

A Survey on Silk supply Chain Management Using Blockchain

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Abstract: *India is known to be the second largest producer of silk in the world with the silk market growing at a potential of 4-5% YoY yet remains highly unorganized & fragmented in terms of supply chain. Emergence of forged products and product quality scandals has disclosed the importance of quality management from a supply chain perspective. The reason lies in the challenges brought by the traditional system: self-engrossments of supply chain members, asymmetric details in fabrication processes and limitations of quality inspections. Blockchain is a propitious technology to solve these problems. In this paper, we discuss how to enhance the silk supply chain quality management by adopting blockchain technology.*

Keywords: — *Supply Chain Management; Smart Contract; Decentralization; Blockchain; Silk*

I. INTRODUCTION

The constant unfolding of counterfeit silk fabrics and quality scandals has revealed the significance of quality management from a supply chain perspective. According to a survey conducted by "The Indian textile journal", the yearly fabrication of raw silk in India was 17305 tons, of which mulberry raw silk alone accounts for 15445 tons in 2005. The appeal for raw silk was much more than the fabrication at 10180 tons yet India imported 10538 tons of raw silk in 2005. The imports have regularly escalated in 2000 from 6015 tons to 10538 tons representing a compound annual growth rate of 9.8%, against a mere 0.25% compound growth rate in fabrication. During the five years the appeal supply gap has escalated by 73%.

The imports of fabrication have increased from 39% to 68%. This scrutiny indicates that India has not been able to meet the increasing appeal for silk in the domestic market by escalating domestic silk production and to exploit the huge export potential. Instead resorted to importing raw silk to fill the domestic demand supply gap.

Solution to the problems of product quality in supply chains has become a key affair in acquiring manufacturing power from strategy implementation.

The root cause lies in the traditional centralized system: 1) the self-interests of the networks of members; 2) asymmetric information in the production process; 3) poor quality testing 4) technical limitations.

The exposure of blockchain tech has brought ingenious possibilities to Supply Chain Quality Management. A blockchain is a concord that allows the data to group into blocks, linking those blocks together into a chain. Each block is distinctive of itself and depends on blocks previous to it containing the identification transactions, the definite transaction's contents, and a pointer to the preceding block in the chain. To persuade the estimate of the end product, trackability and keeping track of industrial processes are beseeching essential. Blockchain technology has come out as part of a development link to the Internet of Things, giving features such as trackability, validation and security to sectors willing to use this technology.

In the retail sector, blockchain provides users the chance to keep track of details about time and location of progression, the emergence of raw materials, the standard of materials involved in the making processes of

manufacturing, details about the parties that work on it, etc. Blockchain technology adopts the governance model of human community in IT systems, and further develops the traditional centralized system to a distributed decentralized system that allows different interest groups to give out in the same IT system. This system also improves the qualities of by-product and assistance in supply chains by smart contracts.

II. LITERATURE SURVEY

“Made in Italy” [1] the Ministry of Economic Development commissioned this project, Italy developed in collaboration with IBM ,applicability of the blockchain technology to assess the technology of the traceability and promotion of Made in Italy supported it .The data model requires each user to be associated with a personal information sheet containing their name, user password and role: when they login on the platform, the role of the actor will verify the application and said information is used in input to verify compliance with limits set forth in the Smart Contract. Focus was on quality, origin, environmental and ethical sustainability. The technology

“A Blockchain-Based Framework for Apparel & Footwear Supply Chain Traceability” [2] Blockchain-Based Framework project was proposed by Cognizant on November 2018 for a Apparel & Footwear Supply Chain Traceability. Through smart contracts and audit the data model integrates blockchain with -Agent Onboarding and Registration, Asset Registration, Asset Certification, Distributed Ledger, Transaction, Certification and tracking. The focus visibility, traceability, better consistent quality ,improved supplier capability, capacity and reliability.

