

The Use of Blockchain Technology in Electronic Records Management Systems to Mitigate Corruption in South Africa

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Abstract

This paper presents blockchain as an integrated tool that can be used in records management to eliminate public corruption. The paper defines blockchain technology as electronic records management in a networked environment to manage public contract transactions. During the Covid-19 pandemic, many “covidpreneurship” companies were awarded contracts at figures inflated by 200%. In response, the state president instituted a joint committee to investigate the problem and requested investigative authorities to make recommendations to prosecute offenders. This paper argues that the government can stop public funds-related corruption by using an integrated records management system built on blockchain infrastructure. The disruptive technology could be a catalyst to stop Covid-19 personal protective equipment (PPE) suppliers from raising prices 100 times above market value, which has led to criminal investigations. A living-lab methodology was adopted, which allows innovative technology to be experimented with in a social research design. Hence, a software algorithm was applied to mine qualitative data from news feeds and their contents, presented as qualitative text transcripts. The paper contends that the blockchain is vital in protecting the integrity of public contracts and their records management and to ensure that no one can alter the contract or inflate prices. The paper recommends that records officers/managers authenticate and conduct transactional records audits. The contract process should be automated using blockchain. It will eliminate favouritism and nepotism in the award of public tender contracts. The technology can also be used to automatically filter out exorbitant quotations above the market values of items.

Keywords: blockchain; corruption; covidpreneurs; disruptive technology; integrated



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records systems; records management

Introduction

As South Africa struggles to combat the coronavirus outbreak, President Cyril Ramaphosa delivered a national address on 24 July 2020, in which he decried the pervasiveness of fraud, corruption, and mismanagement of public funds through bogus contracts and procurement processes, defrauding the nation during the Covid-19 pandemic. This paper advocates for the adoption of blockchain technology in integrated records management (RM) to address the challenges of public contracts and transaction documentation that can be resolved using an open RM system. Therefore, aligning disruptive technology like blockchain as e-government infrastructure with public RMS will significantly improve business processes and RM in a networked environment (Ajibade and Mutula 2019a). Because blockchain has the ability to verify all recorded transactions and monitor any changes in real time, it may reduce the incidence of irregular expenditures. This strategy will prevent public funds, goods and services from being diverted to private individuals or groups. Some of the Covid-19 food parcels, for example, were found on the counters of some vendors selling such products, clearly marked “NOT TO BE SOLD” (Maya 2020). The president’s address indicated that many companies were conspiring with public officials to inflate contracts by hundreds of per cent above the actual prices of “item per cost” and that seven investigative bodies had recently been established to investigate and prosecute those engaged in fraud/corruption (SABC News 2021).

It was also stated that the prices of protective gear in South Africa were inflated by 43% to 200% of their retail prices prior to the Covid-19 surge (eNCA News Online 2020).

The approach of initiating investigations only after an actual fraud has occurred is merely reactionary. However, blockchain technology is proactive, and fraud and attempted corruption are prevented before they occur. Furthermore, when tenders and contracts are posted to the public ledger, it is simple to verify each detail (publicly created records). Any attempt to manipulate or change an agreed-upon contract, or to add any figures, would be seen by all parties, and the system could be programmed to blacklist anyone who attempted to change the recorded transactions. Since the blockchain records “hash that has been generated is publicly seen by all,” any attempt to cheat the system will be limited. Furthermore, because one of the benefits of blockchain is encrypted data that are publicly protected through digital signature, all records on this system will be highly secure.

