Blockchain-based Zakat Collection to Overcome the Trust Issues of Zakat Payers

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Abstract—Zakat is one of the five pillars in Islamic principles, subject to all qualified Muslims which requires them to contribute a proportion of one of their income or the wealth possession for the welfare of the Muslim community. In Malaysia, Lembaga Zakat *is the organization appointed by each state government to manage the zakat transactions. The zakat transactions can be done either through online transactions or over the counter. However, there are issues related to zakat management such as the zakat payers are not satisfied with the zakat distribution, and there are claims for lack of transparency in the zakat management which lead to trust issues among zakat payers to contribute their zakat through* Lembaga Zakat. *One way to respond to the issues is by having transparency in the zakat transaction by applying a trust model such as blockchain in zakat management. Thus, this project aims to use blockchain technology and its main component, smart contract, as the base of the zakat collection and utilize Ethereum as the platform.*

Keywords— Zakat, blockchain, smart contract, Ethereum
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I. INTRODUCTION

Blockchain is a revolutionary technology in line with the fourth industrial revolution that aims to transform people's lifestyles. The technology offers a transparent mechanism that promotes transparency and security, making the information difficult to alter by unauthorized parties. Blockchain is based on Distributed Ledger Technology (DLT) using consensus algorithms that allow data or transactions to be stored globally across servers. Blockchain is strongly grounded by three principles in the core of this disruptive technology: distributed ledger, cryptography [1], and peer-to-peer(P2P) [2]

In other words, blockchain introduced a record-keeping technology [3] that is decentralized, immutable and secure. Due to these features, blockchain technology brings a model of trust that does not rely on a central authority. A blockchain network also relies on strict protocols and a consensus algorithm to verify the truth of any given past or present state of the system, which could be an ideal solution for zakat collection issues, as discussed below.

Lembaga Zakat Selangor, Pusat Pungutan Zakat Majlis Agama Islam Wilayah Persekutuan, Pusat Zakat Negeri Sembilan, Majlis Agama Islam dan Adat Melayu Terengganu and Lembaga Zakat Negeri Kedah Darul Aman are example of organizations that manage zakat collections and distribution for respective state that it represents. Each of the organizations listed above is appointed by the respective state government in Malaysia and generally can be called as *Lembaga Zakat*. In addition, each of the *Lembaga Zakat* has its own zakat management system to manage zakat collections and distributions data and information.

The Zakat Management System consists of five stages: planning the zakat management, collecting the zakat, organizing, distributing, and disbursing the zakat [4]. One of the main contributors to the zakat foundation is the zakat collection which is contributed by the zakat payers, also known as *muzakki*. Focusing on zakat collection, Lubis and Azizah [4], in their findings, stated that one of the challenges on zakat collection is the zakat payers choose not to pay zakat through the Zakat Management System. The reason not to pay zakat through the Zakat Management System is either the zakat payers prefer to directly liaise with the zakat recipients or the zakat payers has some issues with Zakat Management System such as the system itself is claimed are with lack of transparency, storing inaccurate data or the zakat payers have trust issues towards the system.

Similarly to Lubis and Azizah [4] findings, Wahid, Kader [5] also identified that the zakat payers are not satisfied with the current zakat distribution management which lead to trust issues. The trust issues also discussed by Ali, Khamar Tazilah [6] and trust are found as one of the significant factors for zakat payers to pay zakat to zakat collector institutions.

Thus, the existing trust issues which are caused by the unjustified expenditure [7] and ineffectiveness of the current Zakat Management System rationalizes the need for more advanced, life-changing technological approaches like blockchain. These are real deals since the goal of zakat is to distribute the fund equitably [8], but it seems like it does not reflect positive results from zakat distributions when there

are still some needy local communities that did not benefit from zakat [7]. This project explores, addresses, and uses blockchain technology in the sub-component of the Zakat Management System, the zakat collection. With the blockchain and its security features offered, the zakat collection system is hoping to instil the transparency of zakat collections and increase the zakat payer trust towards the Zakat Management System.

This project focuses on the collection phase of the zakat transactions. As the zakat collection faces many challenges, it seems more than a need for the current zakat organizations to implement blockchain technology in their Zakat Management Systems.

