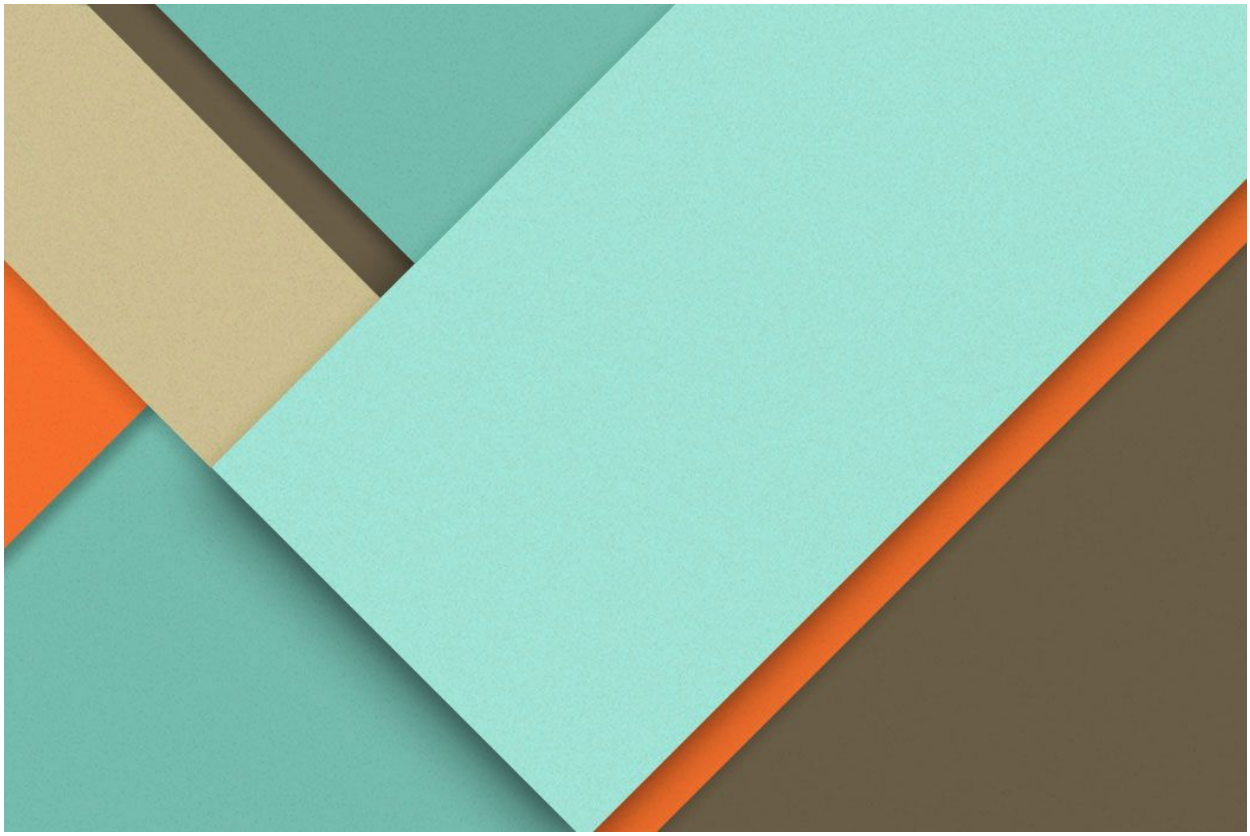

Blockchain solution for Health Insurance Claims and Patient Health Records

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Naga Siva Srinivas Kotamarthi, CFA; Raghu Raaj, Mrinal Sinha
Arthashastra

Overview

This document analyzes the Health Insurance Claim process from the perspective of Consumers, General Insurance companies and Hospitals and aims to provide a futuristic path with an improved process using various functionalities like decentralization, security, distributed ledger maintenance provided by Blockchain Technologies.

Goals

1. To articulate and analyze the problem areas in the Health Insurance Claim Settlement area from the perspective of the most important actors - Policyholders, Hospitals, Insurance Companies
2. To provide an overview of Blockchain capabilities
3. To translate core Blockchain capabilities to address the pain areas of the Industry

Problem Statement

Indian ecosystem of Health insurance at a high level has actors in the form of Insurance companies, Insurance Agencies, Hospitals, TPAs (Third Party Auditors of claims), Policyholders. When it comes to claim settlement process of Health Insurance, TPAs play a major role particularly in the area of Cashless Claim facility provided by the Insurer to the policyholders with networked hospitals.