Even digital signatures are now recognised in the judicial system as a means of authenticating electronic documents, particularly to express consent (Racolță 2020). Blockchain, as a digital signature, can be a useful tool for securing virtual contracts (Pooja and Yadav 2018; Yadav and Vijayakumar 2018), authenticating and enhancing transaction integrity, and protecting the document (Hermawan and Wardhani 2016; Qiu, Cai, and Xu 2018). The inability to authenticate or validate contract price ranges, or the

proclivity of public officials to ignore such, is one of the factors enabling corrupt practices. When a contract is to be executed, for example, to provide a set of devices (i.e., laptop model c560i) valued at a market price (e.g., R14,500 ZAR), and a supplier submits a quotation with an estimated price per item of R58,000, the system will automatically flag the quotation. The public procurement officer can employ records officers to use big data technology to aggregate and classify all relevant prices and price checks, as well as to set a price range in the system. Subsequently, the platform will be configured to filter out all inflated tender prices and pre-select all vendors and suppliers who fall within the price parameters. In order to eliminate the possibility of data manipulation, the digital signature is used to authenticate all shortlisted suppliers' documents and information (Qiu et al. 2018).

The use of blockchain would imply that all parties and the general public would be able to openly verify any contract that has been declared, as well as any contracts that have yet to be verified. The cost of executing a contract is also openly available, and the public can bid on the contract's execution. Any accepted bids are made public, and the contract cost cannot be altered once it has been accepted.

Problem Statement

During the Covid-19 pandemic, the South African government publicly expressed its outrage and frustration at widespread corruption, which manifested itself in inflated tenders and mismanagement of coronavirus relief funds. On the national SABC News broadcast by the President, Cyril Ramaphosa, on 23 July 2020, it was alleged that several companies and public officials had conspired to defraud the nation (SABC News 2020). More so, according to the South African Revenue Services (SARS), cited by SABC News Online (2020), "many of the tenders for PPE are awarded to companies and people who are politically connected." Furthermore, the president announced that "what concerned me and South Africans are instances where funds are stolen, misused, procured goods are overpriced, food parcels are diverted from needy households, and there is corruption and mismanagement" (*Times Live* 2021). The president announced the formation of a seven-unit task force to investigate, and reiterated that the task force should recommend to the National Prosecuting Authority (NPA) the prosecution of all or anyone found guilty.

Special Investigating Unit (SIU) Probing PPE Tender Fraud

The data received from the National Treasury indicated that a total of R30.5 billion was spent on personal protective equipment (PPE), and of this amount, use of over R13 billion was subject to investigation. Of the 2 256 PPE contracts that were awarded to state institutions, a newly established company with no experience was awarded contracts, and in many instances, "evidence showed that there was political pressure that played a role in the procurement of PPE." It also appeared that the names of the service providers were predetermined before supply chain management (SCM) commenced. Also, as of 5 February 2021 "the SIU has made 38 referrals to the National

Prosecuting Authority (NPA) for criminal prosecution and has also recovered over R120 million from dodger PPE tenders” (SABC News 2020).

Thus, this paper proposes using agile records management systems (RMS) in an integrated network environment to create, process and monitor public funds-related contracts and actual procurement processes in order to prevent corruption, as this technology will allow the government to be proactive through networked RMS. Due to the capabilities of these disruptive technologies, any attempt to conceal contract figures or overpricing above market value could be detected and stopped. The only way to stop public mismanagement and reckless spending is to attempt to prevent corruption. For this reason, the study proposes the use of blockchain technology as a records management infrastructure to document and execute all public tenders, procurement and contract awards valued at more than 20 000 South African Rands (R20,000). One method of avoiding corruption is to know who approved a project at any given time and to eliminate favouritism based on political connections. The blockchain timestamp can provide the exact time a specific task is executed, which is typically generated by the blockchain application’s network protocol (Sniatala, Amini, and Borojjeni 2020). Understanding the precise time when a block was generated for a given transaction is critical for public accountability and transparency (Abed and Manaa 2020). The public can monitor the execution of each contract, and the system can detect any attempt to alter, amend or influence any contract after it has been publicly executed.

