

Blockchain Based Tertiary Institutions Revenue Model

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ABSTRACT

Knowledge is one of the most essential elements in a person's life. Education funds and Revenue misappropriation and mismanagement is a reason for the deteriorating quality of higher education. Technology continues to develop with new different transaction and payment methods being introduced. Despite, better features offered in the new methods, embezzlement and fraud loopholes still exist. Transparency has a very significant effect in the use of education funds and revenue. As a consequence, fighting corruption has become a major concern for policy-makers and actors involved in development, in addition to the pressure exerted by tax payers on governments to increase transparency and accountability in resource management. In this work, transparent transaction and settlement payment model is developed using the Block chain Technology, which prevents transactions from being tampered with and avoids unnecessary payment of additional fees by students.

Keywords: - Blockchain technology, Higher Institution management, Tuition fees, Fraud, Transparency.

I. INTRODUCTION

In every part of the world, education has become a vital service that governs the level of progress or growth of every nation. Apparently, the importance of Tertiary education cannot be over emphasized. Well-educated people are more employable and productive, earn higher wages, and cope with economic shocks better. Tertiary education benefits not just the individual, but society as a whole, hence, has become services that require the involvement of both the private and public sectors [1]. Fees play a very big role in higher education. Besides the government's fund, each student needs to pay a particularly price. Free higher education sounded new and attractive. Unfortunately it was financially and ethically wrong in a developing countries, as there is no adequate fund in the developing countries for free higher learning [2]. Hence, fees are made in exchange for learning to provide for lectures/faculty members, spaces, classrooms, technology equipments, library and many more things. Currently, Higher education is in crisis. Many educational institutions are struggling to keep up financially, culturally, and in other ways. A major problem is the ever-increasing student debt crisis. Just in the U.S., "people collectively hold trillions of dollars in student debt, and many of them are taking longer than ever to pay off those loans, if indeed they ever do." This condition is together indefensible and unjustifiable [3].

There are numerous causes for the present state of affairs. Strategy reorganization around the world has augmented the independence that institutions enjoy on disbursements on capitals [5]. This was not necessarily a bad thing, until greedy institutions realized it meant they could raise tuitions

and enrich themselves (and their administrators) while fettering students with expenses for eras to come. Without delays, students and institutions of higher learning found themselves stuck in debt spiral that left individuals demanding to infiltrate larger fees and the other demanding to take out larger advances to settle the fees [3]. Research divulged that it is not only the substantial reserves offered to run the institutes that matters, but also the budget or administration of the reserves [5]. Unfortunately, Education funds misappropriation and mismanagement is a reason for the deteriorating quality of higher education.

Despite the fact that meager resources are allocated to the sector, they are mostly not judiciously used. It is crucial that municipal reserves be tailored effectually and used for the tenacity of their purposes. Nevertheless, there are several degrees of cases majorly stated in indigenous print and internet of mismanagement and misuse of investments in educational sectors. A total of KRW9.4 billion was misused at 10 national universities as Professors and employees at several state-run national universities in South Korea allegedly misappropriated nearly KRW10 billion (US\$8.9 million) of students' tuition fees, reports the [6].

The funds were intended to cover student guidance programs such as counselling and safety activities carried out by professors and staff during lunch hours, after work or on weekends. In one case, employees at a national university overstated the number of such activities by changing locations and clothes, earning KRW1.2 billion. In Nigeria, Misappropriation and mismanagement of funds was accrued to some tertiary institutions, leading to a huge loss of revenue. It is an extensively recognized point that open higher educational sectors in Nigeria are inadequately

supported. However, if the reserves are judiciously managed and well tailored by the administrators of the citadels of higher learning, the status quo wouldn't have been worse. As a result, combating fraud has merged into a major distress for legislators and people involved in improvement, in addition to the pressure impounded by tax payers on regimes to increase clearness and culpability in reserve administration.

Transparency is a major requirement in environments where finance and value for money is appreciated. Hence there is a critical need for openness in the financial management process in universities. While using a digital online school pay system, parents pay fees with their credit or debit cards. There are no checks written and no cash change, yet, this centralized solution still possess weaknesses that can lead to embezzlement. [7]. In the face of the rising costs, growing expectations, heightened debt sensitivity, misappropriation and shrinking budgets in tertiary institutions, Tertiary institutions must adapt top technology developments, suitable enough spread costs and administration method. [8].

