Blockchain Technology For Implementing Silk Production System

[1] Kavita Bhosle, [2] Atharva Mohite

[1] MIT, Aurangabad, MH, India

[2] IIT, Indore, MP, India

Abstract: Every silk industry has a value-added chain from silkworm eggs to fabrics or finished garments. In this chain, every activity has its own importance and specialized knowledge is required to perform each and every activity. Different activities in the supply chain are widely spread all over the state. The activities performed in the areas formed clusters such as clusters of Cocoons production, Silk Reeling, Spinning, Dying, and Weaving. All the activities are interdependent with each other. But the linkage among all the players of the chain is established by some intermediaries or traders. Blockchain can provide supply chain transparency also it reduces risk and cost across the supply chain. We proposed a more secure method to supply chain management for silk production using Blockchain technology. Security and transparency will be provided through a face recognition hardware device and QR scanner. Customers can see details of all stages of silk production. Due to such transparency in the system, the silk business will increase and farmers and all units of a cluster will get benefited.

Index Terms – **Silk Production, Blockchain.**

I. INTRODUCTION

Silk industry is an example of private, centralized blockchains and is not open for all. The system has access restrictions. Peoples who are involved in cocoons production, Silk Reeling, Spinning, Dying and Weaving and want to join requires permission from the system administrator. These all entities are governed by single entity. At each block stages of silk industry, face recognition with OTP is used to store every transaction in hyperledger. Hyperledger in which all transactions are stored is a private. QR code is used on product so that customer can scan all stage information through QR using QR scanner. There is no transparency exist in available solution. Silk customer have not guaranty that product purchased is authenticated and all stages are not transparent eventually market get down. Also there will be possibility of malpractices.

Silk customer will have guaranty that product purchased is authenticated and all stages like cocoons production, Silk Reeling, Spinning, Dying and Weaving will be transparent so that industry can gain confidence of customers and eventually market get increased. Solution help to reduces supply chain malpractice and increases transparency in silk production market. Also it helps to get public trust so that silk market will be benefited.

Julien provided comparative study of major framework Fabric, Ethereum, Quorum, MultiChain and R3 Corda required in Industry [1]. Fabian introduced the basic concepts of blockchain technology and studied real world applications from the energy domain [2]. In the domain of Sericulture has study every activity in the value chain and the constraints that are being encountered for natural Silk Sector of Assam [3]. Research worked on a private and permissioned application of Blockchain for automating the shipping processes among different participants in the supply chain ecosystem [4].

II. PROPOSED BLOCKCHAIN FOR SERICULTURE SYSTEM

The proposed system relates to product and systematic process for silk industry. Silk industry is having different stages like cocoons production, Silk Reeling, Spinning, Dying and Weaving. At each stage non editable transaction can be saved in hyper ledger of blockchain so that these transactions can be seen by customer by scanning QR code. Researchers have been proposed and did survey on Silk Supply chain management in India. They have provided information for enhancement of the silk supply chain quality management by adopting blockchain technology [5].

We proposed more secured method to supply chain management for silk production using Block chain technology. Security and transparency will be provided through face recognition hardware device and QR scanner at customer end. This system can be applied in any industry for showing transparency in making product to customer. Example: silk industry, any product industry, dal meal industry, health care section for making patient history transparent. This proposed system is useful because existing block chain technology never has been used in silk industry and QR code is used on product so that customer can scan all stage information through QR using QR scanner. At each block stages of silk industry, face recognition with OTP is used to store every transaction in hyper ledger [6-9].

We have worked on hyperledger Fabric which is hosted by the Linux Foundation and worked on decentralized operating system. It supports permissioned blockchains execute on distributed applications [10]. Clients, peers and ordering service nodes are the main components of hyperledger fabric for proposing transactions, maintaining the ledger and deciding the order of all the transactions. Application logic has been implemented using smart contracts known as chaincodes. Permissioned blockchain permitted to join the network after proper proof of their identity [11]. Then permissions are allocated to perform designated activities on the network. This is known as permission based role system. Special permissions are granted to each participant. In sericulture system, participants are farmer, reeler, twister, dyer, weaver, etc. Few participants may have permission to perform specific functions such as read, write and access the information on the blockchains. Such system controls the activities of the various participants in the allotted roles [12].

Nick Szabo proposed digital form of Smart contract first time [13]. It stores its state on distributed ledger using an event driven program. Contract code, key value database, ledger, validating and non validating peer, deployment and invoke are the key concepts of smart contract [15-17].

2.1 Development Stages silk production System

Following are the development stages of sericulture (see **Error! Reference source not found.**). We are developing smart contract for all stages of sericulture.

- Sericulturist or Farmer : He/ she will produce cocoons and sale to cocoon market

- Cocoon Market: Authority is given through face recognition. Maintaining record of silk cocoon purchase from farmer and sale to reeler.