Objectives

The aim of the study is to analyse public sentiments emanating from the mismanagement of Covid-19 relief funds; present blockchain as a viable and useful records management system (RMS) in a networked environment; and, finally, propose an agile records management model based on blockchain technology, to mitigate persistent corruption and mismanagement of public funds through tender, public procurement, and inflation of goods and services, and to eliminate political influences. The study was guided by the following objectives, which were consistent with this aim:

1. To analyse public sentiments about Covid-19 and tender frauds due to political influences.
2. To understand the importance of blockchain as electronic records system.
3. To determine the usefulness of blockchain for managing record keeping, to improve accuracy, integrity, and authenticity to mitigate tender fraud.
4. To create a blockchain records management model to manage public procurement RMS to mitigate incidences of corruption.

The justification for this broad main aim is to provide innovative solutions to the problem expressed about the mismanagement of Covid-19 funds in the midst of a pandemic, and to create a model that can guard against future public contracts and irregular procurement expenditures. Therefore, the authors’ aims are neither to relitigate

the historic corruptions that could have been prevented, had there been a robust RMS, nor to regurgitate the already documented literature that has documented patterns of corrupt practices in South Africa.

Literature Review

This section introduces the key terms and literature relevant to this study. A brief introduction and definition of blockchain technology, as well as what it can do, are discussed. Subsequently, the technology's utility in records and potential application in records management are presented. Following that, the advantages of technology in records management will be briefly explored.

Blockchain Technology

Blockchain technology is an electronic system designed to manage information blocks that are linked together (Kim, Lee, and Kim 2020) as a digital asset to store data in a reliable way, while upholding the integrity of such information (Pourvahab and Ekbatanifard 2019, 99574). It is an integrated technology used to manage a chain of recorded information as evidence of transactions that cannot be easily manipulated. Some authors have defined the technology as a digital ledger of records that are known to the public (Calvo and Mathar 2018). A blockchain is a decentralised network that keeps records securely, with each record created visibly open to all, and in which the movement of the records can be monitored openly. One of the advantages of such openness to managing records is that the creation, storage and migration of the records are visibly traceable, and ensure greater opportunities to authenticate the veracity (truthfulness) of the records. Therefore, any alteration or attempt to manipulate the records is immediately detected. According to Meijer (2017, 6), a blockchain is a secure distributed ledger database controlled by multiple users. The records on the blockchain are secured since the network of all integrated computers collectively verifies all the transactions (records) and authenticates them before they can be approved as legitimate records. Thus, integrated records systems improve the credibility and authenticity of all records within the chain of blocks within the platform. As indicated by Savelyev (2018), the inability of any user to change or alter blockchain records gives it credibility. Thus, using this technology for public contract administration and processing is vital to enhance integrity and incorruptibility in tender awards of public contracts, since the system promotes transparency once the records have been created. Any attempt to alter or change any data would be visible to everyone on the blockchain network.

The Usefulness of Blockchain Applications in Records

Blockchain technology has been applied in various fields to manage records, especially electronic records systems. For example, the technology has been used for health records of patients in hospitals, using decentralised blockchain technology (Pourvahab and Ekbatanifard 2019, 99576). One of the advantages of this system is that every user connected to the blockchain decentralised electronic records systems can easily identify the provenance of each record created. The e-records in a networked environment allow

everyone to see the movement of such records as they are used to perform a given task or transaction and such is recorded and stored in the blockchain. Furthermore, the systems also provide the records metadata such as the date and the time each function/activity is performed. The second advantage is that once the records have been created, they can neither be altered nor manipulated. This enhances the integrity of this public records system in line with the RM principle of original order, because blockchain technology makes sure that once a record has been created, the chain of records cannot be altered.