Presidents of Higher Education Institutions has also suggested Computing technology as a combating measure, which supports large growth with relative small investments. [9]. The "Blockchain" technology is becoming one of the most demandable disruptive technologies [10]. This paper however systemizes the areas of possible use of blockchain technologies in the activities of universities education funding, payment of tuition fees and expenditures by unifying or integrations all stakeholder s to the Blockchain, thereby increasing trust, security, transparency, and the traceability of data shared across an organization's network. The information recorded on a blockchain can take on any form, whether it be denoting a transfer of money, ownership, a transaction, someone's identity or an agreement between two parties. However, to do so requires a confirmation from several of devices, such as computers, on the network. Once an agreement, otherwise known as a consensus, is reached. Hence, trust is built on blockchain's enhanced security, greater transparency, and instant traceability. By greatly reducing paperwork and errors, blockchain significantly reduces overhead transactional costs and reduces or eliminates the need for third parties or middlemen to verify transactions. The security features of data storage in Blockchain technology that make data alteration difficult, disintermediation and decentralization of all transactions of any type between all parties on a global basis will unveil the salient breaches of the twin principles of accountability and transparency in the management of funds in the tertiary educational institutions and the impact on the goals and objectives of the institutions.

This work however presents a prototypical block chain application, which experimentally proffers measures to reinforce the twin principles of transparency and accountability in the management of funds in tertiary educational institutions.

II. RELATED WORKS

Education is the process of receiving or giving systematic instruction, especially at a school or university. It is the process of facilitating learning, or the acquisition of knowledge, skills, values, morals, beliefs, and habits. Educational methods include teaching, training, storytelling, discussion and directed research. Education is defined as the process of gaining knowledge. An example of education is attending college and studying. Computer education includes computer systems and information systems. Contrast with training. [11]. School productivity becomes very important and something that cannot be negotiable. To improve the productivity of school, funding is one of the most important inputs in the implementation of education. Financing is required in order to implement all school policies and programs to achieve the objectives and quality of education [12]. Fee is a payment made in exchange for education, fees play a very big role in higher education since lectures are needed in order to provide education to the one who need it.

Tuition payments, usually known as tuition in American English and as tuition fees in Commonwealth English, are fees charged by education institutions for instruction or other services. Besides public spending (by governments and other public bodies), private spending via tuition payments are the largest revenue sources for education institutions in some countries. There are no or only nominal tuition fees for all forms of education, including university and other higher education [13]. Since the universities can get money from the tuition fees, they can build some new and better facilities for students, such as teaching buildings, a gym, and other recreational facilities. More cash also means the university can offer a higher salary to attract better teachers [14]. Tuition is charged at different rates from one type of institution to the next. Net tuition indices mark an increase in the "relative real burden" for payments at various types of institutions for higher education; in the period between 1980 and 1995; example, this burden increased by approximately 80 percent for students at public universities and by 148 percent for students at private universities [15]. Most students or their families who pay for tuition and other education costs do not have enough savings to pay in full while they are in school [16]. Some students must work or borrow money to afford an education [17]. Education funds should be based on the principles of equity, efficiency, transparency, and public accountability as well as the allocation of funds for education. Management of the funds obtained from the government and from the public, should be based on the spirit of accountability and transparency [15]. Reliable information on the benefits that the various higher education institutions (and their subunits) offer to their students, funders and society in general is key for their legitimacy, their funding and their competitiveness [18]. Moreover Transparency has recently become synonymous with efficiency and good practice. In government and in private sector, transparency has become a household name, an indicator of quality governance. Transparency is a principle that guarantees access or the freedom for everyone to obtain information about government administration, information on

policies, the manufacturing process and its implementation, as well as the results achieved [14]. From the side of students, public authorities and the general public, the need for tools that allow better and broader use of information regarding the services and performances of higher education institutions is growing [20].