II. RELATED WORK

A. Zakat

Zakat is also known as almsgiving. Zakat is one of the five pillars of Islamic principles subjected to all qualified Muslims [7, 9]. Zakat has two categories: Zakat al-Fitr and zakat of wealth [7]. Zakat is the payment from a defined proportion of one qualified Muslim's income or the wealth possession for the welfare of the Muslim community. The goal of this principle is mainly to uplift the quality of life of the needy as well as extinguish selfishness among the community and also to eradicate poverty. In a Muslim country like Malaysia, zakat affairs are institutionalized where the institution will hold the responsibility of managing the collections and distributing the Zakat [7]. The institution known as *Lembaga Zakat* will also identify the recipients or called asnaf who are qualified individuals to receive the Zakat, such as the needy, the poor, the new Muslim converts.

B. Blockchain

Fig. 1 represents a high-level overview on how blockchain works. When a peer initiates a transaction whether it involves asset transfer, record changes or other information, that requested transaction will be broadcasted into the network the peer resides in. Upon received, a group of validator nodes then will be responsible to decide whether a transaction is valid or not valid before appending a new block, which finally will lead to the completion of a blockchain transaction for the valid transaction.

One of the important features illustrated in Fig. 1 is blockchain security which emphasizes validation and verification. Each blockchain transaction will be verified and validated by nodes that are in a blockchain network. The security in blockchain involved in encryption is important to prevent sensitive information from getting into the wrong hands, altered or counterfeit. For instance, every participant has their unique key, known as cryptographic "hash" [3] which makes them pseudo-anonymous.
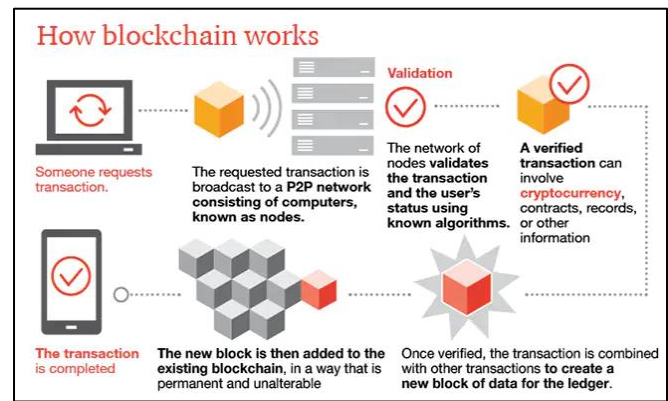

Fig. 1 Illustration of general blockchain concept[16]

Besides encryption, blockchain technology also comprised of distributed databases, timestamps, and consensus algorithms [10]. The term distributed ledger can be rephrased as a distributed log of timestamp and validate transactions where the records of the payments that have had occurred in one network are downloadable by all of the network participants. On the other hand, a consensus algorithm is a computational process where the goal is to reach the consensus of multiple unreliable nodes. There are many types of consensus algorithms, for instance, Proof of Work (PoW) where a group of 'miners' will solve a computation problem as a part of validating one transaction.

The decentralized nature of blockchain makes it is different from traditional centralized systems. Blockchain provides a distributed ledger that enables each of the network users to get a copy of a transaction. Thus every transaction becomes transparent and visible to all users. It also eases the data sharing process without compromising its data security and user's privacy. Therefore, when compared to centralized systems, blockchain is more reliable, especially when designing a transaction system involving real assets. It is equipped with the strengths of security, tamper-proof, transparency, traceability, inter-connectivity, and also cost-effectiveness. Another main component of blockchain is a smart contract. The smart contract is a simple program that runs and is stored in the blockchain network which defines a set of agreements and conditions between nodes (mainly between buyer and seller) to automate transactions [11]. This program removes any trusted intermediates, avoids fraud losses, and minimizes accidental exceptions.

