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Article on

Block Chain Technology and its Application in Chain of Custody.

Geethanjali

Student, School of Excellence in Law, Tamil Nadu Dr. Ambedkar Law University, Chennai

Hallaciyananthan

Student, School of Excellence in Law, Tamil Nadu Dr. Ambedkar Law University, Chennai

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ABSTRACT

The world is going towards the age of technology. There is no field which does not use technology. One such type is blockchain technology. It got developed and became very popular after the creation of Bitcoins as a cryptocurrency by the pseudonym Satoshi Nakamoto. This paper describes the possibilities of having blockchain technology in the field of Law through Chain of Custody. Blockchain Technology is defined to be a decentralized ledger system and tamper-proof. The Chain of Custody has all the necessary evidence that a police officer or crime investigator needs. To bring an effective change in the chain of custody Blockchain Technology can be used. When using Blockchain Technology, government organizations can extract the origin of the chain of custody with the chronological analysis, custody documentation, and nature of both physical and electronic evidence for all kinds of cases. This technology assures the custody's security through hashing process and makes it more legit to track the people who access the evidence stored during the submission in court.

KEY WORDS

Blockchain Technology: Decentralized ledger system, Distributed ledger: It is a consensus of replicated, shared, and synchronized digital data geographically spread across multiple countries or institutions, Proof of Work (PoW): It is a piece of data that is very difficult to produce as it is a time-consuming process in this digital era, Chain of Custody Form (CCF), Chain of Custody (CoC), Blockchain-based Chain of Custody (B-CoC).

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INTRODUCTION

Chain of Custody involves keeping a detailed log showing who collected, handled, transferred and analyzed the evidence during an investigation. Chain of Custody is essential during criminal court trial sessions. The step-by-step procedure for establishing a Chain of Custody starts from the Crime scene. The eyewitnesses and many pieces of evidence that are collected are shown in this Chain of Custody. It shows the timeline of the case from the beginning. Prosecutors must establish an unbroken chain of custody to make an exhibit into evidence. Chain of custody is when information gathered from the crime scene is used to show what was at the scene, its location, and its condition. All pieces of evidence and how it is handled before reaching the court must be chronologically documented to withstand the legal challenges which might come during the trial. This process is time-consuming and goes through numerous hands before reaching the court; therefore, chances of tampering are always high. Hence, the security perspective of the Chain of Custody must be taken care of. To prevent alteration in the evidence or data, blockchain technology can be exercised; by far, this technology is considered to be tamper-proof. Also, this technology is known for its trustless system, being immutable, and having a network consensus.

STATEMENT OF PROBLEM

- Does an improper chain of custody impose a threat to justice?
- Can blockchain technology help prepare CoC?
- Learning to use blockchain is difficult, is it worth taking up such a big task.

OBJECTIVES

- Knowing in detail how a blockchain works.
- Understanding the importance of chain of custody.
- To know why blockchain is, by far, the best way to prepare CoC.
- To comprehend how a chain of custody can be useful to stop the chain from being broken.

METHODOLOGY

The methodology is based on the doctrinal study. The source of information regarding the concepts discussed in this paper are secondary data like journals, newspapers, and the internet. The suggestions and conclusion are drawn out after a brief research on related cases that were filed in the past throughout the world.

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CHAIN OF CUSTODY- BASELINE RESEARCH

DEFINITION:

"Chain of Custody" (CoC) typically refers to the foundation the prosecution needs to establish, for certain types of exhibits to be admitted into evidence.

Exhibits are tangible objects that are relevant to the facts of a case.[1]

SIGNIFICANCE:

Under the law, an item will become inadmissible in court during the trial unless the chain of custody is unbroken, without gaps/discrepancies.

Thus, CoC must be proved to be handled properly and is unbroken to be legally considered in the court. Also, CoC plays a crucial role in high-profile cases like the 1994 murder trial of former professional star OJ Simpson. (Simpson's defense showed that crime scene blood samples had been in the possession of multiple investigating officers for various lengths of time without being properly recorded on the Chain of Custody Form. This omission enabled the defender to create doubt in the minds of the jurors that Blood evidence linking Simpson to the crime could have been planted or contaminated to frame him.[2])

PROCESS OR PROCEDURE FOR CHAIN OF CUSTODY:

From the time pieces of evidence are collected until it appears in the court of law, it must be in the physical custody of an identifiable, legally authorized person.