Transparency in the financial management of an educational institution is indispensable in order to increase the support of parents, communities, and governments in the administration of the entire education program in schools. In addition, transparency could create mutual trust among the government, the community, parents, and the school community through the provision of information and improvement of the ease in obtaining accurate and adequate information. The acquisition of this information increases the parents' trust in the school [15]. Transparency simply provides the needed vehicle and impetus for credibility of management's direction and efficiency bill of health. It serves as a control valve against inefficiency and fraud, and an index of economic development [13]. Financial transparency helps to hold public officials accountable and enhance public confidence in government departments while agency costs can be reduced. Adeoti [21] asserts that transparency implies openness, communication and accountability. Hence, the critical need for transparency in the financial management of universities. The most outstanding gain of the environment of transparency, therefore, is that governance delivers on promise. There is absence of tension as quality services are delivered daily with a remote tag of positive bill of health for those who run the system. Suspicion is reduced to the barest minimum and the work community transforms too easily into a small paradise of sorts where people vow to make life careers [19]. The atmosphere of total transparency offers less room for self-profit and no one is under pressure of the temptation to cut corners. There is a healthy debate at the meetings and members of the various committees have a fulfilling motivation to contribute their quota in driving the organisation to higher heights. The workers easily turn into team builders and the university is better for it. Financiers are happier to bring in more funding when they can see the basic tenets of good governance such as transparency, probity and accountability (or improved productivity) entrenched in the management [19]. For any corporate governance to be adjudged as adequate, it must be such as protects and guarantees rights of the stakeholders [19].

Accountability is a state that is rated for the quality of its performance in completing a task which it is responsible. Accountability is the obligations of the individuals entrusted to managing public resources, and related to it, in order to answer the things relating to fiscal accountability, managerial, and the programs or activities [14]. Financial accountability is accountability regarding financial integrity, disclosure and compliance with laws and regulations [22]. Puruwita [15] explained accountability is a complex concept that is more difficult to do than to eradicate corruption. Accountability is the imperative of public sector institutions

to put more emphasis on horizontal accountability (society) rather than just vertical accountability (higher authority). A rapid review of the literature shows that a number of attempts have already been made to tackle the issue of corruption both globally and sectorally. In the social sector, for example, several studies have been conducted on corruption in the provision of health care services. However, it appears that the education sector has not been given proper attention by national education authorities and donors, despite the many grounds for attaching particular priority to the challenge of combating corruption in education. Embezzlement is essentially the personal use of public funds by someone or persons that the funds were entrusted to. It's a form of employee theft that tends to center more on small businesses simply because there are not sufficient checks and balances in place to track funding. In schools, fee payments that are not monitored closely can become the target of school embezzlement fraudsters.

Currently, the financial transactions between individuals, organizations, and companies are taking place with the help of third-party approval of intermediaries such as banks, financial institutions, standardizing bodies, or credit card providers. These transactions involve multilevel approvals, costs, and inefficient processes in some cases, which also lead to waste of time and resources. To resolve these issues, blockchain technology has appeared as a new financial digital innovative solution. Here, financial transactions are online, open, and transparent [23]. Blockchain is digital, decentralized technology which maintains a record of all the transactions which happen over a peer-to-peer network. These records are stored in decentralized systems which are interconnected. Blockchains are "tamper evident and tamper resistant digital ledgers implemented in a distributed fashion (i.e., without a central repository) and usually without a central authority (i.e., a bank, company or government)". Blockchain innovation empowers the "production of a decentralized domain, where the cryptographically approved exchanges and information are not under the control of any outsider association". Any exchange at any point finished is recorded in an unchanging record in a certain, safe, straightforward and perpetual way, with a timestamp and different subtleties [24]. Every organization runs on information. The faster it's received and the more accurate it is, the better. Education is another domain registering many national and institutional research and projects for integrating the block chain technology in interesting and innovative applications, such as: proof of learning, management of credentials and transcripts, management of student records, management of reputation, and payments [25]. Blockchain is ideal for delivering that information because it provides immediate, shared and completely transparent information stored on an immutable ledger that can be accessed only by permissioned network members. A blockchain network can track orders, payments, accounts, production and much more. And because members share a single view of the truth, you can see all details of a transaction end to end, giving you greater confidence, as well as new efficiencies and

opportunities [26]. The core idea of the blockchain technology is consequently the fact that it is accessible for everyone, but still controlled or possessed by no user alone. It is with the help and co-operation of the participants of the net-work that keep the ledger in accordance with present time. The participants together enhance and continue the blockchain by complying with strict rules and general agreement, which means that the participants agree on how the chain will be updated [27]. This agreement is called ‘the consensus mechanism’[28].