C. Blockchain-based Zakat Management System

Fig. 2 illustrates the blockchain-based zakat collection system architecture [12]. In this blockchain-based zakat collection system, a complete zakat transaction will only be recorded or committed to the blockchain if it has gone

through several processes. The processes start with a zakat payer request to make a payment. A smart contract will take care of the request by simplifying the transactions between both parties, the payers and the zakat collection system. If all the conditions for a zakat payer and the system are met, the transaction is made. This newly made payment will be noticed by the network. Blockchain-based Zakat Collection System is designed to fit the general blockchain architecture with some enhanced model for zakat payment. Any zakat payment will be encrypted on the payer side and can only be decrypted by the payment receiver. The details of the zakat payment transaction are treated as blocks. The payment transaction that will be updated in all nodes' ledgers contains all the details of the payment such as the payer id, payment amount and the transaction date. The new payment transaction record can be imagined as a block and is mathematically related to the previous block; the previous zakat payment transaction. In addition, all nodes in the network have the same record in their ledger.

Fig. 2 Illustration of Zakat Collection System in blockchain architecture [12]

D. The Successful Stories of Blockchain-based Zakat Systems.

Integrating blockchain technology in Islamic social finance has been popular in the last few years. Currently, there are not many Islamic institutions or charities that accept the use of digital currency as it is still clouded by uncertainty and lack of fatwa from their local mufti, not to mention the differing view of Islamic scholars. The process of collecting Zakat can not be separated from trusted organizations or institutions because they are the one that is reliable enough to avoid any form of fraud.

Momin [13] reported a Turkish mosque located in Shacklewell, London known as Masjid Ramadan has become the first to accept Zakat in crypto-currency either using Bitcoin or Ethereum. The mosque will then need to convert the digital currency into sterling as soon as possible to avoid the sum affected by the volatile valuations of Bitcoin. This implementation has helped them to gain a broader scope of donors from Muslims all around the world. The donations

can be made via the mosque's websites, where they need to scan a Quick Response (QR) code and then gain the information on their crypto-currency hard wallet[13].

Another example of blockchain in Zakat is a Malaysia-based company named Global Sadaqah in collaboration with SINEGY, a recognized market operator approved by Securities Commission Malaysia and Luxtag, a solution provider to enables the tracking and tracing of products using blockchain work together to promotes Muslim cryptocurrency owners to pay Zakat on their digital currencies. The Zakat collection on digital currencies by Global Sadaqah accepts Zakat payment through blockchain and even accepts the Financial Process Exchange (FPX) of participating banks [14].

Lastly, the International Federation of Red Cross and Red Crescent Societies (IFRC) blockchain application by Dr. Ziyaad Mahomed and his team comes up with an application that leverages blockchain technology Zakat collection. The usage of the app is very simple. Firstly, the user needs to choose either to do Zakat or charity. If Zakat, then the app prompts the user to select which Mazhab they follow. Next, the user can choose what they would like their Zakat being used for, such as education or eliminating poverty. Lastly, they will complete their payment via a secure gateway [15].

III. METHODOLOGY

To come out with a working zakat collection system, we have conducted four phases of the development process as illustrated Fig. 3. The phases consist of exploring the existing studies on zakat, investigating blockchain technologies and design, coding, and testing the zakat collection system.
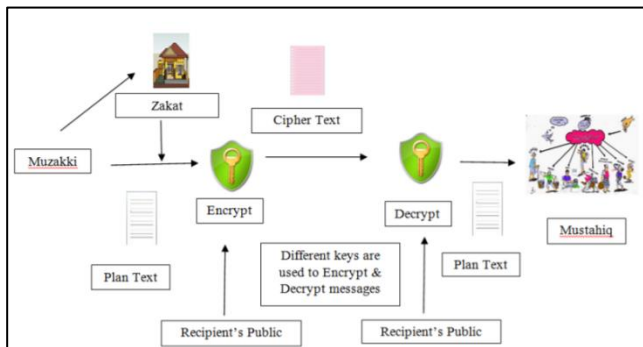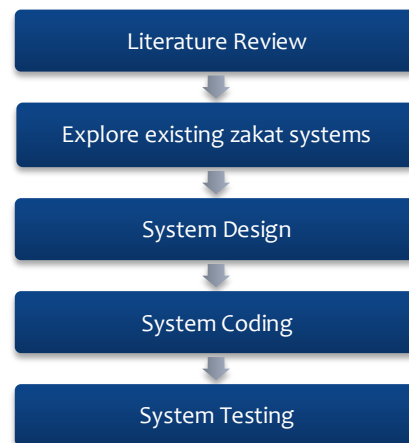

