
Blockchain based crowdfunding systems

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1. INTRODUCTION

In simple terms, crowdfunding can be defined as raising funds for a project or a campaign by a group of people instead of using established entities such as banks or loan provider. Freedman and Nutting [1] defined crowdfunding as a method of collecting many small contributions, by means of an online funding platform, to finance or capitalize a popular enterprise. The crowdfunding action mainly involved three parties, which are the contributors, crowdfunding platform and project managers. Some popular crowdfunding plat-forms include kickstarter.com, Indiegogo.com and mystartr.com.

The main benefit of crowdfunding is that it can raise the amount of money needed in short amount of time. This is due to that many people today use Internet and social media which means that through these channels the project founder can reach out the public within a short amount of time [2]. Besides, many project founders have chosen crowdfunding to raise money for their projects as it is harder to gain loans from bank or other investors [3]. This happen because that most loans take a long time to be processed. Some studies also stated that there are benefits of crowdfunding in non-financial term. For instance, crowd funders can provide value-added involvement and feedback to the project, while also creating publicity and public awareness of the business [4]. Schlueter [5] believes that there are two main advantages of crowdfunding. The first bene-fit is crowdfunding provide better matches between the inventors and the funders from all around the world. The second advantage is, investors also have access to more information in the initial phase of the project. This information is very valuable to investors and might boost their eagerness to invest on such crowdfunding projects.

However, despite having several advantages, crowdfunding platforms still have many flaws that needed to be improved. One of the main issues that that have been in traditional crowdfunding platform is fraud cases [6], stated that online crowdfunding leaves contributors susceptible to fraud because traditional legal and reputation security measures may not work. This is further stressed in [7] who stated as no

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credentials are needed to post a project and, once the project has been posted, and there are few legal obligations to deliver what the project promised. Some other crowdfunding problems highlighted by other researchers includes 1) the rewards are significantly delayed 2) campaign initiators cease communicating with their backers for more than six months after an unmet delivery date, or 3) the promised product is never delivered and the backers are not fully refunded [8]. Another study made in [9], shows that there were over 75% crowdfunding projects deliver products later than expected.

By implementing smart contracts in crowdfunding system, we can create a contract that will hold a contributor's money until any given date or goal is reached. Depending on the outcome, the funds will either be given to the project owners or safely returned to the contributors.

Blockchain can be defined as a distributed database of records of all transactions that have been executed and shared among participated parties. The characteristics of blockchain includes decentralization of data, persistency, anonymity and auditability [10]. There are two main components in blockchain system, which are transaction and block. Transaction represents the action triggered by the participant, while the block is a collection of data recording the transaction and other associated details such as the correct sequence, timestamp of creation, etc [11]. The transaction-records, or blocks, in a blockchain are linked together cryptographically, rendering them tamper proof [12]. This means that each block that have been inserted cannot be modified or deleted. To achieve reliability, blockchain uses consensus algorithms. This is to ensure that all nodes in the system have same exact copy, thus eliminating the need of trust between each node in the network. The process to establish consensus in the blockchain network is called mining. Mining is important as it ensures that each data that added into the ledger is immutable and secure [13]. Among popular consensus algorithms include Proof of Work (PoW), Proof of Stake (PoS) and Byzantine Fault Tolerance (BFT). As the blockchain has many advantages over traditional system, various industries around the world are being disrupted by its implementation. This includes real estate activities, finance and insurance, arts, entertainment & recreations, etc [14]. Among the advantages of using blockchain technologies include ability to operate in with high efficiency and low cost. Besides, the integrity of blockchain data also can be trusted as once it entered the ledger, it cannot be tampered by anymore [15]. The only concern about using blockchain technologies is the high usage of power and computing resources by the distributed system [16]. Due to its anonymous nature, blockchain technology also may lead to cybercrimes which includes money laundering, online gambling, getrich-quick scams, extortion, illegal trading and terrorist financing [17].

One of the appealing features in the blockchain is smart contract. Smart contract can be defined as executable code that runs on blockchain to facilitate, execute and enforce the terms of an agreement. It is used to automatically executed the agreements once the specified conditions are met [20]. Smart contracts can be deployed on different platforms such as Bitcoin, NXT and Ethereum. It consists of program code, a storage file, and account balance. Users in blockchain network can create a contract by posting transactions on blockchain network [18].

One of the areas that blockchain can be implemented is crowdfunding platform. Nowadays, most of the existing crowdfunding plat-form today are centralized-based platform which can leads to some problems. As stated in [6], online crowdfunding leaves contributors susceptible to fraud because traditional legal and reputation security measures may not work. Among example of popular crowdfunding platform nowadays include kickstarter.com, Indiegogo.com, mystartr.com, and fundly.com. The applications of blockchain in crowdfunding platform have been discussed in [19]. The author stated that the blockchain can solve crowdfunding issues such as fraud, money laundering, and information asymmetry. As the data in blockchain is transparent, investors can scrutinize the data on the block to correspond the project's authenticity. There are also some companies that have started implementing blockchain in crowdfunding platform. At this moment this research is written, crowdfunding platform that we found are WeiFund, Acorn and Cybit. WeiFund is operated by allowing user to create campaigns which used smart contracts. Besides, it also allows user to create their own smart contracts. At this moment, WeiFund is still in alpha phase. Meanwhile, Cybit and Acorn are still in main ICO crowdsale phase. In Malaysia context however, there is no undergoing development for blockchain based crowdfunding yet. Table 1 shows the current crowdfunding platforms in Malaysia.