Blockchain and Records Management

According to ISO 23081-1:2017, the principles that govern records management should be immutable, regardless of the form of technology that created them. It means that the creation and effective management of records, as well as the identification of record requirements, record controls and processes for capturing records, and actual records management—regardless of form, structure or technology—must be legitimate and authentic. The discussions of Hofman et al. (2019) centre on blockchain technology as public record-keeping systems. Therefore, the creation and management of electronic records should uphold all the tenets of RM, meaning the records must be authentic, usable, reliable, intact (Stančić 2018, 56), and ethical due to their veracity. Since the trustworthiness of a record will be judged by its accuracy, authenticity and reliability (Stančić 2018, 57), the blockchain technology helps uphold this records principle, as the cryptography and security embedded in the computational algorithm of blockchain make the records immutable, irreversible and open. The systems will prevent any attempts to alter or manipulate the records, and all authorised users on the platform can trace the sources of attempted alteration of the records. It is especially pertinent in the context of this paper, in which the authors propose advanced integration of fourth industrial revolution technology to mitigate widespread public corruption and contract irregularities in the public sector.

The Advantage of Blockchain Technology for Records Management

One of the advantages of using blockchain as a records management tool (electronic system) is built on the premise that once a record is created as evidence of transactions, it cannot be tampered with (Hofman et al. 2019) or fraudulently altered. Blockchain technology is important as a validation tool to authenticate all recorded information. Just as the blockchain can be used for birth registration and certificate validation (Sharma et al. 2020; Sharma, Afzal, and Dixit 2020), the same logic applies to the registration of a contract or company, where the actual name and credential of any companies bidding will be authenticated. For example, any company that has defrauded the public due to past contracts or inflated tenders or quotes will be automatically flagged and filtered out during the validation process. The same logic will be applied to all the submissions in which the system validates the prices, the company reputation, and the capacity to deliver the projects, among others. One of the advantages of using the blockchain is that all potential bids are awarded based on merit, and not because of

any political connections, nepotism or favouritism. Likewise, the blockchain technology as a public ledger (records systems) can be used to prevent double payment or spending (Lee et al. 2018), due to a built-in algorithm that generates the “hash”; and the same can be applied to public supply chain management and tenders. Once a transaction has been digitally created and recorded by the record creator (provenance or source), everyone on the integrated records system will identify the source. Once a record has been created, all other parties will recognise the sender of the digital signature (Berbecaru and Marian 2019). Only the authorised person from the provenance can sign or validate a contract (in the case of South Africa, this should be the forensic accountant), and this is not the same person responsible for advertising and shortlisting the candidate to award any public contracts. Nevertheless, if any party tries to fiddle with the systems, there is also a technique to detect the invalid signature (Guan et al. 2017). It enhances the validity of the transactions by improving the data security (Singh and Vasudeva 2019).

Methodology

A living lab is a research methodology primarily meant for open innovation (Schuurman, De Marez, and Ballon 2016) as researchers adopt technological innovation or tools. The approach allows for the use of innovation and the latest technology in research by applying technological tools in real-life social contexts to get society feedback (Ajibade 2018). The living-lab methodology also allows the use of technology at a development stage to be used in the social setting (Dell’Era, Landoni, and Gonzalez 2019; Nesti 2020) to test the validity of such technology as users give feedback (Vermeulen et al. 2016). Software technology, aimed at mining qualitative data based on people’s reaction to the news and events in the country during the Covid-19, and sentiment analysis were adopted to mine data from newsfeed comments from *Times Live* news broadcast. The second set of innovations in the study was introducing the JavaScript algorithm for creating a transparent, verifiable, time-stamped and integrated records management system in a networked environment. The `block.js` script in the class `block` indicated some of the system capabilities that might be integrated to enforce transparency, such as timestamp, hash, and the actual data, which—in the case of this paper—would be publicly generated for government projects and tender processing to eliminate corruption.

Qualitative content data, using sentiment analysis, were conducted as an innovative approach in the archives and records management field. A previous study by Lee et al. (2017) adopted it to make sense of online comments on educational videos. “Likes” on newsfeeds, for example, are reportedly weighted higher than just views 100 times and based on their mathematical calculations; “likes” of each comment are weighted 100 times higher than views (Aichner and Jacob 2015, 266).