Fig. 3 The development phases of this project

A. Literature review and study the existing system

We started our project by doing literature reviews, including the three main scopes: Zakat Management System, Blockchain Technology, and exploring the options of platforms suitable for our proposed system. From the

research, we discover some issues in the traditional Zakat Management System: lack of transparency, lack of trust from donors, and inefficiency. Fortunately, Blockchain Technology, with its provided transparency, could solve many current problems, especially in gaining people's trust in local Zakat Institutions.

We also reviewed websites from Majlis Agama Islam Wilayah Persekutuan (MAIWP) and Majlis Agama Islam Selangor (MAIS) to study more about types of Zakat as well as the calculations behind every one of them. From the websites that we explored, we have gained insights of the website that uses the UI/UX in order to ensure the flowing smoothness of Zakat Payment which is very useful in building our prototype.

Based on the investigation, we identified what needs to be taken into account before verifying someone as eligible for paying Zakat. We also explore the Islamic scholars studied to calculate the eligibility of payer to Zakat using digital currency parts such as Bitcoin and Ethereum.

B. Design

This design phase is focusing on the design of the blockchain-based zakat collection application. In this project, we assume that the zakat payers are using the Ethereum wallet. To pay Zakat, each transaction should be done through our smart contract. The smart contract is a program that runs on blockchain that will check if the requested transactions satisfy all the requirements or pre-determine conditions stated in the contract before agreeing to sign the transaction. To interact with the smart contract that we built, tested and deployed onto the blockchain network, we will provide a friendly user interface connected with the network using the web3 framework.

The flow zakat payment using this system is very straightforward. In this development, all transactions are expected to use Ether cryptocurrency for payment. The flowchart illustrates in Fig. 4 shows how our smart contract manages the zakat collection starting from money transferred from payer to zakat centre until the transaction block is committed into the distributed ledger (blockchain).

Based on Fig. 4, the process is initiated when the zakat payer requests a transaction (i.e. to pay the zakat fee through the web app). When a person intends to pay the zakat, the system will create a block that represents the transaction. Then, the block is sent to every node in the network. Next, nodes in the network will validate the transaction and nodes that validated the transaction will receive a reward (mining) for the Proof of Work. That newly created block is added to the existing blockchain and the transaction is completed.

For this zakat blockchain solution, the parties in the network could be ranged from the zakat payer and the zakat authorities (Islamic Religious Councils). All the transactions during this path are kept in the general ledger (e.g data with zakat fee, date of payment, payer, the total amount of wealth and the type of zakat). This information is complete and authentic.

This system is suitable with public blockchain networks as all Muslims should has access to it as all of them are obliged to pay zakat. Thus, all zakat payers will be a node in this network and help validate a transaction.
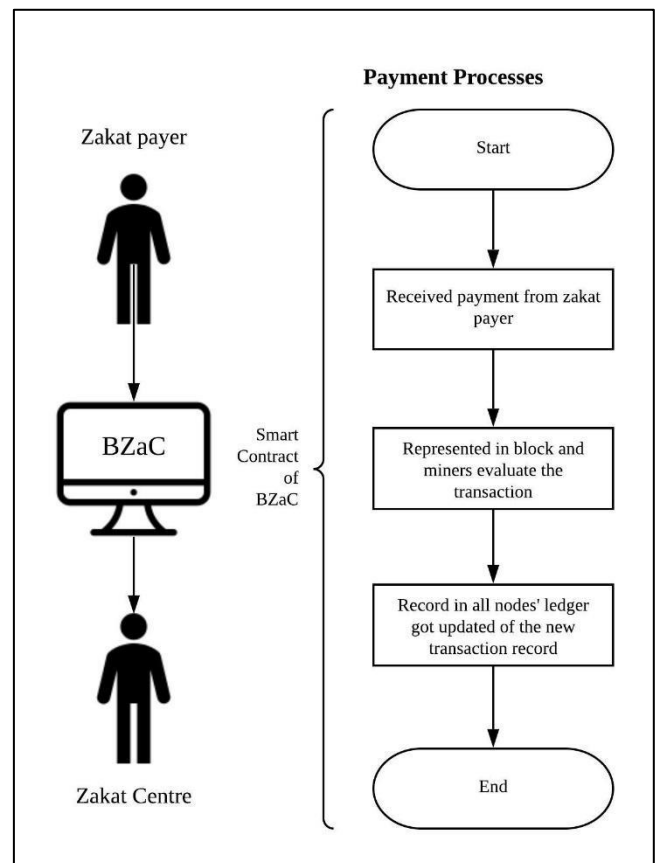

