Proposing the use of Digital Currency in Hajj and Umrah

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Abstract—Despite being the two major gatherings of Muslims in the two holiest cities of Saudi Arabia, Hajj and Umrah religious pilgrimages have come under scrutiny due to their numerous challenges. These challenges, including rising death tolls among pilgrims and soaring complaints about corruption and incompetence against pilgrimage managers, have instigated several debates over rival approaches to reforming the pilgrimages. This paper aims to explore literature reviews on digital currencies, especially Cryptocurrencies, highlight their role in solving these financial mismanagement issues, and propose their use in the organization and management of Hajj and Umrah. The study approach was to review recent literature about Cryptocurrencies to understand the concept, their benefits and why they could be adopted in solving corruption issues in Hajj and Umrah. The paper also throws light on the impact the use of cryptocurrencies in the pilgrimages will have on the economy of Saudi Arabia and future potentials. From the review of various literature, findings from the study revealed that utilizing the blockchain technology of cryptocurrencies would offer a lasting solution to corruption and financial mismanagement encountered in Hajj and Umrah. This knowledge would contribute positively to reforming the pilgrimages and provide a theoretical basis for a practical application of digital currencies in the organization and management of Hajj and Umrah

Index Terms—Bitcoin, Blockchain technology, Cryptocurrency, Digital currency, Hajj and Umrah, Smart contract, Pilgrimage

1 Introduction

Hajj and Umrah are two religious pilgrimages birthed by Islamic religious doctrine where faithful Muslims travel to Makkah and Madinah, the two holiest SaudiArabia cities, and perform rituals in several sacred sites. Based on the Islamic lunar calendar, Hajj, a 5-day event, takes place from the 8th to the 12th day of the last month of the Islamic year (Dhul Hijah). This timing, however, varies in the Gregorian calendar, occurring about 11 days earlier each successive year. On the other hand, Umrah is a non-compulsory minor pilgrimage that occurs any time of the year [1]. Approximately 2 to 3 million Muslims from about 183 countries perform Hajj each year. In 2017, a total of 2,352,122 pilgrims were officially reported to perform Hajj [2].

Due to these high populations, however, the pilgrimages are not without challenges. One of which is the rising death tolls of pilgrims year after year [3]. According to Bianchi [4], out of about 23 million overseas pilgrims that came to Mecca for the Hajj between 2002 and 2015 in the Hijri months of Dhu al-Qi'dah, Dhu al-Hijjah, and Muharram, about 30,000 of them lost their lives. In comparison, 29,000 foreign pilgrims lost their lives during the Umrah season. The author also recorded that 31,000 pilgrims out of 11 million who came from inside Saudi Arabia also lost their lives, with about 10,000 dying during the Hajj months and 21,000 over the Umrah months.

Furthermore, the pilgrimages are also burdened with endless scandals, corruption and financial mismanagement amongst organizers both in Saudi Arabia and other Muslim nations [3]. In Malasia, around the early 2000s, Tabung Haji, the Malaysian hajj pilgrims fund board, was accused of inadequate investment and financial mismanagement [5], [6]. Though refuted by the board, records revealed they were disbursing sour loans to Malaysian businesses and acquiring overpriced properties [7]. Muhyiddin [8], in his study, also revealed that Indonesians pay as much as 50% more than their actual pilgrimage fees required by law for these pilgrimages. These corrupt practices have given the pilgrimages an awful image.

In tackling these challenges, pilgrims must be trained and equipped with hajj knowledge before embarking on the pilgrimage. This training could be in the form of sharing information via gadgets, applications, and the web [9]. There is also a need to restore stakeholder's trust after these numbers of recorded financial scandals through transparent disclosure to all stakeholders, especially for the depositors of how funds are used, invested and managed. The use of Cryptocurrency will be essential in achieving such a goal. This study explores various literature on cryptocurrencies, highlights their role in solving financial mismanagement issues, and proposes their use in the organization and management of Hajj and Umrah.