We performed sentiment analysis, and our content analysis of public reactions to the presidential address was clustered, with each comment separated by a comma. The presidential address was broadcast by SABC News, eNCA, eTV News and *Times Live*. However, since the intention of the authors was to harvest and analyse public

sentiments, the “get comments” function for data mining was performed on the *Times Lives* broadcast, and the comments were imported and further analysed. However, since the main objective of the paper was not to deliberate on the reactions and public comments, the authors focused on substantiating the importance of automated and integrated records management systems in a networked environment, to ensure integrity in the public procurement and contract awards.

The qualitative data collection methods used a combination of non-obstructive observation, living-lab methods, and text mining algorithm to aggregate the citizens’ responses to the national presidential address regarding the “covidpreneurship”; and prevalence of corruption and diversion of public resources. The qualitative data were parsed using a software algorithm to mine newsfeed reactions and comments from citizens. The total number of samples that were reported was from 270 participants, whose opinions and comments were captured. However, due to the large volume of the text, the responses were categorised by themes, and the number of people/participants associated with each response theme. Clusters of responses were included in the bracket in front of each theme.

```
function getComments()
{
  var ss = SpreadsheetApp.getActiveSpreadsheet().getActiveSheet();
  var vid = ss.getRange(1,1).getValue();
  var data = YouTube.CommentThreads.list('snippet',
    {videoId: vid, maxResults: 100} )

  var item1 = data.nextPageToken;
  var info1 = [item1];
  ss.getRange(1, 5).setValues([info1]);
  for (var row=0; row<data.items.length; row++) {
    var item2 = data.items[row];
  var info2 = [item2.snippet.topLevelComment.snippet.authorDisplay
    yName,
    item2.snippet.topLevelComment.snippet.textDisplay,
    item2.snippet.topLevelComment.snippet.publishedAt,
    item2.snippet.topLevelComment.snippet.likeCount];
  ss.getRange(row+2, 1, 1, 4).setValues([info2]);
}
}
```

One of the most important benefits of using programming languages to mine (extract) and process data, is that the process validity can be tested over time by repeatedly using the system. As a result, the use of living-lab methodology in qualitative studies is

critical, particularly in the fourth industrial revolution era. Furthermore, because the Covid-19 pandemic has disrupted most traditional data collection methods, such as face-to-face interviews, adapting technological innovation to scientific inquiries is critical.

Results and Discussion

The text analysis revealed some of the participants' perceptions. The excerpts below present their points of view. The qualitative data presented below are based on reactions to newsfeeds and the responses they elicited from some of the viewers via comments. The comments were generated using the algorithm described above in the "get comments" functions. As previously stated, the number of likes to comments is 100 times more important than the number of times the contents were viewed. The number of "likes" per comment was then captured. See cf. 46, cf. 41 and the rest in the qualitative section on responses and comments to the presidential address about Covid-19 funds mismanagement, corruption and public officials' alleged involvement that led to investigations. Therefore, based on Aichner and Jacob's (2015, 266) findings, "likes" weighted 100 times higher than just "views" and based on their mathematical calculations, "likes" of each comment are weighted 100 times higher than "views," as the number of likes in the content analysis signifies agreement with certain comments. Therefore, once a comment is posted and (cf. 46 likes) is attributed to such comments, it is equivalent of 46 people "agreeing" to say the same things as the comments. For this reason, it is important to include the number of "likes" associated with each comment from all participants. Some of the comments are italicised below; each comment is separated by a semi-colon.

Public Sentiments about Covid-19 and Tender Fraud due to Political Influences

This section presents some of the sentiment analysis and data mined from news feeds, which can provide valuable insights for a qualitative investigation.

