A FRAMEWORK FOR IDENTITY VERIFICATION MANAGEMENT SYSTEM USING BLOCKCHAIN FOR INTERNATIONAL TRAVEL

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Abstract

The need for an Identity Management Systems with high level data integrity of online data cannot be overemphasized due to the presence and ubiquitous nature of online activities. Traditional biometrics-based identity management systems on the other hand, collect and store personal records and biometrical data in a centralized server or database, and an individual has no control over how and for what purpose her biometrics will be used. Such kind of systems can result in serious security and privacy issues for sensitive personal data. In this paper, we propose a novel approach to leveraging blockchain/smart contracts to enable secure and privacy- preserving identity management across multiple security agencies in a country, using Nigeria as a case study. The basic idea is to use blockchain to store an authority's attestation as well as an individual's transformed value. The blockchain data is then controlled by smart contracts that define various access control policies. The data owner has the flexibility to change the access control policies for any identity verifiers using a white list, a timer, and other methods. We implemented the proposed approach using the well-known sovrin ledger and tested the effectiveness and flexibility of various access control policies and data integrity benchmarks.

Key words: Islamic banking, microfinance, Islamic microfinance, Entrepreneurship, development, Kano State

1.0 Introduction

Digital Identity management has become one of the major problems in today's world, due to the continuous technological development, specifically the development of 5G and Internet of Things (IoT), the number of entities in the digital world have increased exponentially (Panait et al., 2020). The identification ecosystem of the past decades is complex and full of middlemen. Service providers have invested billions in system and infrastructure to be compliant with data security regulations. As of today, they are still facing challenges in managing user's identity, authenticating and authorizing users. Everyday online users are tasked with providing identity, entering credentials for online and cloud services that they access. These has generated huge volumes of user data with service providers and user private data is stored and left to the discretion of service providers (Lim et al., 2018) model, whereby banks generate profits from the margin earned from savers' deposits and demand deposits on the one hand and interest earned on funds lent to enterprises or individuals on the other hand (Ryu, Piao and Nami, 2012). The advocacy for the emergence of an alternative form of finance is based on the need to effectively address the financial needs of the poor and low-income earners, hitherto neglected by the

conventional commercial banks (Onakoya, and Onakoya, 2013). Khan (2008) explains that microfinance refers to making small loans available to the poor with a focus on those not served by traditional institutions through programs designed specifically to meet their needs and circumstance. Microfinance can, therefore be regarded as the process by which low income households will have a greater access to a variety of high quality financial services to finance their own small business enterprises. These services rendered by microfinance institution are not limited to credit facilities only, but it encompasses savings, insurance and money transfers. Typical microfinance clients include the poor and the low income people who find it difficult to benefit from the conventional or formal financial institutions (Gumel, 2012).

The prohibitive interest charged by conventional microfinance irrespective of the result of operations may discourage small entrepreneurs to access funds from the banks. Dahiru and Zubair (2008) in Onakoya, and Onakoya, 2013) report that the major challenge of microfinance in Nigeria is that the microfinance institutions and programs have not achieved their objectives of reaching a greater number of people living in poverty. With the apparent failure of conventional microfinance, Islamic microfinance has been advanced as an alternative to conventional microfinance (Frasca, 2008).

Islamic finance as defined by Jobst (2007) is a financial relationship involving entrepreneurial investment which is subject to moral prohibitions. Islamic finance is based on principles that prohibit risk taking, interest earning, sinful activities, gambling, speculative trade and money lending to customers. It believes in trading based on real goods and services and a reward-sharing contract. Islamic microfinance focuses on providing an ethical financial system with a motive of wealth redistribution. Islamic micro finance may through arrangements like *Musharakah Mutanaqisah* help entrepreneurs who possessed the business skills but lack enough capital to set up the business. It might become an incentive to the entrepreneur to strive since they will be rewarded with equitable profit sharing ratio if the business is profitable. Similarly, In the case of *Musharakah* mutanaqisah arrangement, the Islamic bank will receive income from its share with the *mudharib* for a business not like a conventional bank which will oppress the entrepreneur by charging interest on the loan. Similarly, the bank would become an active partner by assisting the entrepreneur not only with capital but also with business advice.