2 CRYPTOCURRENCY

Cryptocurrencies are digital assets that serve as a medium of exchange that, unlike paper money in physical form and issued by a central authority, are decentralized and electronic. In cryptocurrencies, individual ownership records are stored using cryptography in a computerized database called a ledger, and this ledger is powered by a technology called Blockchain technology [10]. For a system to be regarded as a cryptocurrency, such system will require no central authority,

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have a detailed record of all cryptocurrency units and their ownership, allows transactions to be performed when ownership of the cryptographic units can be proved despite a change in ownership, have detail records of created new cryptocurrency units if they can be created, can prove ownership of cryptocurrency units using cryptographic technology, and can perform at most one instruction when more than one command for the change in ownership of the same cryptographic units in the system are simultaneously given [11].

American cryptographer David Chaum could be the first to conceive Cryptocurrency after developing an anonymous cryptographic electronic money called ecash in1983 [12]. More interest developed in 1996 after the publication of "How to Make a Mint: the Cryptography of Anonymous Electronic Cash" and "The American Law Review" by the American National Security Agency [13]. Finally, in 2009, Satoshi Nakamoto created the first decentralized Cryptocurrency called bitcoin; this marked the opening of the floodgates as Namecoin, Litecoin and Peercoin shortly followed in 2011. Currently, hundreds of cryptocurrencies exist in the world [14].

Cryptocurrencies can be generally classified into Bitcoins and Altcoins. Bitcoins are the first designed cryptocurrencies created as a reward for mining. It is trendy, with approximately 6 million cryptocurrency wallet users using it, according to the University of Cambridge as of 2017 [15]. Bitcoins meets all the features of a cryptocurrency. They have open-source software, are decentralized with a peer-to-peer network. They are Global, Fast, Reliability, Secure, Automated, Scalable, Sophisticated and flexible. All other types of cryptocurrencies and digital assets are collectively called altcoins. According to Paul Vigna, they are alternative versions of bitcoin [16]. There are many altcoins, including Litecoin, Ethereum, Ripple, Dash, NEM, Monero, Neo, Stellar, Ether, Dogecoin, Ampleforth, Aragon, Augur, Axie Infinity, Balancer, and Bancor Network. Ethereum is arguable the most actively used Blockchain.

Etherium is a decentralized virtual machine based on blockchain technology that merges the concepts of altcoins, scripting, and on-chain meta-protocols, which allows developers to create scalable, standard, feature-complete, interoperable and easily developable arbitrary consensus-based applications. It has a blockchain with a built-in Turing-complete programming language, allowing developers to write smart contracts and create self arbitrary rules for ownership and transaction formats. Ethereum runs on smart contracts, whose state is stored in the Ethereum blockchain, and each instruction consumes gas (a virtual resource that fuels the execution and inclusion of transactions into the Blockchain). Each block has a block gas (execution fee) limit, and the networks adopt the Proof of Work algorithm [17].

2.1 BLOCKCHAIN TECHNOLOGY

This type of technology uses a decentralized, fully replicated append-only ledger in a peer-to-peer network. It has a sequence of blocks containing the transactions of the ledger, where all participating nodes have a complete local copy of the Blockchain. These transactions are sorted chronologically, and each block in the chain houses a cryptographic hash of the previous block. As the blockchain Nodes receive network broadcasted transactions, it creates new blocks. Once complete, other nodes includes it in the Blockchain [18]. In addition to having a secured hash of the previous block, a current block also has a timestamp. The chain breaks when attempted modification of existing data present a varying hash value from that of the last block

Blockchain technology uses the concept of Asymmetrical cryptography and Distributed IT architecture. Asymmetrical cryptography allows the use of a paired public and private key system, enabling users unknown to themselves to exchange encrypted information. In comparison, a distributed system empowers nodes connected to a network to communicate. These Blockchain creating concepts gave rise to a secure and trustworthy environment, allowing unlimited data, transactions, and contracts exchange. In blockchain technology, the Proof of work is used to prove the credibility of data in blocks. Its mechanism involves using the method to solve the puzzle, so before a new block is created, the nodes must resolve that puzzle [19]. ETHEREUM and BITCOIN, the two most popular blockchains systems, use this mechanism. Other mechanisms include Proof of Bandwidth, Proof of Elapsed Time, Proof of Authority, and Delegated Proof of Stake. Because of their design, the Blockchain protocols are difficult to tamper or alter. They are irreversible, resilient, and have no centralized authority in a well-distributed system. These features make it the best bet for solving corruption and financial mismanagement in Hajj and Umrah.