III. DESIGN ARCHITECTURE

This work involved cryptocurrency (which is a blockchain technology) as the basic model. As shown in Figure 1, our architectural design includes three major components including Front-end, Back-end and Database Management. Each of the architectural components is being discussed in the subsequent sections.

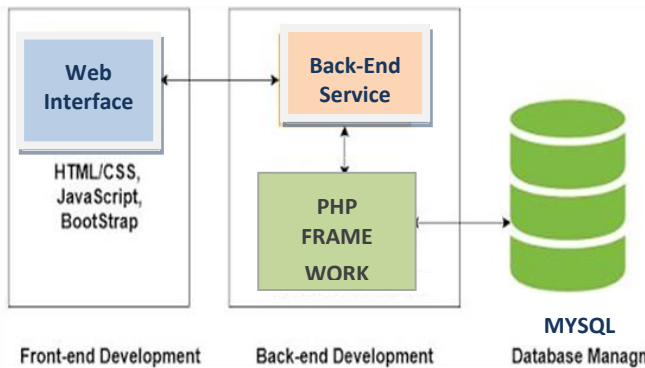


Fig 1: Architectural Design

A. Back End Design

There are many blockchain platforms, coin or smart contracts oriented, based on different consensus algorithms, and with different developing tools and programming languages (Body, 2018; Amasu, 2018) This includes Ethereum, Sidechain, Hyperledger, Quorum, IOTA, Recorder, Nebulas, and Corda.

For easy prototypical deployment of the developed system XAMPP was used to locally host the website, it also provides the MySQL module for the work. To run Xampp and make connection locally, the XAMPP control panel was opened on the local machine. Both ‘‘Apache’’ and ‘‘MySQL’’ modules were started up therein, then they were opened up in the browser which automatically creates a local host connection. Prior to the local hosting, a PHP configuration file had been set up to connect the html forms to the MySQL database. The HTML pages were further converted to php pages to allow easy access to the database in order to save, get and update the database.

- PHP

PHP is the Web Server Scripting language used in Web development. In this work, PHP code was used in the server side because it’s highly secured, which is a basic requirement of the blockchain technology, compared to JavaScript. PHP also allows easy and direct access to the database.

B. MySQL - Database

MySQL is an open source relational database management system (RDBMS). In this work, six separate Entities were created namely; Departments list, Fee list, System Info, Transaction list, Transaction meta and Users.

- *Department_list*: This database contains information about different departments within the school. This database was connected to ‘‘registered departments’’ under the admin session. A view of the Departments Entities within the school is shown in Figure 2

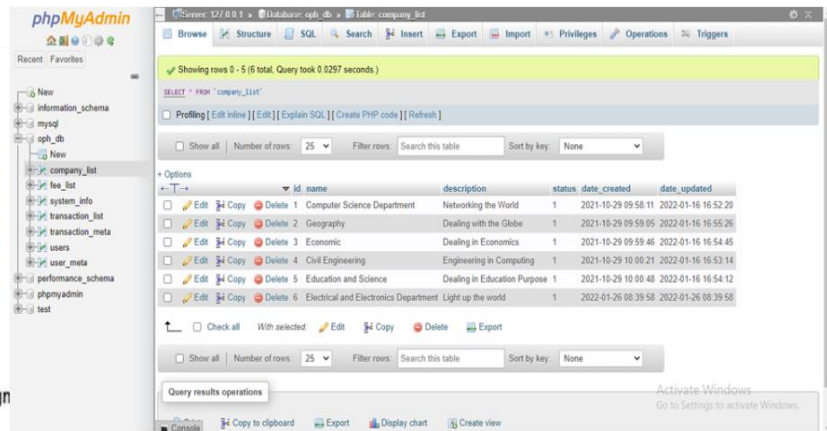


Fig. 2: Department Entities list

- *fee_list*: this database contains information about fees paid during transaction, the fees paid and the date that the fees were paid as shown in Figure 3. This is connected to the fees table from the admin interface.

