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A Decentralized Grant and Bounty Platform

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Abstract
We continue to observe in our classes and web-based discussions that traditional grant and bounty systems are a very messy business. They are usually difficult to read between the lines since the money does not get distributed properly, the payouts are extremely slow, and you are left at the mercy of the central bodies which may be biased or simply not do their job.It made this assignment a paper proposing a Decentralized Grant and Bounty Management Platform based on blockchain and smart contracts. The best thing is that the site allows organizations to place grant or bounties on specific projects, and individuals in the community can submit their proposal or solution in a secure and verifiable manner. Then the work is automated with smart contracts that automatically do the grading, the checking and the rewards, and we only have to set up rules that would make this process automatic, thus no human being needs to do the tedious check-lists and we reduce the number of errors or even fraud. The system maintains the safety of transactions, their impossibility to be changed, and the display of all in real time due to its full decentralization, which instills responsibility and makes all more reliable. Overall, it is not only that funding and rewards become smoother with the help of this platform, but that it also challenges the world to collaborate and be more innovative as it gives us a reliable, fair, and easily auditable system to all our grant and bounty requirements.

Keywords: *Index Terms—Blockchain, Smart Contracts, Grant Manage-ment, Bounty Platform, Decentralized Systems, Transparency, Innovation Funding*

1. Introduction
Grants and bounties are extremely prolific research and start-ups since they assist in driving innovation, solving issues and getting people collaborating [1], [7]. They are simply the financial shot in the arm that individuals or groups need to launch their study, new technology, or innovative projects [2], [7]. However the old-school funding models are rather painful, the paperwork may take an eternity, the process lacks trans-parency, and a significant amount of power is concentrated in a few central institutions [3], [6]. All that causes money to linger on and resources to be mis-allocated, and people to lose faith in the system, thereby making potential contributors unwilling to commit to research and development. As the level of blockchain technology is raising at such a pace, decentralized systems have become a reliable workaround to those pain points [12], [17]. Transparency, immutability, security, and decentralization are provided by blockchain, which is why it can be considered a fine option to manage financial transactions and have good records [9], [10], [14]. Including smart contracts, you can establish rules and conditions which will automatically be executed without people needing to do the legwork or go through the middlemen [11], [16]. That will make caching funds, reviewing proposals, reviewing work and rewarding much smoother, safer and clearer. The concept in this full-stack setting is a Decentralized Grant and Bounty Management Platform, which is supposed to

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streamline fundraising and increase its effectiveness and reliability [10], [15]. The platform allows organizations to put research issues or work and deposit money in a secure manner through blockchain [8], [12]. Students, devs, researchers, and people like us can scan the list, make proposals, and submit solutions through a clean interface. Locking in blockchain to provide solid record-keeping and rewarding through smart contracts will help us create trust, eliminate fraud, and create a shared environment where innovation is accessible and where individuals globally can explore research and development [9], [11].

2. Literature Review

Such funding platforms as Kickstarter and Upwork are not that unusual nowadays. They allow organizations to post projects and anyone can pitch or hustle on the given tasks [3], [5]. Their popularity has to do with the fact that they are ex-tremely user-friendly, feature distinct step-by-step workflows and boast a massive user base [2], [6]. But they're not perfect. The transaction charges are apt to get out of control, they continue to have a centralized authority and how the money actually comes to be distributed is a great riddle to most users [1], [4]. To add to that, there is privacy concerns, tardy payments and even the fear of biased selection and people simply do not trust them as much as they should [5], [7]. That is why many recent articles are investigating blockchain to address those pain points [8], [12], [14]. The decentralised ledger of blockchain which registers all the transactions in an immutable manner to ensure that no one can alter the information [9], [10]. It is even smoother with the addition of smart contracts as the system is able to auto-matically enforce pre-defined rules without human interference [11], [16]. It turns out blockchain is already processing a variety of use-cases such as banking, supply chains, sharing medical data, and even elections, all without middlemen, fraud reduction, and increased confidence in all parties involved [10], [12]. All that hype notwithstanding, there remains an enormous disparity in terms of designing a grant and bounty platforms that are actually decentralised [13], [14]. The majority of available solutions continue to rely on the center of checks and balances and distribution of funds manually, slowing down the process and leaving the system vulnerable to security breaches [8], [13]. They also lack automated evaluation systems, i.e. rewards tend to be unfair or obscure [3], [6]. This fact demon-strates that we are in need of an improved solution provided that we are concerned with sustainability and fairness. Our system attempts to address those problems by unioniz-ing blockchain with automation of smart-contracts [10], [11]. The aim is to create a robust, effective system to administer grants and bounties which spits out secure fund allocation, automatic reward payouts, and a transparent record which can be audited by anyone [9], [12]. Unless it fails, as we hope it will, it will nature trust and cut operational headaches and create a more collaborative research funding and problem-solving environment among students and academics alike [15], [17].