Nigeria has 986 microfinance banks that are licensed by the CBN to operate within the country with about 90% of these institutions located in the state capitals and the rest in some local government headquarters (Gaul, 2011). Therefore, the rural transformation if any is at low rate. Lagos has the highest share with 19.14% of the MFB and more than half of the MFB are in the South (79.62%).The Northern part of the country, with over 46% of the nation's population, has 20.38% (201 of 986) of the MFIs in the country. other reasons for the higher rate of unbanked people in the Northern zone is partly due to cultural, educational and religious factors which greatly affect their willingness to patronize and access the convention microfinance products and services to finance small and medium scale business (Abraham and Balogun, 2012).

An important feature of SME is their ability to create jobs. The total number of persons employed by the Micro, Small and Medium enterprises (MSME) sector in Nigeria as at December 2010 stood at 32,414,884. However, these enterprises are mostly characterized by inadequate capital base and low managerial and technical skills mainly caused by their poverty situation and inaccessibility to adequate investment capital (NBS, 2012 as cited in Abdullahi and Abdullahi, 2013).

The economic potential of Kano State is not contestable. With a population of over 9 million people, vast arable land for agriculture, mineral resources and a major commercial hub in northern Nigeria, the State is in a good strategic position to grow if it chooses to do so. The involvement of the State in commerce dates back to the 19th century and it progressively served as an important hub for Trans-Saharan trade. The enormous population and the presence of skilled artisans tend to attract businessmen and industrialists into the State. The markets places where the bulk of the commercial activities take place have grown steadily over the years but their structures and mode of operations have remained greatly unchanged due to inadequate capital.

Capital is the blood life of every business. The main sources of capital in Nigeria are the financial institutions, precisely commercial banks. The lending procedures and collateral facilities are some of the obstacles hindering growth and development of SMEs in Nigeria. The formal banking system is beyond the reach of many who therefore patronize micro finance institutions. Similarly, the religious, vision and welfare objective determines the extent to which some entrepreneur patronize the informal banking system. Therefore, Islamic microfinance has emerged as a new financial innovation to substitute for conventional Microfinance. Scholars in Islamic finance often argue that religious belief in Islamic countries is against the conventional microfinance which is one reason why a *Shari'ah* compliant microfinance is needed and why it is flourishing (Ashraf and Hassan, 2013).

A number of studies have been conducted both at national and international level on various dimension of Islamic microfinance and entrepreneurship bordering on its applicability, effectiveness, performance and challenges (Hassan & Mohammed, 2008; Jamal & Sheik, 2013; Morsid & Abdullah, 2013; Muhammad & Zakaullah, 2013; Onakoya & Onakoya, 2013 and Gumusay, 2014). However, none of these studies seek to assess the potentials of Islamic micro finance on entrepreneurial development in Kano State.

The rest of the paper is organized into four sections. Section two presents a review of related literature on microfinance, Islamic microfinance, entrepreneurship and entrepreneurial development. Section three discusses the methodology adopted by this paper. Section four is on results and discussions. While, section five presents a summary, conclusion and recommendations arising from findings of the study.

2.0 Literature Review

Identity is the distinguishing attribute of an individual. It is widely referred to as the sum of attributes, such as biometrics, height, and birthdate, or the designed attributes.

Identity Management System

Digital identity plays an increasingly important role in our interconnected, digitalized society. Also with the continuous technological development, specifically the development of 5G and Internet of Things (IoT), the number of entities in the digital world increased exponentially. For example, most of us have a number of digital identities, associated with our workplace, our personal life, and other professional-related activities. This partly contributes to the growing reliance on identity information management (also referred to as identity management, identity management and access control), designed to manage and secure our identity information and to provide relevant services (Panait et al., 2020) (Liu et al., 2020). Identity management solutions are generally designed to facilitate the management of digital identities and operations such as authentication, and have been widely used in real-world applications (Meghana, Ramya Krishna, et al., 2020). Identity and Access Management refers to the processes, technologies, and policies that manage access of identities to digital resources and determine what authorization identities have over these resources (Hamza et al., 2018).