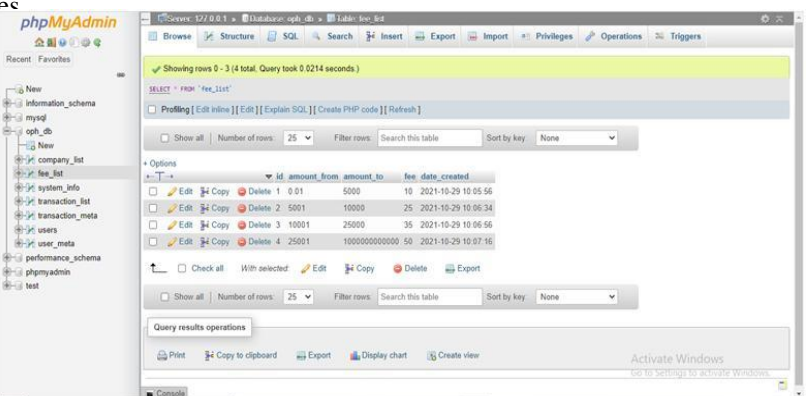


Fig. 3: A view of the fee Entity list

- *system_info*: this database contains information on the different contents uploaded to the website and other information, as shown in Figure 4.

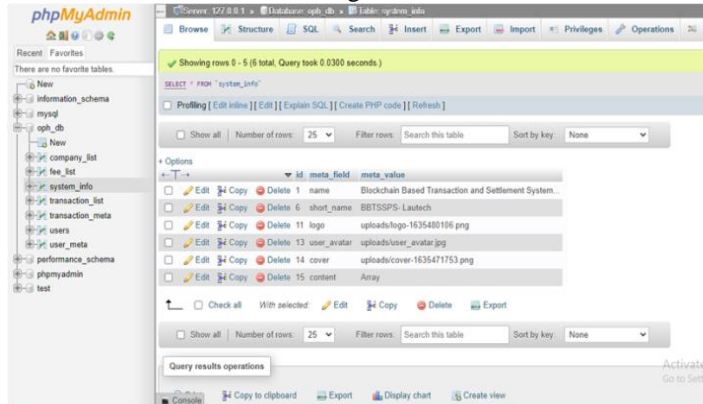


Fig. 4: A view of the system info database

- *transaction_list*: this database contains a list of transactions performed within the system.
- *transaction_meta*: this database contains information about different transactions performed within the system and the dates they were created.
- *users*: the database contains information about users including name, username, password and pictures as shown in Figure 5. This database was connected to the signup page.

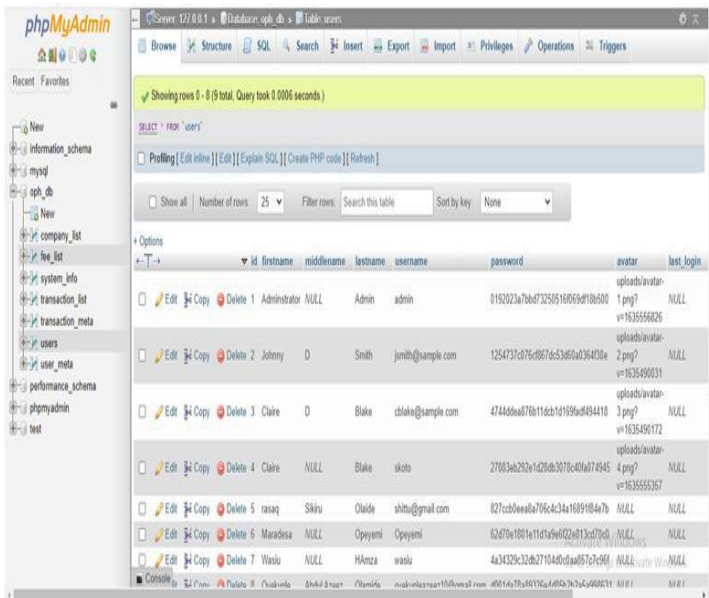
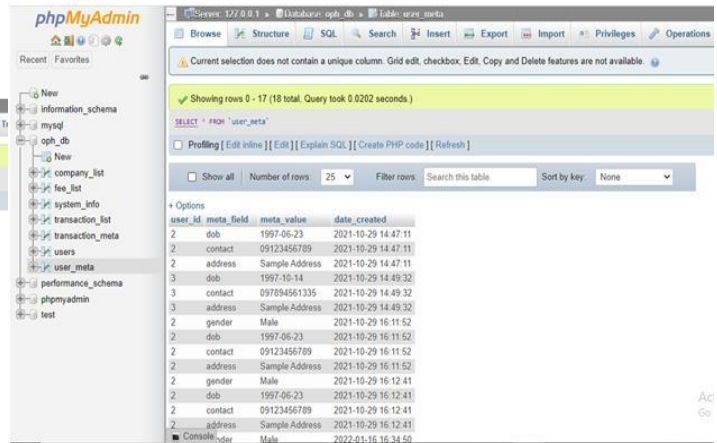