3. Proposed System Methodology

3.1.System Overview

The platform is comprised of three key stakeholders::

- Grant Providers –Folks or companies that put up grants / bounties.
- Participants – Users who submit their solutions or pro-posals.
- Admin/Smart Contract System –Process of verification and funds dispensation.

As shown in Figure 1, the proposed system follows a structured workflow starting from user registration to reward distribution.

3.2.User Registration and Authentication

We have to create an account first before we can do anything on the platform. We enter our name, email, and log in details in the sign up form, and the system ensures that it is not lost. Since we students are concerned with security, the platform identifies us using blockchain, and nobody can open fake or duplicated accounts [8], [10]. Encryption and digital signatures are used to ensure the safety of our data once we log in such that it does not end up into the wrong hands [9], [11], [16]. The entire process instills confidence between the users and the grant providers, such that only authentic students will be involved [12], [17].

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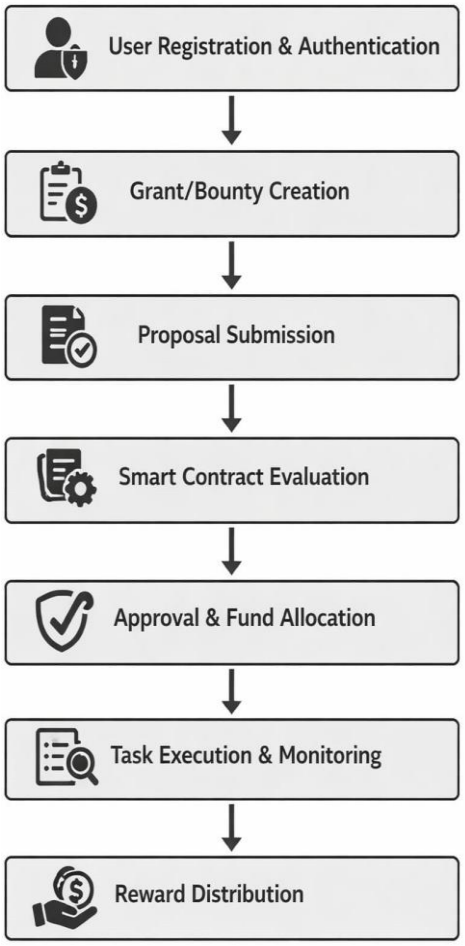

Figure 1 Flowchart of Proposed Grant and Bounty Platform

3.3.Grant and Bounty Creation

In case you are a grant giver, then you can create new grant opportunities or bounty jobs directly off the dashboard of the platform. You will include the problem statement, the cash prize, the due date, and the evaluation criteria when you formulate a task. You may also include additional information such as the skills required, deliverables expected and project guidelines to provide a student with a clear idea of what they are expected to do. After posting the grant, a smart contract is generated which secures the reward in the blockchain making the money technically owned by whoever is picked and can not be altered or removed until the terms of the project are fulfilled [10], [11]. In that manner, the budget is secured to whoever gets elected and cannot be changed or dragged before the terms of the task are met [9], [16].

3.4.Proposal Submission

We are able to filter through the entire pool of grants or bounties and select the ones that match our skills. And then, we submit, write up in detail about our plan, upload supporting materials or a demo, and that is all on the platform. The system has the records of all submissions in the blockchain and thus the data is virtually immutable and cannot be altered [9], [10], [14]. This maintains a solid document of all the proposals that we have made and this allows the grant people to go through it without prejudice and with an open mind [8], [12].

3.5.Smart Contract-Based Evaluation

It is all evaluated automatically by smart contracts that check the criteria that we have already established [10], [11]. They go through the rubric and go through all submissions and mark those that are at or above the targets. The system com-pares every proposal with the rubric at the deadline. It could even select the finest one in case it confirms that the work satisfies the requirements [8], [12]. Upon the finalisation of the contract, the payout is triggered [9], [16]. This self-evaluation assessment reduces the amount of work the administrator has to do, accelerates the process, and makes the process equitable [15], [17].