Four types of Blockchain networks exist; Private Blockchain, Public Blockchain, Private Blockchain, and Hybrid Blockchain. Private Blockchain network is the type designed to give private organizations the privilege to join the network and validate the transactions through consensus algorithm this encourages privacy and fast transaction speed [20]. Public Blockchain, on the other hand, is designed to accommodate members from anywhere and anytime without restriction. Every member, however, has the same permission and unique encryption key and can verify transactions by consensus algorithm [21]. The third type Federated or Consortium Blockchain is designed to benefit from both public and private Blockchain networks. Unlike public networks, members can only join with permission from specific members. Few members have verification process privilege, while others only have viewing permission [22]. Finally, Hybrid Blockchain, like the Federated Blockchain, has the advantage of public and private Blockchain, providing controlled networking and flexibility to change authorization matrix any time [22].

Nodes

Node is a Cryptocurrency terminology that means a computer connected to a cryptocurrency network. It helps support the network through validation, relaying transactions, or hosting a copy of the Blockchain. They serve as communication points, execute essential network functions and keep copies of the distributed ledgers [23].

Hash

A hash is a mathematical algorithm function, usually one-way, that transforms an input into an output. Hashing is computationally infeasible and has no decryption step, so it should not be confused with encryption. An excellent example of a cryptographic hashing algorithm is the Secure Hash Algorithm (SHA-256) [24].

Smart Contracts

Smart Contracts, on the other hand, are high-level programming languages designed and implemented software. They power cryptocurrency exchange between users and can also be used to exchange other valued assets [25]. On Ethereum virtual machines, these cryptographic boxes act like self-executing and operating programs. They can trigger themself to execute any instruction without interruption and third party control as long as certain conditions are met.

Wallets

Wallets in the world of digital currency cryptocurrency is what stores keys used to receive or spend Cryptocurrency. These keys make it possible to write in a public ledger and spend associated Cryptocurrency. There are different methods to store keys in wallets, namely the use of paper wallets where keys are written on paper and hardware wallets through a digital wallet [26].

3.0 BENEFITS OF USING CRYPTOCURRENCIES IN HAJJ AND UMRAH

Blockchain technology's capability to sectionalize comprehensive read of transactions back to the origination, and maintains a steadily growing tamper proof arrangement blocks that hold batches of individual transactions profer complete solutions the numerous challenges of Hajj and Umrah. Some of the benefits of using Cryptocurrency in Hajj and Umrah include

3.1 Eradicate corruption and financial mismanagement issues

As stated earlier, Hajj and Umrah are faced with countless corruption and mismanagement cases. However, Blockchain technology profers solutions as it stores records in electronic codes and links in a chained structure to become complicated to manipulate [27]. On Bitcoins, for example, double-spending can easily be traced by verifying the public ledger, as it is possible to check transactions made with bitcoins since its creation. This will discourage corrupt managers for fear of being caught [28]. The system also disallows the infusion of an invalid transaction on a block, as other network nodes quickly detect this because most nodes adhere to a new protocol to be accepted as a valid change. Cryptocurrency adoption will also ensure that all transactions are secure and provide valid identification of all users and money spent, and the purposes they were spent can easily be traced. This goes a long way to eradicate corrupt practices and financial mismanagement.