Identity Management (IdM) System is used for providing the security of user access, managing users, credential verifications and check whether the right persons are to access the resources provided by the services. Authentication of users is performed in different ways like password, bio- metrics, token-based or certificate based. In most organizations, the risk, cost and efforts towards managing identity increases along with the growth of the organization. For the proper management of the identities, every organization needs a well-defined identity management sys- tem. This helps the organization to reduce the risk associated with identity management as well as the cost and the time required to fulfill the employee's identity and access needs (Hamza et al., 2018).

Blockchain is the decentralized distributed database technology that is combined with guarantees against tamper-resistance of transactions/records using cryptographic methods. By using time- stamping of its trans- actions and messages, blockchain provides universally verifiable proofs for existence or absence of a trans- action in the distributed database and the underlying cryptographic primitives using hash functions and digital signatures provide guarantee that these proofs are computationally secure and verifiable at any point in time. Blockchain is decentralised, jointly maintained by a plurality of independent parties/nodes and achieves consistency of transactions among distributed nodes by using distributed consensus protocols (such as Byzantine fault tolerance algorithm without the need of having a central authority (Htet et al., 2020).

Blockchain technology is a data structure, which is represented by a list of blocks in a particular order, to establish, validate and share distributed ledger of different kinds of transactions through peer-to-peer (P2P) networks of computers (nodes). It is based on cryptographic hash functions, asymmetric-key cryptography and digital signature (Meghana, Krishna, et al., 2020). Blockchain is a networking technology, where nodes are directly connected to each other in a Peer-to-Peer (P2P) manner. It has eliminated the concept of centralization through consensus mechanisms. Decisions in the network are made after the consensus among all nodes. Furthermore, blockchain is also known as a distributed ledger technology. Ledger contains the record of transactions made in the network, and is distributed over all nodes. In Figure 2.2, the basic blockchain structure is presented.

In a typical workflow for a passenger leaving a country via a port of exit, the passenger would be required to swipe passport at a passport scanner which records the details and then an immigration officer validates and stamps the exit out of the country. The passenger now proceeds towards the boarding gates and takes the flight to the destination. The next stage is the submission of the Advanced Passenger Information System (APIS) data, which is the current Identity Management System used by many countries including the United State, Nigeria, India and so on. The APIS was introduced by the US Customs and Border Protection and is a required criterion for many nations. Common system operational in many countries including the United States are fast-tracked and quick-entry systems like the Global Entry Program. Global Entry allows rigorous background checks verified passport holders to skip lines and an immigration desk and walk to a Global Entry Kiosk to generate an exit pass. The kiosk scans the passports and collects fingerprints to verify authenticity of the passport holder. All of these systems have clearly contributed to ease of air-travel especially for citizens and have helped alleviate extensive screening and congestions at airports. Similar systems exist for entry through rail/sea. The downside being each of these systems have exposed us to new points of failures and security breaches (Patel et al., 2018).