- Reeler: Authority is given through face recognition. Maintaining record of Silk cocoon processed, reel and production of raw silk

- Twister: Authority is given through face recognition. Maintaining record of raw silk is twisted

- Washing-Bleaching-Dyeing: Authority is given through face recognition. Maintaining record of raw silk is processed and dyed raw silk

- Weaving: Authority is given through face recognition. Maintaining record of dyed silk yarn is processed and silk Saree or cloth is weaved on handloom or power loom

- Printing: Authority is given through face recognition. Maintaining record of raw Silk issued for producing plain Saree/ fabric. It may be dyed and printed.

- Marketing: Authority is given through face recognition. Maintaining record of Silk Saree or fabric is sold

- Consumer: Using QR scanner customer will get all block information from sericulturist to market and Silk Saree or cloth is purchased.
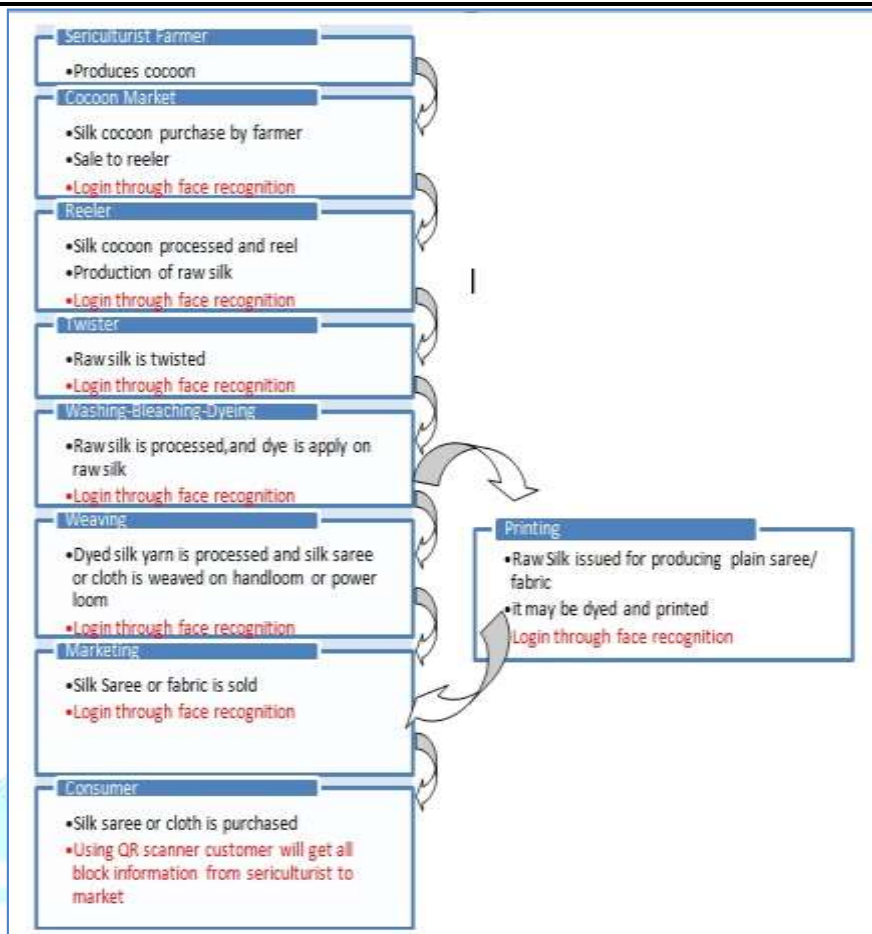
Figure 1. Stages in development of silk from cocoon

III. RESULTS AND DISCUSSION

We have implemented block chain system for sericulture process using small network. It successfully displays the record to customer after QR scanning on silk product [18]. Following are the advantages of using such system

1. Records on a blockchain hyperledger cannot be changed
2. An initiated transaction cannot be changed, stopped, undone.
3. Login through face recognition and finally all details of supply chain management can be visible through QR scanning by customer
4. High traceability of silk material supply chain as per ensure corporate standards
5. Increase transparency and visibility
6. Minimizes administrative cost and paperwork
7. Increase public trust and corporate reputation through providing transparency of silk material used in product
8. Reduce supply chain malpractice
9. Each block user has its personal responsibility to complete transaction. This work can be done using central database system but data can be editable and more security will not be provided.

Detailed performance monitoring of blockchain systems has been done using transactions per second, average response delay, contract execution time. RPC Method and Log-based Method may be used for monitoring performance of blockchain [19].

IV. CONCLUSIONS

Blockchain can provide supply chain transparency also it reduces risk and cost across the supply chain. We proposed more secured method to supply chain management for silk production using Block chain technology. In sericulture system, participants are farmer, reeler, twister, dyer, weaver, etc. Few participants may have permission to perform specific functions such as read, write and access the information on the blockchains. Such system controls the activities of the various participants in the allotted roles.

