

# A Proposed Currency System for Academic Peer Review Payments Using the BlockChain Technology

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## Abstract

Peer review of scholarly papers, as a critical step in the publication of high quality outputs in reputable journals, may face problems such that few incentives for researchers drive them to conduct suitable reviews in a timely fashion and in some cases unscrupulous practices are occurring as part of the production of academic research output. This report is based on a proposed currency system using the BlockChain as its basis and finds a particular solution for the system.

## 1 Background Introduction

Almost every research academic is aware of the current environment in which both institutions and individuals are subject to some form of assessment and a considerable proportion of the scoring is often weighted on the production of scholarly outputs, typically as papers in reputable journals.

Apart from the obvious authors and readers, these journals typically have a small number of editors who do most of the day-to-day management of the intellectual material; there might also be a larger editorial pool from the discipline who oversee the journal, and then there are those people who take on the role of reviewers which could include all of the previously listed groups of people.

The production of a journal also include publishers who publish for profit or publish through a non-profit entity such as a learned society. Irrespective of the details of the process, the production of an academic journal is an economic system and like any such system the publishing process presents a number of intended and unintended incentives.

Due to the anonymous nature of peer review, people seem to have lesser incentive to carry out this part of the publication process. Although some journals will list those that have carried out reviews on its behalf, it is more difficult to provide a measure of the number, quality and timeliness of those reviews. The paper considers how it might be possible to provide a greater incentive to carry out peer review and to raise the quality of those reviews using some of the currently available internet-based technologies. The proposal also provides a mechanism to track the review process

and has the potential for wider application within the academic publishing environment as an alternative metric to those used at present.

## 2 Proposed System

### 2.1 Blockchain

The incentive to improve the peer review process might be to pay the reviewers some real money but obviously it's not a good option here for there are potential conflicts of interest. Instead, the technology of BlockChain allows for alternative currency exchange mechanisms, and we can found a new exchange system using the cryptocurrency similar to bitcoin (called r-coin in the paper referred to 'ReviewCoin')

The BlockChain has the advantages:

- It is a distributed accounting system not owned by any specific organisation. No one has the only right to modify the system.
- It is difficult to corrupt and transactions are anonymous, which means that it is difficult for 'bad guys' to modify the review due to interfere the publication of a paper.

### 2.2 R-coin system

In order for this exchange system to work, authors need to register an ID using a system such as ORCID to confirm their identifications and then submit their ID to the journal or through Publons when doing a peer review. Then they are paid with r-coins. The exchange mechanism will be talked at next part.

The new journals needs a registration process to join the r-coin currency in case of unscrupulous people from setting up publications that do not conform to the rules agreed by the community. Also, a lot of journals, are not so fabulous that should be excluded from participating. A body that decides which journals were acceptable is needed.

Finally, the r-coin is just 'present' for review. The r-coin system only provides a "right to publish" mechanism. It couldn't be access to the 'real' money transaction.

### 2.3 Transaction Mechaisms

#### 2.3.1 Pay for one publication

The author should pay some r-coin to require a peer review, but this will have many conditions. When multiple authors are involved in submitting a paper, then should the cost be shared equally, or only the corresponding author pay or the authors could decide their own r-coin contribution that could be a reflection of their contributions to the paper.

The cost of submitting a paper to a journal would need to be agreed and whether that cost was the same for all journals or journals could set their own price.

#### 2.3.2 Earn from review

The participant will only earn the r-coins from review. However, the payment of the amount of r-coin could also be related to timeliness where less r-coin is paid if a review is late. The reviewers would be paid more r-coins per review the more reviews that were completed.

### 2.3.3 Expansion of currency pool

There are two ways to expand the r-coins pool.

**New registration.** An author would be given a certain amount of r-coin during the ID registration process. Every new author will have an initial r-coin budget so that they can then start submitting papers to journals. This also resolve the lack of budget for a new research.

**Review** The r-coin is paid once an editor accepts the review in terms of meeting the journal's quality requirements. But the payment of the amount of r-coin can be changed in each transaction(review) which depends on the factors mentioned above, thus the r-coins that an author pay is not equal to the total of what the reviewers receive. In this method, the pool expand and it also encourage peer review.

## 3 Personal Work

I mainly deal with the distribution of the papers in the system.  
The distribution system has mainly two respects.

### 3.1 The distribution algorithm

As far as I know,the current distribution system of the paper review system often sends the paper randomly to the reviewers.In my system,I put forward a new method to distribute the papers to the reviewers.This method is like the NBA draft mechanism.

I try to adjust the weight of the reviewers dynamically during a period of time.In brief,the reviewers who receive more papers will have the less possibility than those receiving fewer papers.It seems that it has no meaning for the system if we only concern about this function.But we can not only adjust the weight according to the numbers that a node receives but also many other factors.Such as the reviewing ability of a reviewer node,the reviewing speed of a reviewer node and the integrity of one node.

In our simulation,we set that one reviewer can only review 13 papers one day(Of course,this number is too large considering the true situation)which can avoid the vicious competition of the system reviewer.For we assume that the coin used in the system can be traded in the real world,someone may keep the client open all day and gain much more papers than others.It will cause a waste of the manpower and time resources.The weight of one reviewer will decrease when they receive more and more papers on one day.And finally if all the reviewers receive 13 papers but there are still papers left,the system will return a message infers that there should be more reviewer for the system.And for the new day,the system will initialize the weight of the reviewer which implies that they can review more papers for the next period of time.The following code is that the reviewer weights change according to the papers they receive:

```

def weight_choice():
    s = 0
    load_weight()
    for j in range(0, len(reviewer)-1):
        s += weight[j]
    if s <= 0:
        print("CAUTION : Need more reviewers ! There are surplus papers to be distributed !\n")
        return -1
    t = random.randint(0, s-1)
    for i in range(0, len(reviewer)-1):
        t -= weight[i]
        if t < 0:
            weight[i] -= 1
            return i

```

### 3.2 Forgetting Mechanism

For the system, we consider that the reviewer account will usually be personal. So there may happen many accidents which will cause the papers cannot be reviewed or on time. Then we design a forgetting mechanism. We mark a time stamp when we distribute all the papers to the reviewers and store a copy in the system. If a paper has been reviewed and return to the system, the corresponding time stamp will be deleted. While when the earliest time stamp is due, the system will get a message and re-send the papers to the other reviewers.

## 4 Future Work

On one hand, we can complete the distribution algorithm about the adjustment of the weight. In this algorithm, the weight usually represents the percentage that a reviewer can review in a period of time of all the papers. But if someone arises the situation that he forgets to review the paper or doesn't review the paper on time. The system will decrease the weight of the reviewer as a punishment. At the same time, if someone can always finish reviewing the papers ahead of time. Then we can consider increasing the weight of the reviewer in the system.

On the other hand, for the actual use of the system, we shall consider the safety of the transmission and the storage. For example, when we find that a reviewer doesn't finish reviewing the paper on time because of the transmission loss. Then we cannot blame him or her for the forgetting.