Fig. 5: A view of the users database

- *user_meta*: this database contains data on users such as gender, address and dob and the dates they were created, as shown in Figure 6. This database was connected to the Student(s) page in the admin interface.

Fig. 6: A view of the user-meta database.



C. Front-end Design

The front end of the blockchain transaction system was built using HTML, CSS and JAVASCRIPT. The front end provides a means by which the user (both the admin and the student) is able to interact with the system. The HTML, CSS and Javascript codes were written using a code editor called Atom. Each HTML page was constructed and written separately and then attached together using “href” in the html codes for each page. The CSS was created as a different folder and was linked to the HTML pages by noting the sub-directories and properly inserting them into the HTML codes, the same was done with the javascript files as well.

- *Web Interface Design*

All of the above mentioned tools were used to design the Web Interface, which is necessary to access the entities within the database Entities. Figure 7 shows the Login/Sign-up Page. After registering and logging in, the user sees the dashboard where he can perform majorly one action which is to “View Transaction”. Within the View Transaction” subprocess, the user can perform other actions such as “Make Payments” and “Print Transactions” which are also subprocesses to “View Transaction”. When the user is done, he can either decide to end the process by logging out or continue the process by going back to the dashboard. On ending the process, the user stops the system by logging out and closing the link. Figure 7 shows the Admin Dashboard.

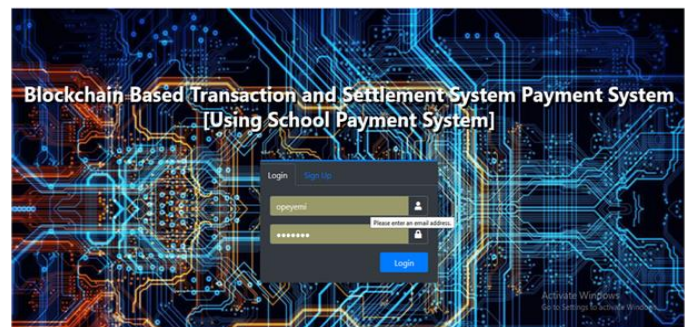


Fig. 7 Login/Sign-up Page

On logging in, this is the first interface that the admin, the admin gets access to his/her dashboard where they can see the number of registered students and the number of

registered departments inside of the system as shown in Figure 8.

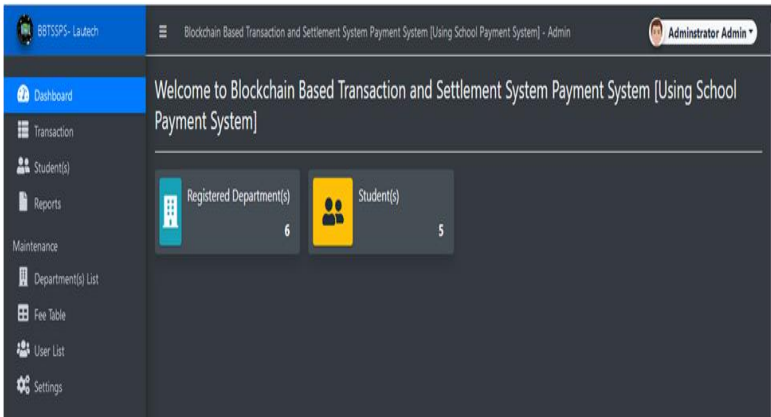


Fig 8: Admin Dashboard

The user list shows the list of admins that have previously been created. As shown in Figure 9, more admins can be added by making use of the “Create New Admin” button.