“De Beers blockchain for diamond” [3] To span the diamond value chain De beers group initiated development of the first blockchain. For the project they have partnered with corporate investment and incubation firm BCG Digital Ventures. The data model ensures the platform meets the needs of users that are addressed with protection of commercially sensitive data, streamlining processes at various stages and providing affirmation. For every diamond registered the main focus was on Tamper-proof, permanent digital records, conflict-free, natural.

“Luxochain” [4] project was enabled to provide traceability for luxurious products and was developed by Luxochain. With a traceability of information, it aims to secure all work, that allows users to check production batches, ingredients, processes and, in the analyzed case, intercept any anomalies that may arise along the supply chain. They provide blockchain solutions for luxury supply chain products. By sharing important information on the origin of materials and ingredients we can make the supply chains more transparent, processing and manufacturing methods, distribution and delivery dynamics. Making luxury products safe from counterfeiting, maintaining authenticity of the luxury products was the main focus.

“Reshma Mandi ” [5] is India's first technology-led ecosystem to connect various actors in the silk supply chain, starting with connections between sericulture farmers of India and silk reeling community as they form the backbone of silk supply in India. The main focus was to connect sericulture farms to the reeler community of India via scientific testing at hubs, fair pricing & optimized logistics, hence providing a predictive raw material sourcing, capacity building, all via digital means. They have a community of 50+ silk reelers, making use of their digital platform daily, for procuring cocoon needed by the community of reeling.

Si Chen, Rui Shi ,Zhuangyu Ren ,Jiaqi Yan, Yani Shi and Jinyu Zhang [6] proposed a framework for managing blockchain-based supply chain quality .The framework is composed of four layers; the bottom layer is IoT Sensor Layer. In this layer, to locate the products in the logistics process GPS is used . Quality information, assets information and transaction information is recorded with RFID technology. The Data Layer is the second layer, including blockchain and safe distributed ledger. All the information copy of the supply chain of suppliers is kept by the enterprises , manufacturer, logistic operator, retailer and financial institutes. With this data, to execute quality control and improve the efficiency of the supply chain smart contracts are used. The third is Contract Layer. To supervise the access authority to the data Digital identity is used. Real time Quality monitoring and control is used with the real time data about qualities, hence smart contracts are used . With the logistics data, to plan logistics automatically smart contracts are used. The Business Layer which is the final layer includes various business activities in enterprises. In the supply chain each enterprise is able to control and manage the products qualities with the support of blockchain and smart contracts.

Mitsuaki Nakasumi [7]. proposed one of the blockchain based solutions to address the problems of supply chain such as Double Marginalization and Information Asymmetry etc. This platform will enable by combining a blockchain with a homomorphic encryption solution. Here Users are not required to trust any third-party and are always aware of the data that is being collected about them and how it is used. The entities that have been entrusted with maintaining the blockchain and a distributed public/private protected data store in return for incentives. In general, the information sharing schemes are exclusively tied to the major IT companies serving as the trusted third party who process and mediate any electronic transaction. Here the role of the trusted third party is to validate, safeguard and preserve transactions. A transaction is initiated when the future owner of a certain product sends their public key to the original owner. The coins are transferred by the digital signature of a hash .Public keys are cryptographically generated addresses, and transaction is a simple trade of coins from one address to another. here they proposed a new scheme for information sharing. It brings many benefits for the supply chain management generally . In addition to this, the blockchain recognizes the users as

the owners of their encrypted data. Companies, in turn, will focus on utilizing data without being overly concerned about properly securing and compartmentalizing them.