Mostly, shreds of evidence move in this order: Police officer- Forensics technician- police evidence technician (who stores the evidence in a well-secured place and keeps a constant track of the evidence and its whereabouts until that evidence is disposed of after the case is closed.)

A party offering into evidence fungible items such as drugs or blood samples must establish a complete chain of custody as far as practicable.[3]

CHAIN OF CUSTODY FORM (CCF):

A normal Chain of Custody Form holds details of the evidence and helps to keep track of the evidence, to know who all handled the evidence and for how long. The CCF must be handled only by identifiable persons

[1] Paul Bergman, "Chain of Custody" for Evidence, January 22, 2016, The Morales Law Firm, https://sfcriminallawspecialist.com/blog/chain-of-custody-for-evidence/
[2] Robert Longley, what is chain of custody? Definitions and examples, march 13 2019, thoughtco, https://www.thoughtco.com/chain-of-custody-4589132
[3] LexisNexis, State v. Sweet - 374 S.C. 1, 647 S.E.2d 202 (2007), Law School Case Brief, https://www.lexisnexis.com/community/casebrief/p/casebrief-state-v-sweet

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with the authority to possess the evidence. Many pieces of information are included in a chain of custody form, and it depends mainly on the nature of the case and shreds of evidence collected.

Standard details:

- The date and time of collection.
- Name of the investigator and his team.
- The location from where the evidence is collected.
- A unique serial number, identification number, or a bar code.
- Signature of individuals who had the evidence.

Other details:

- A physical description of the collected item.
- Method of capture.
- Date of transfer.
- All changes in the possession, handling, analysis of items of evidence must be recorded on a Chain of Custody form.

CASE AND FACTS RELATED TO CHAIN OF CUSTODY:

Below are some of the facts of the cases which make us realize how a broken chain of custody, lack of evidence, or tampering of evidence delays to serve or fails to serve justice.

1. GUTHRIE VS. STATE OF INDIANA [4]:

   Indiana, United States.

   Defendant here was charged with statutory rape of a four-year-old girl. On the first trial, the jury was not able to figure out if he was guilty or not. On the second trial, he was convicted and sentenced to life imprisonment. There were mainly 2 arguments on the side of the defendant. They are, the evidence that was obtained from his residence was the result of an unlawful search, and according to the law, it is illegal. Secondly, admission of state's exhibit number 6 which was a capsule containing two slides preserving alleged vaginal smears of the rape victim and argued that the state failed to show a complete CoC. As per CoC, the following was recorded: Les Allegood, testified that he had received the capsule from Dr. Joe Greenlee on the early evening of September 1, 1967, and placed the capsule on the Post Commander desk at approximately midnight of Sep. 1. James J. McKowan, who stated, he believed but was not sure, that he took some evidence from the desk to the office. Donald G. Moody stated that he found the capsule on

[4]254 Ind. 356 (1970) 260 N.E.2d 579 No. 869S176. Supreme Court of Indiana.

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his desk at 8:00 a.m., Sep. 2, and transferred it to Keith J. Young and subsequently made tests on the two slides contained in the capsule, the tests show the presence of spermatozoa in one slide. Here, a record of what happened to the capsule from midnight Sep. 1 till the next day 8:00 a.m. was missing and this raised serious doubt over its authenticity.

2. STATE V. SWEET[5]

South Carolina, United States.

Police officers wired a confidential informant (CI) and sent him to buy drugs from defendant Tony T-Juan Sweet at a motel room. They heard only the CI's voice and another voice through the wire. After CI handed over crack cocaine which he got from Sweet, the officers arrested Sweet, charged him with offenses related to the distribution and possession of crack cocaine within the proximity of a school. During the trial, Sweet objected that as the CI was unavailable to testify regarding the admission of the crack, the state had not established a proper chain of custody.

The state rejected the argument and gave consecutive sentences, but Sweet appealed to the State Supreme court. The judgment was reversed, and the court concluded by noting the point that none of the chains of custody witnesses had seen who was in the room making the alleged purchase. Also, no witnesses were very sure that the other voice heard through the wire was Sweet's voice. The CI's possession of the drug evidence could not be reduced to an issue of mere credibility based solely on the officers' knowledge of his name.