3.6.Approval and Funding Allocation

Following that first-time judging, the reviewers or admins read your proposals based on such criteria as feasibility, innovation, impact. In case you pass the proposal is approved in the system. Then the funding allocation comes in, and the money goes in your project wallet. Smart contracts define the guidelines - funding schedule, milestones, payment conditions [11], [16]. In that manner money is kept locked away until you reach the milestones, and it makes the whole thing transparent and prevents abuse [8], [9].

3.7.Task Execution and Monitoring

Once we have the cash we get to actually begin the work. The platform compares our progress with the milestones that we have agreed [10], [11]. Every so often, we need to post updates or evidence of work, and the updates are recorded. They are then checked twice by the reviewers or admins to ensure that everything is on its way [8], [12]. This continuous

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monitoring contributes to our responsibility, notifies us of snags in time and ensures that we remain on track with the project [9], [15].

3.8.Funds and Rewards Distribution

The rewards and funds are automatically and step-by-step sent out. No large lump sum at the beginning; the platform is based on a milestone plan. Upon completing a milestone and it is confirmed, that amount of money will be deposited in your account. Smart contracts ensure that the payments are performed under the circumstances [10], [16]. All transactions are safely recorded and therefore all people can know what is going on [9], [12]. In that manner we maintain low levels of fraud and ensure that we are fairly paid the amount of work we have done [8], [17].

4. System Architecture

In this way, the suggested Grant and Bounty Platform is aimed at providing us with the decentralized, transparent, and efficient platform of the research funding and collaborative development. The architecture is based on the layers such

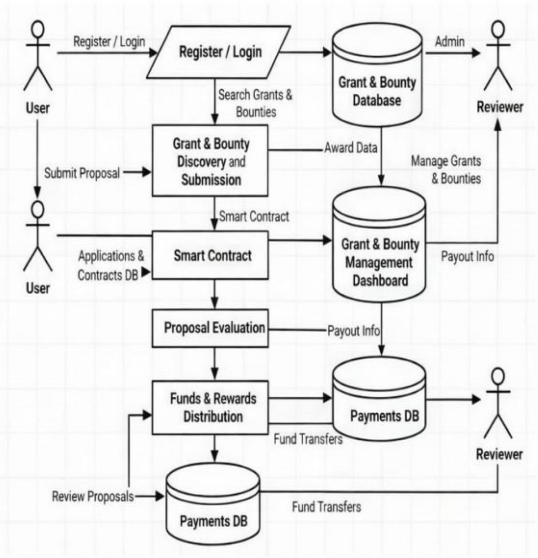

Figure 2 System Architecture of Grant and Bounty Platform

as the user interface, application logic, blockchain layer, and storage. As shown in Figure 2, it consists of the user module, the grant and bounty management module, some smart contracts, the evaluation system, and the database.

User Module: Allows individuals to create an account, log-in, claim grants and bounties, submit a proposal, and monitor all the actions securely.

Grant and Bounty Module: Assistance in seeking and requesting opportunities, and it is the fundamental way how individuals communicate with the platform..

Smart Contract Module: Automates the checking, signing off and management of the money rules- so they are all aware that it is transparent and reliable..

Proposal Evaluation: Reviewers read through every pro-posal to ensure that it is of good quality and feasible and then they give the green Light

Management Dashboard: Provides administrative control for managing submissions, monitoring progress, and decision-making.

Database Layer: Stores the information of users, proposals and financial records securely to ensure the system can retrieve data fast.

Funds Distribution: Manages the transfer of money and rewards in a safe manner, according to milestones.

Reviewer Module: Ensures that it is fair in evaluations and ensures that money is spent properly.

Workflow: Proposals are sent by the users and are validated, assessed and approved by us. We then budget the money and give it out without any issues all documented in the database. On the whole, the architecture is scalable and transparent and allows individuals to work effectively. Overall, the architecture is decentralized, secure, and scal-able, which fits the current research funding and team project well.