Fig. 4 The design architecture of the BZaC system that focused on managing the collection part.

C. Implementation

To write the smart contract and compile it, we used an online Remix IDE. The environment is set as Javascript Environment because it provided us with 10 'fake' accounts with 100 ethers each. With this tool, the writing process as well as debugging can be conducted in a fast-paced approach. After that, the code of the contract will be tested using Truffle software. The environment that comes with the Truffle package really helps us to simulate how the real blockchain network works. Next, to run using the local blockchain, we used Ganache which provides us with visual mnemonic and account. After completing all of these, we integrate the smart contract with the front-end with the help of Web3 JavaScript library.

D. Testing and Evaluation

As in our testing, the application is working fine in transferring the money (Ether) from an account (zakat payer) to another account (zakat centre). Our project is expected to work fine as Minimum Viable Product (MVP) to demonstrate the zakat collection process using Ethereum cryptocurrency. This MVP will require an account address to receive the Ether (zakat fee), and the transaction record will be shown using another application.

For the testing purposes, all Ether wallets created are not real digital wallets, it is just for testing purposes. The much created digital wallet is only intended for several zakat payer account identification. The account is managed through a browser extension namely MetaMask.

In this phase, a test case is introduced to testify the operability of our MVP (Blockchain-based Zakat Collection System). Examples of the smart contract that are tested are presented in

Table 1.

Table 1 Smart Contact Created and Tested

No	Task	Remark
1	Transfer money from an account to another account.	Need to have two different accounts id.
2	Check the balance of an Ethereum wallet.	Only can be done in admin access.
3	Review the transactions of the zakat payment.	A list of payers and the amount paid should be returned by the system.
4	Check the gas usage and balance.	The amounts of used gases to make a transaction and the balance can be inquired through a specific function.
5	Deploy the smart contract into test networks.	Compare the complexity of deploying the smart contract into a test network namely Rinkeby and Ropsten.

In this project, its smart contract is designed to perform several simple use cases. The smart contract is expected to fulfil the functions listed in

 Table 1 above. Most of the intended works to be done through the system, the smart contract has a dedicated function (e.g. checkBalance and reviewPayment). The smart contract is tested on two kinds of test network architecture which are proof-of-work blockchain (e.g. Ropsten) and proof-of-authority blockchain (e.g. Rinkeby).

IV. OUTCOME

For this project, we created a Minimum Viable Product (MVP) of the zakat collection system that runs using a local host of the Ethereum network. To create the smart contract, we used Remix IDE and checked all the transactions using the Ganache application. A successful transaction will be included in the global blockchain dashboard and it can be viewed through etherscan website. If a zakat payment is successful, the payer also will be aware of the new balance in his or her Ethereum wallet. There are several functions contained in this system like withdrawing money, transferring ownership of a cryptocurrency, depositing money, checking the previous transactions and checking balance. Calling these functions using the terminal will display the corresponding output. These functions will be restricted only for the zakat authority council or for public usage.

V. FUTURE WORK

This system is an initiative taken by Final Year Project students to explore blockchain and to show how powerful the technology can be and how useful it is in solving trust issues in zakat collection. This project focuses on the collection part of the zakat management system. Thus, the future work of this project is to migrate the distribution part of the zakat management system using blockchain technology to ensure the transparency and integrity of the distribution records. Another task that can be done in future is to create a better user interface (UI) for this project as this project requires more time to be integrated with a good UI as it requires us to design a universal UI for all zakat players. One more task that should be accomplished in future is to create a dedicated login page for zakat centre staff to review all of the zakat transactions, which allows the staff to print the selected zakat transaction record and register the Asnaf details. Also, in future, this project can be extended by adding a feature that can automatically convert the cryptocurrency (e.g. Ether) amount into physical money (e.g. Ringgit Malaysia) amount.