From the perspective of a Policyholder, any insurance policy is as good as the efficiency of its claim settlement system. The verbiage in the Insurance policy statements, disclaimers, information regarding coverages included, excluded makes it a hard task for an average household person to be able to discern the underlying benefits provided vs restrictions applicable and use the knowledge to take best decisions during medical emergencies. Certain aspects of the process in which claims are settled do not provide a lot of transparency to the Policyholders. While the hospitals and the insurers try their best to provide the best settlement for the Policyholders, a lot relies on the efficiencies of the TPAs. A lack of standard protocols, standard and automated claim settlement mechanisms adds to the paucity of trust in the existing network participants providing uncertainty to the Policyholders.

From the perspective of a Hospital, the better the financial worries of the customers are resolved, the better the Hospital can serve its customers in their greatest hour of need. TPAs typically are provided desks at various Hospitals, hospital networks and considerable costs are incurred for the same. While the entire claim settlement process brings data from various Hospitals in the network, the same is never relayed back to them or other Hospitals for purposes like verification of patient health records in times of need, provision of deluxe rooms and other facilities if the same are adequately insured.

From the perspective of a Health Insurance provider, significant claim processing costs are incurred due to disparate networks of TPAs, unstandardized communication protocols, fraud that may be happening due to inadequate controls in place from the TPA's end. When investigations open up due to customers' complaints to the regulator OR any court arbitration, data gathering and re-verification of the records etc turn out to be cumbersome and significant costs are incurred for the same purpose. All these further result in multiple Customer Service requirements resulting in further costs.

Detailed problem statement

The following section details how the health insurance claim settlement process is currently broken for all parties involved: patients, insurers, and hospitals / care providers. The impact of the imperfect is

1. higher costs, sub-optimal health outcomes, large time delays for patients even if one does discounts stress, frustration, and the feeling of getting cheated
2. higher costs, missed revenues, cash flow challenges, and sub-optimal patient health outcomes for hospitals
3. higher costs, customer attrition (as a result of customer dissatisfaction), cash flow variations, fraudulent claims, and the lack of real time data to guide innovation

Blockchain technology where hospitals and insurers build a *secure network* can help solve these problems. In the following subsections, we address the problems Blockchains can solve in the immediate term.

A. Point of view of Patient

- Delay in final billing
- Too many parties to coordinate with to clarify coverage status: TPA person, Hospital administration person, Doctor(s) in different departments / Nurses, Insurance call center exec, HR of his company (if insurance is through company). Almost always there are problems to be solved in the claims, e.g. in a delivery situation newborn's name is not on the insurance esp. if newborn comes after a week of being

discharged, or, room category etc. etc. Often the patient ends up feeling cheated because of lack of transparency.

- Unpreparedness about cost to be borne (even if the patient has the ability pay) because
    - Sub-limits mean some costs are covered but others are not - therefore not transparent
    - Co-payment costs because agent sold a “cheaper” premium product and patient finds out at the point of care
- Sub-optimal medical choices. Lack of clarity about quality of care available under the policy can lead to sub-optimal medical choices? *e.g. choosing a steel implant even if a titanium implant is covered*
- patient health records on blockchain - phase 2 or 3 (user controls who gets the health record)
    - Better care
    - Don’t have to carry records around
    - Everything - all records, medicines and consumables used are always available for anyone I need to give anything to
    - Maybe lower premium for me

B. Point of view of Hospital

- Cost of TPA: desk etc.
- Cost overheads because of slow process: Multiple back and forth to ascertain whether claim is valid or not requires administrative overhead
- Revenue loss / costs get incurred when they should not get incurred? *Patient thought an expensive stent is covered, but it was in a sub-limit. So now when the TPA says they will pay only Rs. 7,500, the patient refuses to pay. Nothing can get him to pay.*
- Additional security costs: A lot of fights because patients think something that is covered is being denied to them:
- Cash flows? Because the money from the TPA / insurance company is delayed?
- Lost revenues / additional costs because insurance company disputes a claim even if the TPA has processed it?
- Lost revenues because patient does not opt for higher level care (even if it is covered) because of intransparent information. *e.g. choosing a steel implant even if a titanium implant is covered*
- Do not have access to patient history (patient health records on blockchain - phase 2 or 3)
    - Access to patient health records to provide better more personalized services therefore higher revenues claims costs, e.g. covering cancer diagnostics in patients whose parameters seem high risk for cancer