Public Official Alleged Involvement in Corruption

"How the government would be clamping down on corruption when officials are sitting on top of corruption" (cf. 46); "The president should not be surprised that there is corruption when the most corrupt citizens in the country have still managed to avoid justice in court" (cf. 41); "What the president should have done tonight is give the lists of officials that have been arrested by now, instead of now signing a proclamation authorising investigation onto corruption during the Covid period" (cf. 16); "I pray that the president and cabinet are led by God in their decisions. The corrupt to the highest levels are caught. Righteousness will prevail" (cf. 28); And "when politicians are a bunch of liars, thieves, bribers, corruptors who will never change. It is as if they consider it their right to plunder whatever they can to the detriment of the people who put them in power. It is a great pity that there will never be criminal action taken against these heartless people, and the only thing that will work is a change in government" (cf. 7); I don't even think that he (the president) wrote this. This is just a "public relations" (PR) stunt. Nobody is being arrested, instead, those implicated are protected and rehired somewhere else (cf. 24).

Historical Trait of Public Corruption

“For the last 26 years on corruption! Can we assume that based on historical action taken on corruption and the rhetoric of the day that only corruption by white people will be invested[investigated]?” (cf. 26); “So, what about the HUGE cigarette ban corruption” (cf. 21); “Zero tolerance on alleged corruption and looting? ... really, little action for the last 10 years. Why make a speech about it, why not just do it?” (cf. 18); “So private schools have Covid immunity? Again, the government have[has] failed this country. So much talk about corruption since the beginning of lockdown and still corruption continues” (cf. 15); “Trust, people cry about a corrupt government, but they (officials) run corrupt businesses, corrupt institutions and cry about corruption” (cf. 14); “We have heard the president condemn corruption over and over again, but nothing is ever done about it” (cf. 12); “Mr President, with respect, you couldn’t contain the corruption before Covid (Zondo corruption) how do you propose to do it now?” (cf. 12); “What about the backlog of government corruption?” (cf. 8); “With all respect with lots of talks! Same news same corruption, more uneducated kids” (cf. 9); “If the ANC has not attended to corruption, theft and looting in 27 years, should we really expect a wake up now? ... Ho hum ... and even if they ‘investigate’ theft, will anybody be arrested, go to jail ... Ha Zond Haaa. Not in a million years will any action be taken. The prize example is Zuma, who after 15 years after the arms deal is sitting in the sun at Nkandla drinking beer ... ho hum 🍷.”

Impact of Corruption on Businesses

“And they talk about a radical transformation of our economy—just imagine the number of liquidations after one year—SAA, Eskom, Post Office, and SABC are classical examples, and ‘the public officials’ do not have any notion of running a business but are experts at dishonest practices” (cf. 7); “Why talking so much about corruption and our poor economy, but how on earth can restaurants survive if their staff has to be home at night at 9pm” (cf.39); “R500 billion available? Another unfounded statement. Banks are still not approving largely because the government has not got it yet” (cf.36).

The Importance of Blockchain as useful Electronic Records System

The majority of the participants’ comments on the newsfeeds indicated that the government was not being tactical or serious about combating corruption. With endemic public corruption, managing the Covid-19 pandemic in terms of health and economic disruption is undeniably overwhelming. The government’s inability to proactively eliminate corrupt practices has compromised the government’s ability to provide palliative care to the severely impacted public—a difficult task. As a result, a records management system (RMS) that can validate all information delivered by vendors in terms of publicly awarded contracts will aid in the prevention of malpractices. Due to blockchain smart contract capabilities, all transactions would be created electronically and monitored. Compliances can also be enhanced once the criteria for the award have been programmed into the integrated RM system (Ajibade and Mutula 2019a). All noncompliance would be flagged, and if there is a need for adjudication, that can be handled through a separate process. The system can also be programmed to accept quotations within a price range closer to the market valuations of such items to be

purchased. The records of each item would have been recorded in the systems, and the price-per-unit of every item listed on the contract would help the government to eliminate deliberate price hikes. The government can use the blockchain records ledger to validate information-sensing processes (Ajibade 2016) regarding all contracts to improve execution processes and prevent corruption.