3. SARADHA SCAM CASE, 2014 (SUBRATA CHATTORAJ VS. UNION OF INDIA & ORS.) [(6)]:

West Bengal, India.

In 2013, Saradha Group financial scandal, a major financial scam happened. The Government of Bengal set up a Special Investigation Team (SIT) led by Rajeev Kumar, the then Police Commissioner of Kolkata to initiate this case. This case was then transferred to CBI under the order passed by the supreme court. When CBI reached the residence of Mr. Kumar, to take him under custody for interrogation, the police of Kolkata stopped them, after hearing this news, even the then chief-minister Mamata Banerjee reached the spot and led a three-day protest against the move taken by the CBI. In the court, the reason given by the CBI for taking that move was that the number of evidence linked to the case has gone missing. It was more clearly stated, that the police gave out over four mobile phones and a laptop to the accused, which might have led to the destruction of the evidence. The investigation team said that an SIT had submitted only

[5]647 S.E.2d 202 (S.C. 2007)
[6] (2014) 8 SCC 768

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two months' call records related to the case. If the evidence were recorded through blockchain, the chances of destroying the evidence or handing over the phones would have been very low.

BLOCKCHAIN- GENERAL STUDY

MEANING:

Blockchain technology is most simply defined as a decentralized, distributed ledger that records the provenance of a digital asset.

This definition easily states the very essence of blockchain. It is decentralized, no central administrator or centralized data storage and has a network consensus. The records are distributed between multiple participants on peer-to-peer networks (P2P). And lastly, it is a provenance of a digital asset which means the chain is arranged chronologically.

CONCEPTS TO KNOW:

A block consists of the following: Secured hash of the previous block, Current block data, Timestamp, A valid proof of work.

1. BLOCK:

   Series of Data blocks form a Blockchain. A variable in addition to Proof of Work makes a Nonce, a 32-bit whole number. Generally, a nonce is randomly produced when a new block is created further, it creates a block header hash. Block header is a connecting link, which connects one block to another, which is present at the beginning of every block. Hash is a 256-bit number that encrypts the block.

2. MINERS:

   Miners create new blocks on the chain through a process called mining. In a blockchain, every block has its unique nonce and hash. Miners validate new information and record it in the ledger. These miners compete to solve difficult mathematical problems, based on the cryptographic hash algorithm.

3. NODES:

   Nodes are any dedicated electronic devices allotted to run the blockchain. Nodes maintain copies of the blockchain locally in that device. To streamline, consider a network, every single computer in the network is a single node, they are all connected and can receive, create, store and send data to each other. A newly mined block that is in one system is synced with other nodes with the help of a network. The network

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verifies the nodes to keep them updated and synchronized. All the miners are nodes, but all the nodes are not miners. Proof of work secures the network consensus even in the presence of non-compliant nodes.[7]

4. PROOF OF WORK:

Using only hashes is not enough to prevent tampering. There are possibilities where we could effectively tamper with a block and recalculate all the hashes of other blocks to make the blockchain valid again. So, to mitigate this issue blockchain has something called proof of work. Furthermore, this mechanism slows down the creation of a new block, which is going to be added to the blockchain. This mechanism makes it very hard to tamper with the blocks since, if one tampers with a block subsequently one must recalculate the PoW for the rest of the blocks.

WORKING OF BLOCKCHAIN:

The primary block (Genesis Block) holds the blocker head, information, and then hash of the current block. After tracking the source of the evidence, checking for double entry of the same data, verified transactions are aggregated into transaction pools (memory pools) where this information waits till they are included in the blocks by the miners.

Then, the miner after arranging the information constructs the block header. A block header holds mainly the following elements: A summary of all the important data in the block, a link to the previous block in the chain (Parent block), a timestamp showing the time of the creation of the block, and a valid PoW. A cryptographic puzzle must be solved, thus creating the block, then the computer which solves the puzzle, shares the solution to all the computers on the network, and this is called PoW. The network will then verify the PoW and the block will be added to the chain. A blend of such complex puzzles and verification of many computers ensures the safety of every block in the chain.

The summary of what's included in a given block is done through hash functions, which process the data in such a way that results in a standardized unique identification code (digital signature). Hence, the system has a unique identifier for each block of information. If the hashes don't match, the blocks can't be accessed. Therefore, the security of the blockchain is ensured from its use of hashes and the PoW. Since blockchain uses a peer-to-peer network and does not have a central entity to manage the chain, the blockchains secure themselves from being tampered with. Whenever a new person joins the network, a copy of it will be given.