3.0 Methodology
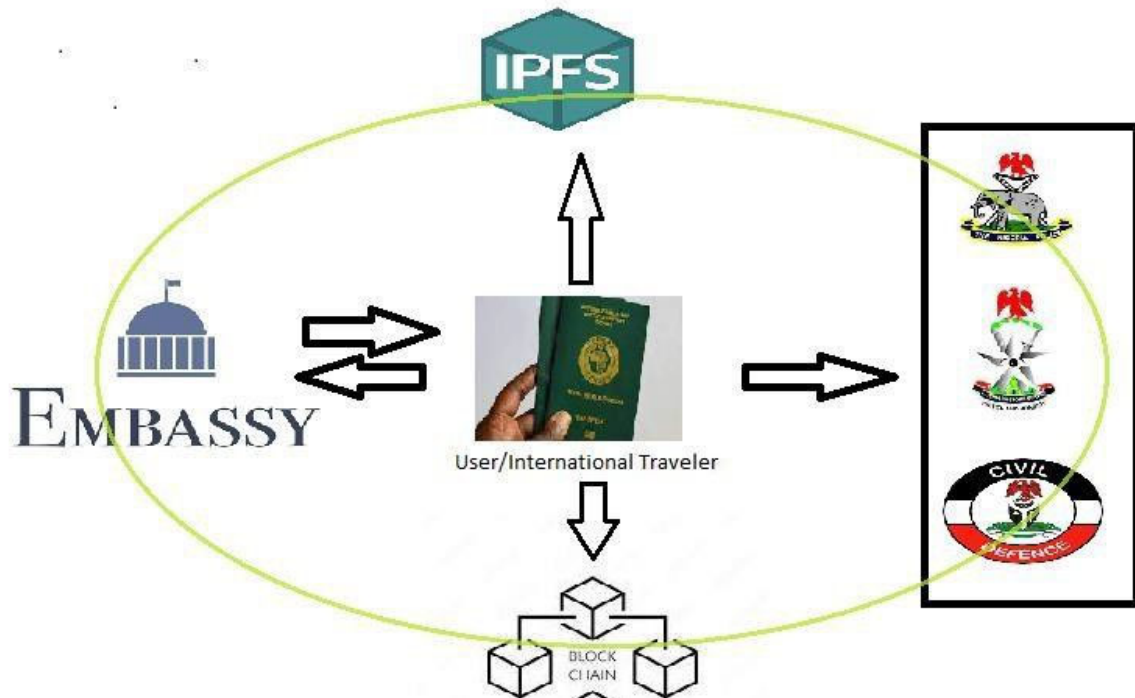Framework

The designed framework depicts in Figure 3.1, presents the components involved, the external storage, and the blockchain. Our contributions begin with decentralizing the database for all the agencies involved and also introducing blockchain into identity management.

The three distinct components within the life cycle are the issuer, holder and the verifier. The immigration service, which is the point of user identity registration will be referred to as issuer, the individual to be registered will be referred to as holder and other agencies of government that interact with the user's information will also be referred to as verifier. A user authentication consists of three primary stages within the life cycle as illustrated in Figure i: smart contract construction or user registration, access control via smart contract, and retrieval and verification of user identity information. These will be discussed explicitly in the next stage.
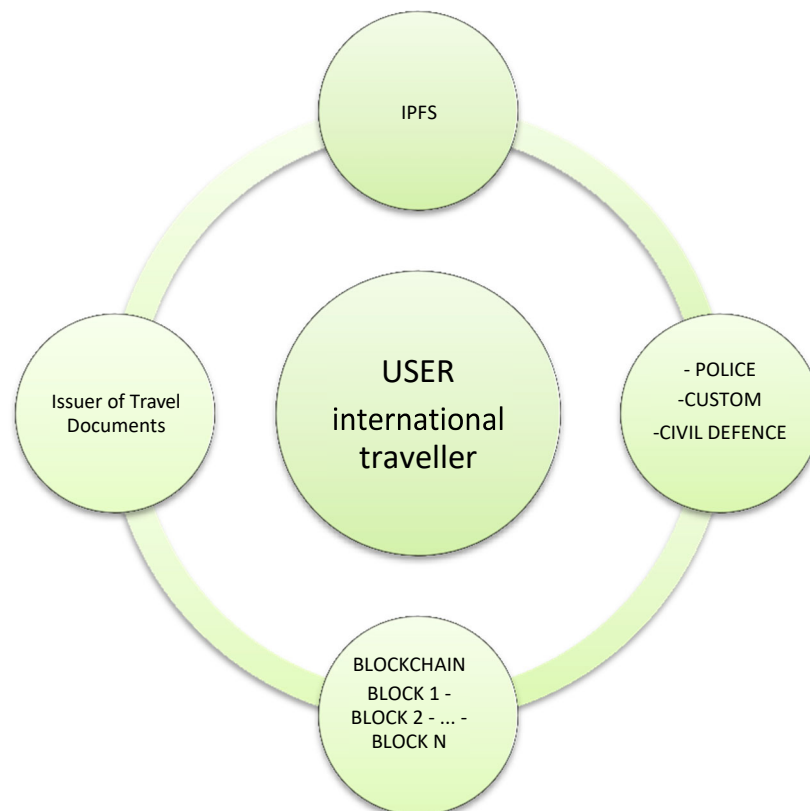
Figure i FRAMEWORK FOR USER IDENTIFICATION SYSTEM

4.0
Conclusion and Recommendations

We have designed a new identity management framework that can integrate a user's transformed individual data to a smart contract through blockchain platform. The frame work will enable data integrity because of the block chain distributed systems and public ledger, it will also ensure data privacy for individual data.

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