A study established that South Africa could potentially lose direct foreign investment if corruption is not addressed (Freckleton, Wright, and Craigwell 2012), as it negatively impacts the ability to grow the economy (Akbar et al. 2020). The citizens believed that the government was merely paying lip service with extensive backlogs of corruption cases without preventing similar future occurrences. Therefore, if the RMS that is built on blockchain technology is used, all contracts will be processed (executed) using a public ledger (integrated records management). When the initial contract is posted, all interested clients will submit their bids or indicate their interest. Once all biddings have been checked against the market price ranges, the bidding processes will begin after a set time, and once the bidding is closed, no additional entries will be accepted. The internal audits of the public offices can use the capability of big data to source (mine) information about different suppliers of the items the government wants to purchase, and their market values and price ranges. After that, the forensic office can ensure that a threshold (total contract amount) is set and all contractors/suppliers within the price-range margins are filtered and shortlisted by the system. One of the advantages of the integrated system is that political affiliations will not be a factor in the selection processes, since the processes are automated.

The model created as innovative solution to these problems mentioned above, is presented herein (figures 1 and 2 below). The first model was within a development environment upon which the blockchain could be built, and this was open source Virtual Studio (VScode). The second model was linked with the records management model, that linked with the system's actual process and decision-making sequence.

```

C: > Users > Ajiba > blockchain > JS index.js > Blockchain
1  const Block = require('./block');
2
3  class Blockchain {
4    constructor() {
5      this.chain = [Block.genesis()];
6    }
7
8    addBlock(data) {
9      const block = Block.mineBlock(this.chain[this.
10     this.chain.push(block);
11
12     return block;
13   }
14
15   isValidChain(chain) {
16     if(JSON.stringify(chain[0]) !== JSON.stringify
17
18     for (let i=1; i<chain.length; i++) {
19       const block = chain[i];
20       const lastBlock = chain[i-1];
21
22       if (block.lastHash !== lastBlock.hash ||
23         block.hash !== Block.blockHash(block)) {
24         return false;
25       }
26     }
  }
}

C: > Users > Ajiba > blockchain > JS blocks.js > ...
1  const ChainUtil = require('./chain-util');
2  const { DIFFICULTY, MINE_RATE } = require('../conf
3
4  class Block {
5    constructor(timestamp, lastHash, hash, data, non
6    this.timestamp = timestamp;
7    this.lastHash = lastHash;
8    this.hash = hash;
9    this.data = data;
10   this.nonce = nonce;
11   this.difficulty = difficulty || DIFFICULTY;
12 }
13
14 toString() {
15   return `Block -
16     Timestamp : ${this.timestamp}
17     Last Hash : ${this.lastHash.substring(0, 10)}
18     Hash : ${this.hash.substring(0, 10)}
19     Nonce : ${this.nonce}
20     Difficulty: ${this.difficulty}
21     Data : ${this.data}`;
22 }
23
24 static genesis() {
25   return new this('Genesis time', '-----', 'fir5
26 }

```

Figure 1: Blockchain technology script for integrated and open records management in JavaScript

Records Management Model for Procurement and Mitigating Incidences of Corruption

The model (figure 2) is based on the idea of using disruptive technology to counteract all human influences that encourage or promote corruption in public offices. This is accomplished, in part, by eliminating the common practice of having the same officers that advertise be in charge of shortlisting candidates and processing application records. The government will be able to monitor the contract-awarding business processes in a networked environment thanks to the integrated records management systems (Ajobade and Mutula 2019a). One advantage of using this model is that it eliminates current practices that place the sole responsibility for advertising, shortlisting and awarding contracts with the same entities within an organisation. Each ministry will be responsible for centralising the contract application gateways. The contracts will be advertised, and once applications with accompanying quotations are received, the systems will forward the quotations and estimates to audit. The forensic department will validate the submission that the system has recommended by verifying or conducting a price check. The compliance department will review all of the recorded information and determine whether the system's configuration complies with the Public Finance Acts (PFA).

officers responsible for approvals; 4) records managers/auditors responsible for RM policy; and 5) compliance. Using these integrated record systems, stakeholders will obtain “useful information for efficient decision making and business intelligence” (Ajibade and Mutula 2020, 49), enabling e-participation via digital platforms (Ajibade and Mutula 2019b, 9). While e-access is provided, the security and integrity of records must also be protected. Another study endorsed the notion that one way to maintain records integrity is to prevent unauthorised people from accessing vital records, such as public contracts records documenting public procurements (Marutha 2019).

