of relevant literature, and [...] gives authors and their works vast and measurable new visibility, readership, and impact". To stay relevant, scholars will have to make even greater efforts to make their material easily accessible [Odlyzko 2002].

There are several existing Open Access platforms, which are usually not used for primary publications. Academia.edu is a social academia walled garden community possible to swhere it is hare papers. They had a lot of press coverage and claim to have more than 36M members. Furthermore, there are pirate websites for scientific papers, such as Sci-Hub, which remove the paywalls.

Kriegeskorte/ Walther/ Deca (2012) state that Open Access is now widely accepted as desirable but that Open Evaluation is often underemphasized [Kriegeskorte/ Walther/ Deca 2012]. They present a synopsis of 18 papers which develop a detailed vision for the ideal future system. The result are 17 design features that should be considered in addition to Open Access for the future of scientific publishing. PEvO makes 16 of those features possible, leaving out only the closed pre-publication phase, which the authors of the study themselves realize to "come[s] at the cost of a permanent loss of value through errors in the initial evaluations".

From an political/legal view, the European Union e.g. has passed a regulation that "Open access to scientific publications resulting from publicly funded research under Horizon 2020 shall be ensured". [The Council of the European Union REGULATION(EU) No 1291/2013]

2. The future with Steem

Blockchain technology has been gaining popularity since the introduction of the Bitcoin currency in 2008 and will be of even greater importance in the future. Even governments and central banks start to utilize it [UK Government Office for Science 2016].

Blockchains can simply be described as decentralized databases with a defined rule set [Angelovska-Wilson et al. (n.d.)]. They consist of "blocks" added one after the other, forming a permanent archive. Each block references its predecessors, thus content can never be changed without invalidating everything added at a later stage. The blocks are generated by alternating servers on the network, decided on by a consensus algorithm. Through this decentralized nature, neither content nor the author nor the time of a post, a vote or any other transaction can be changed or censored or get lost by a failure of a server or cluster.

Given the almost infinite variety of opportunities this technology offers, it was about time for the developing community to widen its focus, which had been mostly restricted to financial applications until now.

Steem, created by Ned Scott and Daniel Larimer in early 2016 [Larimer et al. 2016, https://steem.io, https://steemit.com], is one of the first platforms to explore new fields by combining blockchain technology with social media functions. It incentivizes the creation of valuable content by paying out a certain amount of an internal currency (STEEM) for posts that received positive votes. Furthermore, it is the first blockchain that does not charge transaction fees.

The author of a post is rewarded by the Steem blockchain, proportional to the amount of votes she received from the public compared to all the other votes that were cast on Steem during a certain period of time. Because of the heterogeneity of the communities using Steem, it cannot be expected to become a great source of income for single users, but it certainly will add to the incentives to use the platform.

Other users can propose edits to a post, which can get merged if the original author agrees, while keeping all older versions on the records. Thus, a post and its discussion can always be showing the latest results, and every contribution can be attributed to its original author.

3. Functionality of PEvO

The concept includes several technical functions. Apart from those mentioned below, further necessary functions will be identified. Special emphasis is placed on the user interface. Thereafter, paper hosting and quotability are explained.

3.1. User interface

Accessibility of uploaded content is already given by Steem (via steemit.com). However, the intended use requires a more sophisticated platform with the following features.

3.1.1. Information flow

Content on the blockchain is not indexed and in a raw format. To make the content usable in daily work, a web frontend is needed allowing a full text search of posts and added documents, as well as filters and notifications for certain events, e.g. a new post from a followed user or category.

3.1.2. Registration

Users can sign up either with an existing Steem account, or by creating a new one via PEvO. Creating an account will be for free, but tied to an accreditation process to connect the account to a real person.

All accounts can be used completely independent from PEvO on any other platform that utilizes Steem. Only content with a dedicated meta-tag will be relevant on PEvO.

3.1.3. Public Key encryption

What is not meant to be public should stay private. Everything no second or third person needs to know will be encrypted. The private key never leaves the browser: the server only receives a hash to authenticate the user. From then on, private data will be encrypted before it is sent, and decrypted after it was received. Transactions on the Steem blockchain will be signed locally before they are handed to the PEvO node to process them.

3.1.4. Filter functions

Everyone is free to post or comment on the Steem blockchain, the only restriction is a funded account. PEvO includes a filter, so undisturbed scientific discussion can take place between the accredited members of the community.

Upvotes by the public will still generate the biggest part of the author's monetary reward, but laymen discussion does not need to be watched. Furthermore, it will be possible to mark a reply as not relevant to be able to answer informally.

Of course, it cannot be assumed that all scientists naturally have a agreeable discussion style. Therefore, an extended ignore function will be available.

3.1.5. Anonymizing comments

There might be situations where a negative review of an article could have unwanted social consequences for the reviewer. PEvO will offer their accredited members an account to use for anonymous but nevertheless relevant comments. The author is saved internally for a limited amount of time to prevent abuse.

3.2. Hosting papers

3.2.1. Large files

Besides posting content on Steem, PEvO allows to upload e.g. a PDF document and a number of pictures along with a post. The post should then contain the abstract or a similar description of the content, the title, authors, and other essential data.

While posts are expected to be written in English, for documents an optional language setting is available.

All files are hosted on the [InterPlanetary File System](#) with public HTTP gateways and everyone is welcome to mirror them. As long as at least one mirror is online, the files stay retrievable through any IPFS installation by the address saved in the blockchain.

3.2.2. Quotability

Prerequisites for quotability are endured availability and immutability of the paper. From a technical perspective, every publication on PEvO is quotable.

Short papers fit completely into a post, while longer ones (>128kB, ~16 pages or 32.000 characters of text) need to be attached in PDF format. Those posts include a hash of the document in their metadata, so anyone can compare a file on their disk with the original publication.

Regarding the discussion of quotability of online sources and little general knowledge about the workings of a blockchain, a physical version of the paper is recommended for every publication -- at least in the early phases.

3.3. Accreditation and Rating

The accreditation of scientists needs to be reliable and as transparent as privacy protection allows.

- Email from university/company account
- PGP signed message from known public key

- Personal key exchange with PEvO affiliates

Their public posting key is openly linked with details of their accreditation, and from then on, their content will not be filtered on PEvO any more.

PEvO will also verify the proofs for the ranking where necessary. Proofs can for example be made by institutional or corporate websites in combination with email addresses, or copies of documents and publications.

The algorithms for the rankings, and how each different factor like titles, impact points, community ranking, publications, reviews and self-proclaimed expertise is weighted, will be transparently developed by a scientific advisory board. The data is public, so other algorithms can be used for different kinds of weightings.

4.   Team

Michael spent most of his life creating web applications and managing their technical infrastructure, Alex is a freelance designer. They will design and code the first iteration of the platform. Marlies works as a research assistant at a university and is now carrying out a survey among colleagues on several issues linked to the project. This is meant to give an overview on which functionality the platform needs. Jenny is the project manager but also the graphical artists, responsible for all colorful details and for keeping the overview.

5.   Organization

PEvO is not and will never be a for-profit model. Everything we do will be free like free beer and MIT licensed. Accreditations will be as transparent as privacy protection allows. We want it to be possible for everyone to "fork" the code of PEvO and use an own accreditation list or rating algorithm to set up a similar service.

For the future, we hope that the project will be able to live from donations and other types of voluntary contributions, with a foundation as a legal body. If it is financially feasible, we would like to set up our own foundation, because our ideals of freedom and transparency could be set in stone that way.

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