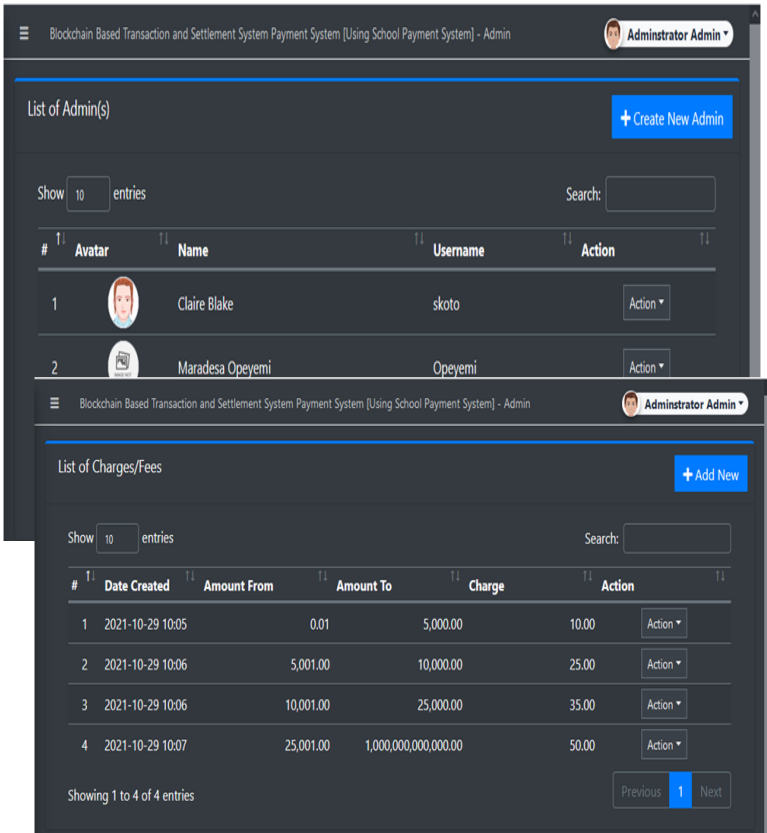
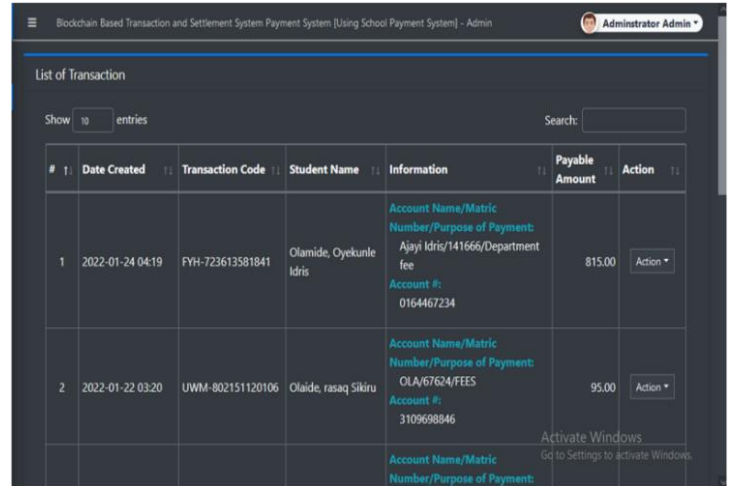
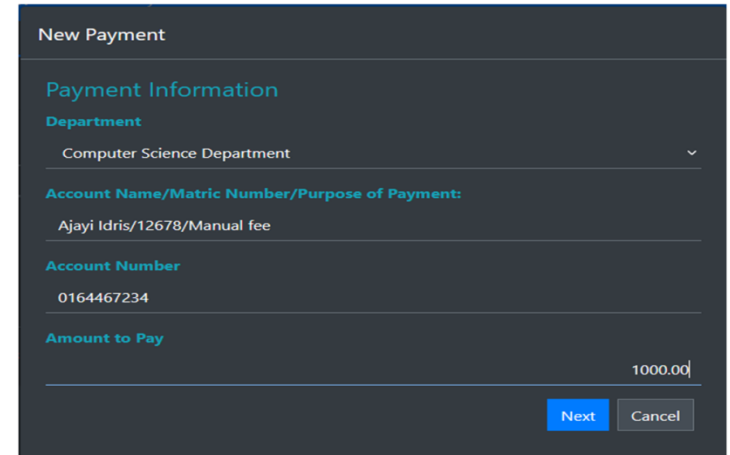


Fig 9: User list

Figure 10 shows the amount of transfer charges that will be needed to add the transaction block to the block chain on



different ranges of charges. This view appears when the admin clicks on “Fee Table” in the sidebar. When the admin



clicks on “Transaction” on the sidebar of their interface, the admin is able to see the transactions performed by students and either approve or reject these transactions. Figure 11 shows the transaction list,

Fig 10: Charges in different amounts

A student user who is using the system for the first time has to first sign up so that the system can save such a student’s information. Thereafter, the student can login to the interface. After logging in, the student can perform a transaction by clicking on “New Payment” from the home page of the student’s interface. Figure 12 shows the new Transaction Page.