- Costs being missed because certain items were not billed when the final bill was printed - add on procedures etc. (put the departments within hospital on blockchain - phase 2)

C. Point of view of Insurance Provider

- Claims settlement costs
    - TPA costs
    - Paperwork costs
    - Low efficiency and high costs because of paper being sent to insurance company (courier costs)
- Claims erroneously processed
    - Additional costs which should not have been incurred
    - Items not processed
- Fraudulent claims (e.g. because staff of TPA did something)?
- Customer care costs because of TPA process
- Bad customer experience therefore lower customer stickiness because
    - hospitals providing items that are not covered due to lack of a system that makes things transparent across the delivery chain (e.g. the cardiac stent example). Therefore, patient has to bear the burden of the costs and this makes the patient angry
    - Co-payment costs because agent sold a “cheaper” premium product and patient finds out at the point of care
- Hospitals asking for deposits (because of delays in payments due to TPA delays)???
- Lack of granular, real-time claims data does not allow insurers to innovate: Since claims information is in physical form? With real time data insurers would be able to customize a policy throughout the year... e.g. sell add on-stuff. E.g.
    - your insurance limit is exhausted, pay Rs. XYZ to increase limit, OR
    - you were diagnosed with ABC. Chances of some disease because of ABC increases, therefore here is a critical illness cover. etc. etc.
    - Increased cases of some particular ailment so provide some diagnostic services free to help people have better preventive care for that ailment - OR free vaccines etc. (to save eventual claims costs)
    - Monitoring the practices of hospitals and whether they are good - e.g. what types of consumables are being used (but for this we need to get to departmental level with hospital - phase 2)
- Large cash flow variations because of poor infra / TPA constraints
- Prevents business model innovation by insurance company - e.g. creating supply market for highly used consumables, contracts with blood banks, etc.
- Data issues
    - Security
    - Privacy

    - Availability / archival
    - Breaches(?)
- Access to patient health records to provide (patient health records on blockchain - phase 2 or 3)
    - better / more personalized services and lower claims costs, e.g. covering cancer diagnostics in patients whose parameters seem high risk for cancer
    - better health plan (more personalized)
    - Maybe earn higher premium

Overview of Blockchain capabilities

Before jumping into the potential solutions that Blockchain can provide at an industry level, it is important to layout certain fundamentals of the same. An understanding of the evolution of Blockchain helps understand the real strength areas of Blockchain that can translate to efficiency gains, trust establishment etc.

The original use case (Payments - Bitcoin)

The original usecase of Blockchain was for Payments resulting in widespread springing of currencies that relied on the benefits provided by Cryptographic principles. The Payment usecase was thought from the angle of a currency that could be managed without a central authority. One of the fundamental problems that needed solving was the “Double Spending” problem where trust needed to be established in the Payment network to ensure fraud in the form of spending the same coins more than once could be done if a reliable ledger was not maintained. The solution to the same came in the form of a cryptographic linked list which took the name ‘Blockchain’. Some important features of the solution were - protection against hacking through ‘Proof of Work’ mechanism, Distributed ledgers which enabled decentralized settlement engines (a.k.a miners), gamification of trust enforcement through incentives for following the prescribed consensus protocol.

While the prospect of a decentralized currency garnered interest across industry, the real benefits were seen from the innovative solutions provided to consensus protocol, trust mechanism, security from hacking, distributed ledger maintenance by Blockchain protocol. The applicability was limited from the core-currency Blockchain applications like Bitcoin as the decentralized settlement process was limited to a prescribed algorithm for payment transfers mainly solving the ‘Double Spending’ problem.