To manage the e-records lifecycle process, the records officer must be familiar with creating or interacting in a networked environment. Because blockchain improves the accuracy, integrity and authenticity of public records, records managers must be able to manage this type of integrated records (Ajibade and Mutula 2019a).

Once adverts have been published, the forensic officer would get all quotations and make sure there are no inflated figures, as they must check the market values of all products quoted; then the executive officer would approve and authorise that a ledger should be created if all conditions are met. However, the records specialist must check compliance with all regulations, including the PFA Acts, and if all requirements are met, then the forensic reports are created. Otherwise, the decision is communicated to the procurement officer before the ledger is created. However, if the conditions are not met, the affected contractors’ agencies are notified or requested to provide any additional records information, and if this is accepted, final approval is granted, and the awardee is ordered to execute the contracts and publicise the data. The company name is one of the vital records databases in the records management office. To allow for competitive pricing of government contract bidding, the type of contract information and product unit price must be made public. However, the nature and structure of the payment should be kept secret from the general public.

If all public contract transactions are recorded using an open system, the case of public corruption in South Africa could be avoided in the future. The records cannot be changed. To collect data and information about specific products they are interested in purchasing, the public procurement department can create electronic files using JavaScript or other programming languages. Since various sources (for example, Covid-19 PPE suppliers and their prices) are consulted, the lowest, middle, and highest price points will be programmed by the records officers, and the systems will be instructed to sort and select an acceptable price range. Following that, the system will launch an open selection to select successful bids. The auditing department would perform quality assessments, and once all requirements have been met, potential candidates and intended transactions will be documented. All of these RM processes will be handled by blockchain records systems. As a result, there is no need to be concerned about adding figures or inflating the price after creating the records.

Conclusion

According to the findings of the study, the general public believes that the government is not serious about combating public corruption. Many public announcements to combat corruption have failed to produce results. The findings also revealed negative economic consequences and potential loss of direct foreign investment if public corruption is not addressed. The study also found that blockchain, as an integrated records management system, can help to prevent corruption because of its capabilities to maintain records integrity, authenticity, and security. As a result, blockchain technology has the potential to be an important RM tool for managing public procurements and documenting transaction lifecycles. If adopted, the blockchain RM model can help with monitoring and enforcing records compliance, as well as mitigating fund misappropriation through records audits. The blockchain records management model was developed as a flexible solution for records managers, public enterprises, and government agencies to understand the fundamental procedure and measures for combating mismanagement of public funds. The system will adhere to the tenets of good RM by providing capabilities for disseminating records, such as retrieving records and allowing the procedure for records security (Ajibade and Khayundi 2017, 183), while also promoting access to business information (Ajibade and Khayundi 2017, 185).

The paper concludes that if the tender management system is built on innovative blockchain technologies, the South African government will be able to eliminate corrupt public practices. Furthermore, the contracts of RM are integrated into the award interfaces. The idea is that blockchain, as an integrated records management system, can be a strong instrument for mitigating the negative effects of public tender contract fraud. Similar to the case of this covidpreneurship, which may have led to various public entities inflating contract prices, this can be avoided if the systems are automated to limit potential human influences.

The study recommends that the government ensures the transition of official government contracts from traditional paper-based systems to an integrated blockchain records platform. By automating the process, the government can ensure that the officers in charge of advertising the contracts are not involved in the shortlisting of the awardee. The systems should be configured to price-match each quotation, and only those within the market value ranges should be shortlisted. According to their tasks, the government should ensure that every public office has qualified records officers and managers to assist in records audits and forensic audits.

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