Soha Yousuf, Davor Svetinovic [8] proposed an ideal overview of the fields where the blockchain will integrate with supply chain management in order to benefit from further research and development. The research technique is based on systematic paper reviews to achieve the following: define the stages of a supply chain; and define the blockchain characteristics such as “trust” and “decentralization” as well as their definition within the scope of a SC. The focus of the paper was on the main four of the eight SCM stages since these processes were the most researched in literature in terms of the problems faced towards achieving efficient supply chain performance. Each supply chain stage was researched in literature in terms of the problems which would provide towards the need for trust and at any time. Retailers, sellers, customers, and anyone in the supply chain are able to trace out the origin, production, and purchase history of each individual product (whenever that particular specific information is available), and here also a customer can also verify the origin and authenticity of the purchased garment, tracking all its stages. and thus, the stages of each garment can be traced back to provide assurance to its validity. Collection, traceability and treatment of the raw materials which could be assured with the use of a distributed ledger in which all the transactions were recorded safely.

To execute traceability T K Agrawal, L Koehl and C Campagne [9] proposed a unique identifier code for each product by using time differing functions that could be a beneficial solution. A connection or a reliable key to stack or retrieve manufactured product details will be acting as a distinctive code generated at all stages of the product life cycle. For goods verification and traceability, this inspection will be presenting a particle randomness-based tag in the textile supply chain. A unique trademark for each product acts as an advanced tag that is economical and can be effortlessly encrypted and verified using a camera based smartphone. The garment unified the enveloped tag by imprinting it over the material surface to overcome the issue of removability. These tags (which will act as a security layer) along with existing technologies are also undertaken to combine the research work to trace the goods, know its composition, history, origin, carbon footprint and dispersal processes.

To analyze how Blockchain can help the clothing industry Juan José Bullón Pérez, Araceli Queiruga-Dios, Víctor Gayoso Martínez and Ángel Martín del Rey [10] addressed key traceability purposes. To track the materials, we will be acknowledging designers, sellers, and final customers to use such forefronts. In concise, a block chain is an open, decentralized, and distributed database that retains documentation of digital activities, with a network of similar databases (nodes), in a peer-to-peer link that is possibly visible to anyone within the particular network. In a specified way, blockchain fetches

a strong assurance that the data will not be altered and that programs associated with the blockchain will resume to be processed. To trust each other and perform proceedings by peers making the need for intermediaries outmoded, localized blockchain networks will be acknowledging people. For validation and tracking the ready-to-wear textiles supply chain they have presented the usage of blockchain technology. With a specific characteristic of a women’s shirt a case study has been introduced. To add new blocks the supply chain uses blockchain technology that permit actors with the goal of tracking the clothing. In a supply chain, anyone, from every location and at any time, retailers, sellers, customers, would be able to trace the beginning, production, and procured history of each individual material (whenever that specific information is available), and a consumer could verify the origin and gentility of the purchased material, tracing all its stages. Thus, the phases of each material can be traced back to guarantee its validity. With the use of a diffused ledger in which all transactions are securely stored, collection, traceability and treatment of raw materials could be assured.

III. COMPARISON

At present with the implementation from the ReshmaMandi organization Indian silk supply chain market is technologically-led by using highly-graded grainage inputs, IOT led scientific advisories, hyper-local sourcing hubs to save on logistics & man-day losses, all coupled with better output pricing and connecting the various actors present in the silk supply chain management. Yet it is unable to provide traceability, prevent product quality scandals and reduce counterfeit products.

The Made in Italy project addresses the quality management problems, reduction of counterfeit products and implements traceability hence improving the quality of the supply chain management using the implementation of blockchain technology. But this project is applicable to only Italian made goods and cannot be used for any other products.

IV. CONCLUSION

This paper will depict the projects that have been implemented in blockchain technology and proposed systems to improve Supply Chain Quality Management. These projects are going to provide a theoretical basis to intelligent quality management of supply chains based on blockchain technology. Also in this paper highlights have been made on various technologies used for tracking and tracing the life cycle of the product implemented in the projects. This system can be further improvised by implementing certain transparent chemical material that are printed inside the fabric which is not noticeable by the naked eye but can be detected by IOT devices which can scan and provide the details to the consumer. Further trading of the goods can be done through cryptocurrencies which enables safe and confidential payment services with no transaction fees as there is no



involvement of any third party and enabling various forms of payments to buy within the supply chain.

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