[7]Sana Uqaili, Understanding Cryptocurrency Mining Through Byzantine Fault Tolerance Algorithm, Jan13, https://medium.com/what-is-bitcoin/understanding-cryptocurrency-mining-through-byzantine-fault-tolerance-algorithm-64b815865030

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Nodes verify everything and make sure all are in order. When someone creates a new block then, each node (nodes refer to the other systems connected in the chain) verifies the block to make sure that the new block is not tampered with, after checking all out, each node will add the new block to their respective blockchains. All nodes in the network create consensus and they agree about which blocks are valid and which aren't. Blocks that are tampered with will be rejected by other nodes in the network. To victoriously tamper with a blockchain, one needs to tamper with all blocks on the chain, then redo the PoW for each block and finally take control of more than fifty percent of the peer-to-peer network. Only then will the tampered block become accepted by all others. This is almost impossible to do.

If a question is raised regarding the privacy of the data in the chain, then the data can be handled in the following four ways.

- Some blockchains can be completely public and open for everyone to view and access.
- Some can be closed to a selected group of authorized users.
- Hybrid public-private blockchains- In some those with private access can view all the data while the public can only view the selected data.
- Lastly, everyone can view all the data, but only the authorized people have the access to add the data.

BLOCKCHAIN'S APPLICATION IN CHAIN OF CUSTODY

If the chain of custody is broken, crucial evidence could be deemed legally futile. This often happens, if the chain of custody form or evidence bag is mislabeled or suppressed. Due to this sloppy chain of custody, evidence is proved to be precluded in court which means losing a case and failing to serve justice. Modern software systems can be used for keeping track of physical and digital evidence; one such thing is blockchain technology.

Integrity, Security, Verifiability, Traceability, Authenticity are the main requirements of a CoC process.[8] As earlier said, blockchain is tamper-proof, so the record entered can't be altered, thereby ensuring its integrity and security. And as the name itself goes, it is a chain made up of blocks. On that account, the CoC can be verifiable and traceable anytime as required. Each block has its unique hash and PoW, which guards the authentication of the evidence. In doing so, we have the opportunity to interact directly with the evidence and results of the tests, if necessary, in real-time, removing the need for intermediaries.

RESULTS AND SUGGESTIONS

CoC must contain all the facts of the case from scratch, in the blockchain. In other words, from the moment the evidence is found till it reaches the court must be entered, which includes in whose possession it was there,

[8] Dr. S. Harihara Gopalan et al, Digital forensics using Blockchain, 8 IJRTE, 182, 182-183 (2019)

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for how long, the reason for retaining the evidence. The chain automatically arranges the records chronologically which is essential for CoC. These chains are an alternative for CCF, so the basic format of data that a block holds is the same as the format followed in CCF. Using the blockchain instead of actual CCF ensures the integrity of the evidence, and since these chains are decentralized, all people involved in the case can track the evidence easily at their convenience. This will avoid any delay in transferring the evidence. (Example: if a blood-stained object is sent for DNA test sampling and when the report is ready, the forensic technicians need not send the result of the test through a mediator and increase the chance of manipulating the report, instead they can just upload it in the blockchain by themselves or by someone under their guidance. All the members can immediately check the reports making them easy to track). It's also better if a signed receipt is obtained upon transfer of items and that is also added in the blockchain, just to be on the safer side. Since the volume of data is increased, using the traditional way to write CoC leads to a reduction in flexibility and capability in documentation, therefore, by using blockchain, even these problems are solved.

If a search warrant is issued at any time during the investigation, then probable cause behind the issue must be added to the chain before the warrant is sanctioned. The pieces of evidence must be preserved in proper, secured, tamper-evident evidence bags that have space to write important case details and a photo of the physical evidence must be attached to the block containing other information of that particular evidence. It is best if every piece of evidence has a witness just to increase the credibility of the proof and these details must be included in the same block as the evidence for which it is created. As the evidence proceeds through the investigations and trial, the CCF must be updated and be checked regularly.