3.2 Building trust through enhancing transactional transparency

The transparency provided by cryptocurrencies by its verification mechanism would create trust among pilgrims and investors as they know they can get quality value for their monies. The system utterly eradicate the possibility of falsifying records, ensuring that vulnerable pilgrims are not shortchanged, which will drastically promote the willingness for more Muslim pilgrims to participate in the pilgrimages

3.3 Assist in the organization of the pilgrimages

Apart from ensuring transparency and eradicating corruption, blockchain technology through cryptocurrencies can be used in the organization of Hajj and Umrah. For instance, it will be the best bet for visa issuance. Employing blockchain technology in issuing visas will drastically speed up the verification process in the immigration centres either inside or outside Saudi Arabia [29]. It will also permit pilgrims who would be the Public Blockchain members to view and validate their Hajj and Umrah visas.

3.4 Boost the economy of Saudi Arabia

Another exciting benefit of Cryptocurrency use in Hajj and Umrah is that it will present significant strides in economic growth in Saudi Arabia and other Muslim countries worldwide [30]. Although most Saudi Arabia's wealth comes from oil, Hajj and Umrah play a good role in its economy. In 2019 alone, the country welcomed approximately 8 million pilgrims for Hajj and Umrah combined, contributing about $12 billion to the economy [31].

Future projections by the Council of Saudi Chambers stated an estimated $150 billion in income between 2018 to 2022 and the creation of thousands of Hajj and Umrah related jobs [32]. These figures are expected to increase by 2030 with the plans of increasing Hajj and Umrah pilgrims to 4.5 million and 30 million, respectively [33]. Apart from these economic benefits, the pilgrimages serve as sources of income and power the private businesses of many Mecca inhabitants and create tourism-related jobs. Therefore, with the input of cryptocurrencies in eradicating corruption and regaining the trust of pilgrims, the economic impact of Hajj and Umrah will be better felt. Furthermore, investing in cryptocurrencies is another way to boost the economy.

4.0 FUTURE POTENTIALS OF CRYPTOCURRENCIES

Cryptocurrencies, due to their numerous advantages, has the potential to revolutionalize the finance industry. The technology can liberate users from rigid governing structures, encouraging more exploits in artificial intelligence and global financial systems and make it easier to transfer funds between two parties in a transaction [34]. With cryptocurrencies, fund transfers are secured, with reduced processing fees, unlike fees charged by most banks and could be accepted as valid currency bringing about a cashless society. It also has the advantage of creating new opportunities, decreasing business operations costs, and relevant crowdsourced voting, Internet of Things devices benefiting multiple industries, including finance, law, supply chain, and governmental institutions.

5.0 DISCUSSION AND CONCLUSION

This paper aims to propose the use of cryptocurrencies in the organization and management of Hajj and Umrah. Its use will dramatically increase public financing transparency and accountability, which will go a long way to reduce corruption and mismanagement. With Cryptocurrency's blockchain technology, one can track all forms of transactions and know how each dollar is spent. The technology also makes it possible to identify all the users of the funds and ensure that the authorized persons, within the permitted time and intended purposes, spend money. It also ensures the immutability of records. Once a transaction data is recorded in a block, altering it will alter all subsequent blocks. This feature provides confidence about data integrity. Data are also secured, confidential, with little risk of data loss.

Combating corruption and mismanagement of funds in Hajj and Umrah will go a long way to make funds readily available for important things such as investing in infrastructure and technology that will make pilgrims visit worth a while and drastically reduce the death tolls associated with the pilgrimages.

The proposed Cryptocurrency would have tight traceability and lack anonymity to make it more efficient in fighting corruption. Blocks would contain additional data with sufficient information to favour fraud and corruption enforcement. In addition, block verification should include a check that correlates with the smart contract containing logical clauses programmed in the code. These features can be incorporated using Ethereum cryptocurrency.

In conclusion, the literature review of this study has shown that incorporating Cryptocurrency, for instance, Ethereum, into the organization and management of Hajj and Umrah could go a long way in making the pilgrimages better. The technology would increase confidence and trust in the managers, eradicate corruption, boost the economy of Saudi Arabia and have a tremendous impact on the country's development.

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