In Malaysia, usage of cryptocurrencies is still studied by Central Bank Malaysia (CBM). As for now, usage of Bitcoin or other cryptocurrencies is not illegal in Malaysia, however, it is not recognized as legal tenders [17].

Table 1. List of Existing Crowdfunding Platform in Malaysia

No	Name	Niche	Use blockchain?
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1	Mystatr	Social clause	No	2	PitchIn	Equity	
		crowdfunding	No				
3	SkolaFund	Education	No				
4	Give.my	Education	No				
5	100percentproject	Education	No				

2. RESEARCH METHOD

The system is built by using ReactJs as front-end and use NodeJS as its backend. For contracts development, Solidity language is used. The contract is compiled into ABI code in JSON format using solc npm package. The ABI interface then is parsed to instance of Web3 provider for contract deployment. Instead of using local node, we used Infura which acts as remote node to connect to Ethereum network. To start using the system, we need to set up cryptocurrency wallet called Metamask. Metamask is a browser extension which allows users to interact with any decentralized application(dApps). After user create account in Metamask, he can transfer the Ethereum to his account. Once user have some Eth in his account, he can start interacting with the system as Metamask has injected a Web3 instance in the web browser.

Then, campaign can start creating campaign and other users can contribute to the campaign. Apart from that, campaign manager also can create requests to show how the money collected will be used. The contributors decide whether the expenses are appropriated or not, and if it is approved by majority of the backers, then only the Ether will be sent to the vendors. The system is connected to the Ethereum network by using Infura infrastructure. As this system only acts as prototype, we do not use main Ethereum network, instead, we used testnet which behaves similarly to main Ethereum network. For this project, we use a proofofauthority blockchain called Rinkeby network to stimulate transactions that are performed by users in this system. As we are using Rinkeby network, Ether cannot be mined, instead, we have to request from Rinkeby Test Faucet at <https://faucet.rinkeby.io/>. The details of transactions performed by users, either fail or success, can be viewed by using Etherscan API. Figure 1 shows the diagram of system architecture and Figure 2 shows the transactional flow of Ethereum in the system.