Fig 11: Transaction approval

Fig 12: New Payment

After performing a transaction, the transaction shows up in the “My Transaction” page and then a student can track a transaction by clicking on “view” under the “Action” column in the transaction table. Figure 13 shows the Track Payment Page.

Fig 13: Track Payment

After performing a transaction, the transaction shows up in the “My Transaction” page and the student user can view all the transactions that he/she has performed.

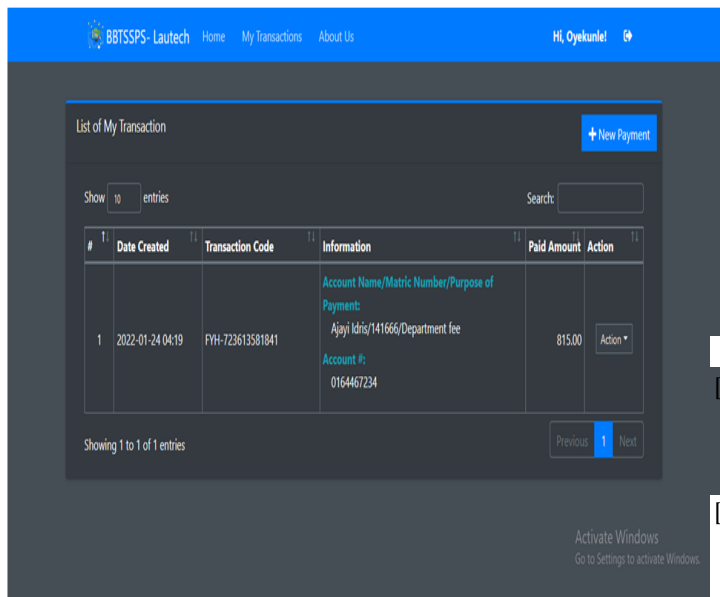


Fig 14: List of Transaction

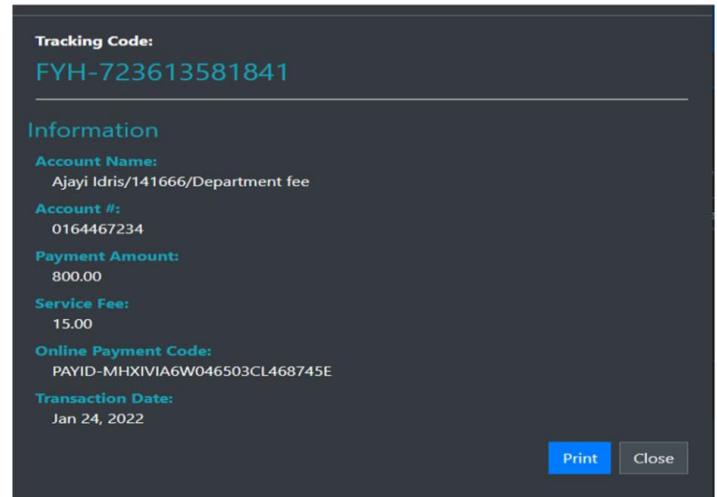
IV. CONCLUSION AND RECOMMENDATION

This work has been able to develop a working payment system using a block chain-based transaction and settlement system with permeates Transparency and accountability. Which is a paramount feature of a working system. It also highlights the importance and significance of the technology. The system built in this work is achieved in five major steps, which includes creation and set-up of the database; front end design with HTML, CSS and JavaScript’s, backend design with PHP and MySQL, front end and back end connection and finally; deployment via local host using Xampp. The school payment system was incorporated with the block chain database. The system has a lot of potential and it’s been recommended to be integrated into the school’s payment system for optimal and transparent management of Tertiary institution Revenue.

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