Smart Contracts and Distributed Ledgers

With the advent of Ethereum, the applicability of decentralized Blockchain based networks was expanded to endless possibilities through the introduction of 'Smart contracts' that can be maintained on Blockchain based platforms. A Smart Contract uses the never ending distributed ledger concept to ensure

- a contract with its terms transparently maintained in a decentralized network could not be tampered with (hence providing 'immutable' character to the contract)
- the enforcement of the Contract for processing and settlement in a regularized fashion using the trust building protocol of Blockchain.
- the concept of 'tokenization' could be applied to a lot of industry scenarios beyond the 'currency' use case and hence the benefits of a reliable distributed ledger could be extended to various industries.

Public vs Private Blockchain solutions

While Public Blockchains are revolutionary in nature aimed at decentralization and doing away with regulations, Private Blockchains help industry participants use the benefits of Blockchain network to solve issues in the supply chain of the industries by solving problems of trust, simplifying the reconciliation requirements, audit requirements across parties involved, establishing transparency to the regulator as well as the customers through a single system of records.

Energy requirements

While there is a well known understanding that mining of Blockchains requires tremeandous computational requirements, a bit more knowledge of the underlying protocol provides deeper perspective of where such a computational requirement is a necessity (security in a public domain by Proof of Work protocol) and where a simpler mining solution can solve the required use case (Proof of Stake protocol)

Throughput and cost of transactions / contract settlements

While Public Blockchains have received criticism for the 'slower' transaction settlement and high costs required to be paid to the miners for settlement, a design layer of Private Blockchain intermingled with a central Public Blockchain can ensure near realtime settlements at far lesser costs.

Future Vision

A network of Health Insurance participants that are inter-connected ensuring

- the product offerings by different providers are translated into transparently enforceable smart contracts
- Claim settlement follows the immutable contract implementation in a fairly decentralized manner thus building more trust into the system
    - In the short term, this can bring down the claim processing costs, thus translating into efficiencies in the system, cost savings for the Insurers and Hospitals and then ultimately premium reduction for the Policyholders
    - In the long term, there is a possibility of the entire Claim settlement to be driven by such a system thus helping the industry participants to focus on Product development
- Privacy and security of such a distributed ledger is ensured and relevant data could be provided to various participants on a need-to-know basis:
    - Health records of the customer for medical treatment, policy eligibility, customized product offering
    - Coverage details for Hospital product offering, faster settlement of claims
    - Prescribed Medical checkup records for Policy issuance, renewals
    - Verification of hospitalization dates, patient condition, diagnosis, treatment provided, components of bills by insurers with the help of the Hospitals in the network
    - Enhanced Fraud detection proactively as well as for investigation of past incidents

How Blockchain can help in the near term

Standardized contract settlement

Treating claim settlement as a standardized contract settlement would solve the fundamental underlying problems in the industry. The smart contract standardization would bring standardized protocols of claim submission, verification, settlement thus reducing excessive processing costs incurred by insurers mainly for those products / coverages whose claim process is standard across the industry.

Reliable system of records

Most of the pain points articulated in the sections above can be solved by ensuring a reliable system of records which is one of the core features of Blockchain distributed ledger.

Private vs Public ledgers

While Smart Contracts can be publicly maintained, the settlement of the same for each Insurance company can be kept private which additionally resolves throughput concerns, concerns of hgih transaction costs, energy requirement concerns, data privacy concerns.

Public ledgers can intertwine all the industry participants' public data thus enabling transparency, reconciliation and providing the core Blockchain security features to such data.

Health Insurance Claims settlement is one of the areas where there is a perfect match of various features Blockchain brings in and the Business problem areas that need efficiencies built in. The solution using the same can have various below components:

1. Underlying Public platform
2. Private Platform for various Industry participants
3. Standardized Contract settlement modules building trust amongst the actors in the industry.

Who we are

Arthashastra advisors is a team bringing together the best of understanding of current developments in blockchains and crypto-currencies, along with detailed, long years of research into cryptographic technologies.

Our team consists of (a) professionals with work experience in FinTech and in large global financial institutions, (b) developers from IIT, and (c) research scientists with 20 years' background in cryptography and several publications in core research areas.

The team brings together experience of designing, developing, and running -

- Crypto exchanges in Australia
- ICOs in SE Asia
- Blockchain based supply chain system to counter counterfeiting of drugs and defense equipment for European Governments and Pharmaceutical companies
- Platform for issuing ad-hoc insurance in Europe