At each stage non editable transaction can be saved in hyper ledger of blockchain so that these transactions can be seen by customer by scanning QR code. Researchers have been proposed and did

survey on Silk Supply chain management in India. They have provided information for enhancement of the silk supply chain quality management by adopting blockchain technology. We have implemented block chain system for sericulture process using small network. It successfully displays the record to customer after QR scanning on silk product.

REFERENCES

[1] Julien Polge, Jérémy Robert, Yves Le Traon : Permissioned blockchain frameworks in the industry: A comparison. The Korean Institute of Communications and Information Sciences (KICS). Publishing services by Elsevier B.V. T (2021).

[2] Fabian Knirsch, Andreas Unterweger and Dominik Engel : Implementing a blockchain from scratch: why, how, and what we learned. Knirsch et al. EURASIP Journal on Information Security (2019) https://doi.org/10.1186/s13635-019-0085-3.

[3] Dr. Jatindra Nath Saikia : Supply Chain Linkages And Constraints In Natural Silk Sector Of Assam: A STUDY OF MUGA AND ERI SILK. International Journal of Multidisciplinary Management Studies Vol.1 Issue 3, December 2011.

[4] Abhilash Sharma and Mala Kalra: A blockchain based approach for improving transparecy and traceability in silk production and marketing. Journal of Physics: Conference Series 1998 (2021).

[5] Aishwarya S Prasad , Deeksha B Shetty , Divyashree H S, Neha R, Dr. Madhu B R : A Survey on Silk supply Chain Management Using Blockchain. Perspectives in Communication, Embedded-Systems and Signal-Processing (PiCES) An International Journal ISSN: 2566-932X, Vol. 5, Issue 2, May 2021.

[6] Nick Szabo. 1997. The idea of smart contracts. Nick Szabo's Papers and Concise Tutorials (1997)

[7] Sharma, F.M. Schuhknecht, D. Agrawal, J. Dittrich, Blurring the lines between blockchains and database systems: The case of hyperledger fabric, in: International Conference on Management of Data, SIGMOD '19, ACM, 2019, pp. 105–122.

[8] R. Han, G. Shapiro, V. Gramoli, X. Xu, On the performance of distributed ledgers for internet of things, Internet of Things, 2019.

[9] E. Androulaki, A. Barger, V. Bortnikov, C. Cachin, K. Christidis, A. De Caro, et al., hyperledger fabric: a distributed operating system for permissioned blockchains, in: 13th EuroSys Conference, ACM, 2018.

[10] M. Kuzlu, M. Pipattanasomporn, L. Gurses, S. Rahman, Performance analysis of a hyperledger fabric blockchain framework: Throughput, latency and scalability, in: International Conference on Blockchain, IEEE, 2019.

[11] Y. Hao, Y. Li, X. Dong, L. Fang, P. Chen, Performance analysis of consensus algorithm in private blockchain, in: Intelligent Vehicles Symposium, IEEE, 2018, pp. 280–285.

[12] Q. Nasir, I.A. Qasse, M. Abu Talib, A.B. Nassif, Performance analysis of hyperledger fabric platforms, Secur. Commun. Netw. (2018).

[13] T.T.A. Dinh, J. Wang, G. Chen, R. Liu, B.C. Ooi, K.-L. Tan, Block- bench: A framework for analyzing private blockchains, in: International Conference on Management of Data, ACM, 2017.

[14] S. Pongnumkul, C. Siripanpornchana, S. Thajchayapong, Performance analysis of private blockchain platforms in varying workloads, 26th International Conference on Computer Communication and Networks, ICCCN,2017, pp.1–6.

[15] P. Thakkar, S. Nathan, B. Viswanathan, Performance benchmarking and optimizing hyperledger fabric blockchain platform, in: 26th In- ternational Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems, MASCOTS, IEEE, 2018.

[16] Baliga, N. Solanki, S. Verekar, A. Pednekar, P. Kamat, S. Chat- terjee, Performance characterization of hyperledger fabric, in: Crypto Valley Conference on Blockchain Technology, CVCBT, IEEE, 2018.

[17] H. Sukhwani, N. Wang, K.S. Trivedi, A. Rindos, Performance model- ing of hyperledger fabric (permissioned blockchain network), in: 17th International Symposium on Network Computing and Applications, NCA, IEEE, 2018.

[18] N. Andola, Raghav, M. Gogoi, S. Venkatesan, S. Verma, Vulner- abilities on hyperledger fabric, Pervas. Mob. Comput. 59 (2019) 101050.

[19] P. Zheng, Z. Zheng, X. Luo, X. Chen, X. Liu, A detailed and real-time performance monitoring framework for blockchain systems, in: 40th International Conference on Software Engineering: Software Engineering in Practice, ICSE-SEIP '18, ACM, 2018, pp. 134–143.