VI. CONCLUSIONS

This project is expected to be able to ease the process of zakat payment through a digital platform given that the user has an Internet connection. Payment can be done in cashless mode as this system will integrate with a payment gateway. The most important feature is this system will provide a safe money transaction as every transaction will be encrypted with a cryptography algorithm. The blockchain is introduced to keep track of all zakat transactions automatically in a distributed ledger. The good thing about this technology is that the record is transparent to all people.

Consequently, it can ensure the integrity of a zakat institution because all people can see where the zakat fund is allocated. Another feature of the ledger is it cannot be removed from the system once it is written. This will prevent any cheating from all parties involved if anything happens in

future. This system will also save costs because it does not need to be monitored by any third party like a bank or government.

REFERENCES

[1] M. Mukhopadhyay. *Ethereum Smart Contract Development: Build blockchain-based decentralized applications using solidity*. 2018: Packt Publishing Ltd.

[2] *What is Blochain.* (2020). Available: https://itchronicles.com/what-is-blockchain/.

[3] V.L. Lemieux. "Blockchain and public record keeping: of temples, prisons, and the (re) configuration of power," Frontiers in Blockchain, vol. **2**, pp. 5, 2019.

[4] M. Lubis and A.H. Azizah, "Towards achieving the efficiency in zakat management system: interaction design for optimization in Indonesia. in International Conference on User Science and Engineering," in *Springer*, 2018.

[5] H. Wahid, R.A. Kader, and S. Ahmad, "Localization of Zakat distribution, religiosity, quality of life and attitude change (Perceptions of Zakat Recipients in Malaysia)," in *Proc. the 13th Malaysia Indonesia Conference on Economics, Management and Accounting*, 2012.

[6] M. Ali, M.A., et al., "Factors that influence the zakat collection funds: a case in Kuantan," *SEAJBEL*, vol. **13**(1), pp. 30-37, 2017.

[7] H. Sulaiman and N. Jamil, "Information security governance model to enhance zakat information management in Malaysian zakat institutions," in *Proc. of the 6th International Conference on Information Technology and Multimedia*, 2014.

[8] A. Othman, "Non recipients of zakat funds (NRZF) and its impact on the performance of zakat institution: A conceptual model," in *2011 IEEE Colloquium on Humanities, Science and Engineering*, 2011.

[9] A.K. Aljabr, et al. "An Expert System for Calculating Zakat in Islam," in *3rd International Conference on Emerging Trends in Engineering, Sciences and Technology (ICEEST)*, 2018.

[10] S. Likens, Making sense of bitcoin, cryptocurrency and blockchain. [Online]. Available: https://www.pwc.com/us/en/industries/financial-services/fintech/bitcoin-blockchain-cryptocurrency.html

[11] S. Yu, et al. "A high performance blockchain platform for intelligent devices,". in *1st IEEE international conference on hot information-centric networking (HotICN)*. 2018.

[12] A. Abuhashim and C.C. Tan. "Smart Contract Designs on Blockchain Applications," in *IEEE Symposium on Computers and Communications (ISCC)*. 2020.

[13] L. Hamdani, "Zakat Blockchain: A Descriptive Qualitative Approach," *EkBis: Jurnal Ekonomi dan Bisnis*, vol. **4**: pp. 492-502, 2020.

[14] S. Momin. (2018) "British mosque becomes first to accept Zakat in crypto-currency this Ramadan," [Online] Available: https://english.alarabiya.net/features/2018/05/28/British-mosque-becomes-first-to-accept-Zakat-in-crypto-currency-this-Ramadan.

[15] GlobalSadaqah to Enable Zakat and Waqf Payments Using Bitcoin.[Online] Available: https://fintechnews.my/23658/blockchain/globalsadaqah-to-enable-zakat-and-waqf-payments-in-bitcoin/.

[16] K.A. Noordin, "Islamic Finance: Using blockchain to improve transparency of zakat process," 2018.