The accessibility to the blockchain of a case must be very limited to those who are involved in the case. Authority to possess the evidence, such as police officers, detectives, forensic analysts, certain officers of the court, and evidence technicians can alone be given access. While the evidence is stored in a place/room, it must be made sure that no one other than the authorized associates is allowed to enter. These rooms must be under basic surveillance and even that should be checked regularly. It will also be better, if the person who checks it, adds the same to the chain. The evidence should be precisely labeled as soon as it is found and should be assigned a unique identification number or barcode to each piece. If any new member is required to be given proper access to the chain, then he/she can be added to it. The time of adding them and the reason behind adding them must be put in a separate block in the chain.

DISCUSSION

In one of the landmark cases, the judgment clearly states that: "Whereas in the case of seized or purchased narcotics, the object offered in evidence has passed out of the possession of the original receiver and into the possession of others, a chain of possession must be established to avoid any claim of substitution, tampering

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or mistake, and failure to submit such proof may result in the exclusion of the evidence or testimony as to its characteristics. Where such evidence or testimony is improperly introduced and is prejudicial to the party against whom it is directed, then the judgment of the trial court should be reversed[9]. Though this case deals with narcotics, the basic key point which is drawn out is the same for all the cases, and this indefinitely proves, as to how much proper chain of custody is important, in criminal courts. Although CoC is most commonly used in the criminal justice system, it can also be used in civil cases such as lawsuits arising from impaired driving incidents and acts of medical malpractice. Therefore, it is important to impose a law that governs the Chain of Custody.

State SC/ST Commission Chairman C. L. Thool said, "In major cases involving serious attacks, rapes, and murders, statements of complainants/witnesses are not registered, which is mandatory under the Criminal Code Procedure (CrPC). In case, complainants/witnesses turn hostile by changing recorded statements, they can be punished. But the police machinery does not seem to be taking these complaints and laws seriously."[10]

When the words of C L Thool is taken into consideration, we can realize how much it is necessary to impose more strict laws to govern the evidence management and complaint filing. From 'they can be punished' it should be changed to 'they will be punished', this will surely bring a change in the society. Even though this statement was said keeping in mind the SC/ST people, but again this is in reality is a true fact applicable to all cases. Just because laws are formed doesn't mean problems are solved. In order for a law to be successful, it must be brought into action. Every police officer from lower posts to the higher authorities must be made to follow the laws of handling custody and the way a complaint must be registered; this must be done either by spreading awareness or by force.

Management of evidence is very important, because it is on this basis, justice is rendered. It is of course true that chain of custody evolves from time to time, that is why, law governing them must be flexible to such an extent, where it can be amended with regards to the growing scenario. A law must be put in such a way that makes them understand the importance of managing evidence and forces all the officials to prepare a proper CoC thereby strengthening the case. When such laws are updated from time to time, the procedure can be followed at ease without any delay and confusion. In countries where such laws are not yet formed, a big suggestion is that while forming such laws, blockchain technology should be included.

CONCLUSION

[9] Graham v. State (1970), 253 Ind. 525, 255 N.E.2d 652

[10] Chittaranjan Tembhekar, most atrocities cases in state closed due to lack of evidence, aug14,2014,05:22, Times of India, https://timesofindia.indiatimes.com/city/mumbai/Most-atrocities-cases-in-state-closed-due-to-lack-of-evidence/articleshow/39569792.cms?from=mdr

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Changes are always difficult to make and accept, but change is the only permanent thing.

Bringing a new methodology into practice is very difficult but not impossible. Blockchain technology is being used in many fields nowadays. Law, order, justice…. These words have been in existence ever since man started to exist. But the most important thing to remember is that, though law and order are passed through generations, the need for it will always grow. So, holding on to old methods to solve a new problem is not justifiable. This technology is difficult to learn and to bring to regular practice, but once practiced the results will unquestionably be remarkable. Blockchain technology of course can be brought into this field in different ways, but the chain of custody needed a drastic change as of now. Practically, the best way to bring this change is to educate about the blockchain and other required technologies to the students of the police academy and other academies/universities which are building up new individuals, who help to serve justice. Lastly, to conclude, every student who comes out of academy or university as a police officer, investigator, analysts, or as any social worker for that matter, must have one clear thought in mind and that is "Doing a wrong thing is easy when compared to doing the right thing, but doing the right thing is the best thing to do, no matter whatsoever." By having this in mind, the wanting to do the wrong thing will be reduced.

DECLARATION

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

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