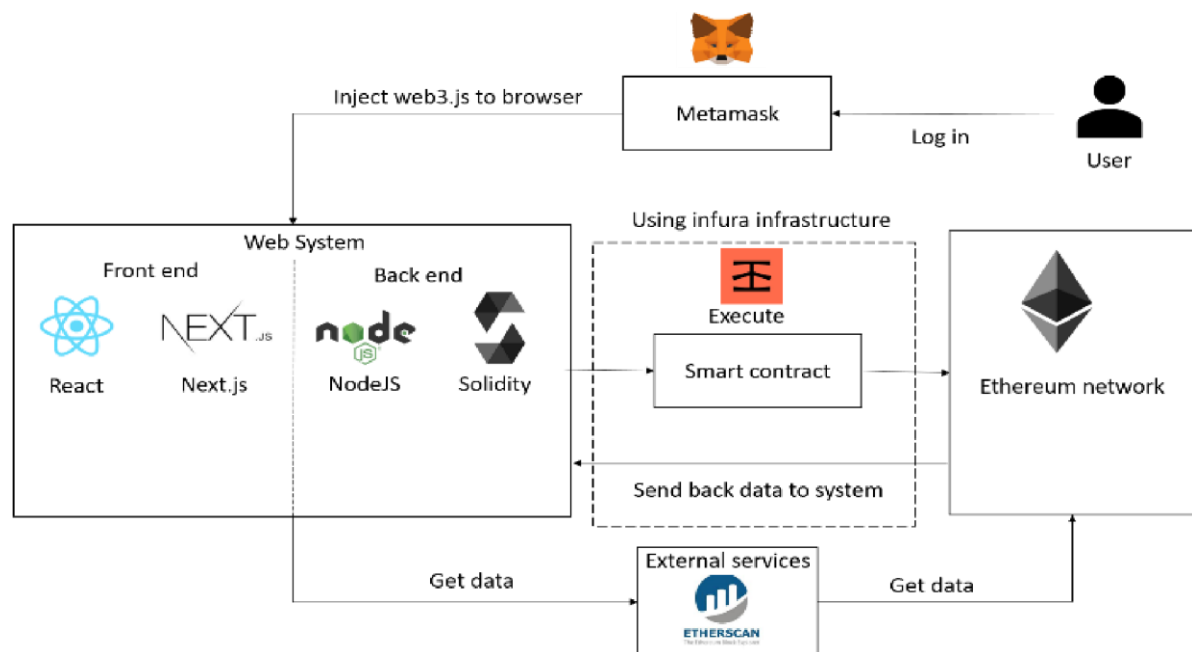


Figure 1. System architecture

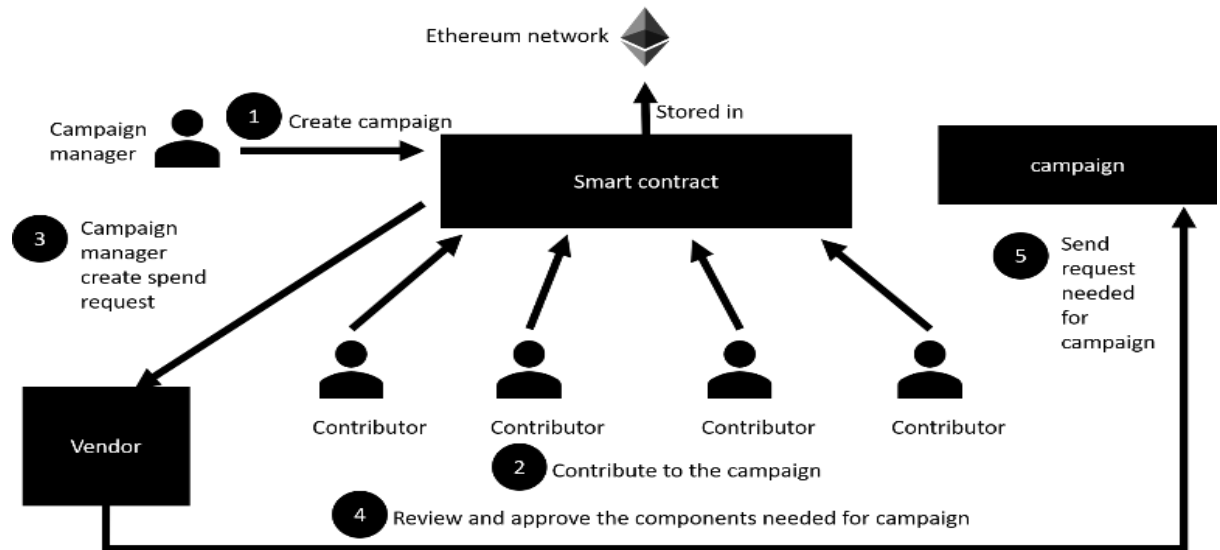


Figure 2. Flow of ether in proposed blockchain model

Flow:

- Campaign manager create campaign. To create the campaign, he needs to fill campaign details. To convince contributors, he also may upload the proposal in PDF format. The proposal will be stored in InterPlanetary File System (IPFS), a peer-to-peer file sharing system.
- The campaign then will appear in campaign page. If contributors are interested with the campaign, he may contribute to the campaign.
- Campaign manager create expense request, which consists of list the items needed to execute the campaign.
- Contributors received notifications new expense request has been added.
- Contributors review either the item proposed by campaign manager is appropriate or not, if it is appropriate, then contributors can vote to agree with the item listed.
- If majority of contributors agree, smart contract will send collected funds to the respective vendors.
- The respective vendor then sends the item agreed to the campaign manager.

Each transaction is recorded in blockchain and can be seen by all users in Etherscan website as shown in Figure 3.

Transactions

Erc20 Token Txns

Latest 6 txns

TxHash	Block	Age	From	To	Value	[TxFee]
0xe12d8e614f20ca1...	3094359	14 days 16 hrs ago	0x986ffd3cfbb63280...	OUT 0x187205a8c4580ba...	0.3 Ether	0.000047296
0x98e21e41ca6feb4...	2947726	40 days 5 hrs ago	0x986ffd3cfbb63280...	OUT 0x8c1ea043cbc1289...	0 Ether	0.0000802342
0xf92ecf5e665e81c8...	2766424	72 days 6 hrs ago	0x31b98d14007bdee...	IN 0x986ffd3cfbb63280...	7.5 Ether	0.000021

Figure 3. Records of Ethereum transaction

3. RESULTS AND ANALYSIS

Implementation of blockchain technology in crowdfunding platform increase contributor's confidentiality when contributing to campaign. This is due to the nature of blockchain transactions which is transparent. All users can view the records of each transaction which can be seen by using Etherscan API. Besides, the implementation of smart contracts also eliminates the need of trust of each stakeholder for the campaign as the contract is automatically executed once the conditions are met. We are in midst of finalizing

the implementation of the system and data of the results would be available soon which is not yet available in our hand at this moment. There would be some acceptance study as well which is also in progress.

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4. CONCLUSION

Provide a statement that what is expected, as stated in the "Introduction" chapter can ultimately In this paper, blockchain based crowdfunding platform is proposed to provide more transparent transactions in decentralize structure. For future works, we plan to implement ERC-223 tokens into the smart contracts as it provides more benefits which are: Consume less gas, allows developers to handle incoming token transactions and eliminates the problems of lost tokens [21].

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