5. Implementation

The student project of creating a Grant and Bounty Platform was implemented with the help of a combination of the latest web technologies and blockchain fundamentals to ensure that all operations remain highly secure and operate well. To do the frontend we wrote some HTML, CSS, and JavaScript, allowing people to log in, browse the available grants and bounties, and make proposals. The backend is based on Node.js and it performs logins, request processing and maintaining all the parts speaking to one another. The user information, proposals, and

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transaction logs are stored in SQLite in a fast and easy to access form. We added some smart contracts into the spirit of a just-do- it: proposals are automatically verified, agreements are automatically executed, and the money is distributed. These contracts exist on a blockchain network to ensure that all is visible, immutable, and safe. It is all modular in that, user management, grant management, proposal scoring and payments all behave like individual applications hence keeping the platform lightweight and scalable. We developed and tested it in Visual Studio Code and on a small number of browsers, simply to ensure that there are no strange quirks in other settings. In brief, the implementation is safe on data, workflow is lean and rollouts of funds are reliable - ideal in a transparent, decentralized grant system.

6. Results And Discussion

The Grant and Bounty Platform completely surpasses the outdated, centralized models, as it makes everything more transparent, secure, and efficient. Recording all transactions in an immutable blockchain registry prevents hacks of data and increases trust. Smart contracts offload the tedious tasks of the job, handling proposal, transferring money and paying out rewards, so that we do not get lost in the paperwork. The system is decentralized and therefore we do not have to have any intermediaries, which not only saves on money but also reduces bias. The platform allows grant issuers, participants and reviewers to jam in a secure and transparent environment. During testing, the app was able to support mul-tiple simultaneous users, maintain data integrity and undertake secure transactions 100 percent of the time. A spot check of the system revealed that the processing time significantly went down and the reliability increased. The automated workflow and blockchain checks took the performance to the next level, making sure that all the moves of the funding arrive at the destination as intended to. In addition, the platform ensures that everyone has an equal opportunity, providing all users with equal opportunities and ensuring that the evaluation is transparent. Overall, the findings demonstrate that the platform is a scalable, secure, and smooth grant and bounty management solution, and can also lead to new ideas and collaboration.

Testing results show:

- Reduced processing time.
- Greater trust in the participants.
- Secure fund management.
- Open-minded appraisal system.

7. Applications

- Research Funding: It simplifies the process of us stu-dents acquiring the money to do our neat projects, and everything is open.
- Open-Source Development: Provides us with devs an opportunity to win bounties by fixing bugs, adding fea-tures, or improving projects that we have an interest in.
- Innovation Challenges and Hackathons: Lets compa-nies convene problem solving competition and compen-sate us when we come up with creative solutions.
- Freelance Task Management: It is a decentralized plat-form through which we can select gigs and get rewarded safely.
- Academic Projects: Helps students and researchers such as us get funding and partnership opportunities to do coursework and final year projects.
- Startup and Idea Funding: Provides organizations or investors with an opportunity to present ideas to potential funders.
- Bug Bounty Programs: Lets companies give rewards to ethical hackers such as us when we find and report security vulnerabilities.

8. Limitations And Future Scope

Limitations:

- The execution is fundamentally extremely complicated since you must integrate blockchain and smart-contract technology to interact with one another.
- Also bound to the underlying blockchain infrastructure that can increase the cost of deployment and

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maintenance.

- Scalability becomes a legitimate concern in the case when the user base and the volume of transactions become large.
- When a contract is on chain you are stuck - it is difficult to amend it and thus lose flexibility.
- Real-time operations require a good internet connection; failure to which the entire process comes to a halt.

Future Scope:

- To connect to newer and more efficient blockchain platforms to achieve improved scalability and speed of transaction.
- The introduction of AI to assess the proposals automati-cally might provide us with objective assessment.
- The development of mobile applications would enhance the platform and make it more convenient.
- The mechanisms on reputation might be added to enhance trust among participants.
- Lastly, the project could be extended to encompass inter-national funding organizations and cross domain partner-ships to increase the project impact.

Conclusion

The decentralized Grant and Bounty Management Platform provides a clear, secure and smooth means of managing re-search funding and bounty chores. By based on the blockchain technology and smart contracts, the system. processes opera-tions that are vital such as locking funds, proposal reception, evaluating them, and allocating rewards, which eliminates the intermediaries and reduces manual hard labor. The the decentralised nature of platform makes data consistent, deter fraud, and creates trust in grant issuers, participants, and reviewers, and increases visibility, too. in decision making where a log of all is irrevocable. transactions. In addition, automated workflows imply fewer things. processing delay and faster operation speed. In short, this suggestion corrects the imperfection of traditional funding. models and provides a scalable and reliable approach to managing. grants and bounties, innovation, collaboration, and. externally-focused research and development.

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