

# **Implementing Blockchain Technology in Supply Chain Management Systems for the Gems and Jewelry Sector: Enhancing Transparency, Traceability, and Efficiency**

Blockchain technology is coming to the jewelry industry, and it's coming fast. Ultimately, this means absolute traceability of every element in the jewelry supply chain; from the mine to the refinery, the alloy manufacturer, the production company, the retailer, and the consumer. But we're still years from that level of supply chain cooperation. You may have heard of blockchain technology as the technology behind internet currencies like Bitcoin. But blockchain can be used to track any virtual or physical goods from one place to another, as long as all the participants in the chain of custody have access to a blockchain platform, and reliably enter their transactions into it. This type of supply chain transparency will go a long way to reassuring consumers concerned about the jewelry industry's impact on the world and will be a huge relief to jewelry businesses everywhere that are struggling to buy and manufacture responsibly.

## **Deliverables:**

## **Case Studies:**

Identify and analyze real-world use cases of blockchain implementation in gems and jewelry supply chain management systems. This involves researching and selecting existing projects or initiatives that have implemented blockchain technology in the gems and jewelry sector. The case studies should provide insights into the implementation process, challenges faced, and outcomes achieved.

A jewelry blockchain initiative, led by Richline Group, Inc., is using IBM's TrustChain platform (which is built on the Hyperledger Fabric blockchain framework). Walmart partnered with IBM in 2016 to use TrustChain to protect the security and safety of food supplies, making it possible for them to quickly trace the origin of food products when food safety issues arise. Berkshire Hathaway's food distribution organization, McLane Company, was one of the partners involved in the Walmart effort. When Richline, the jewelry manufacturing and distribution company owned by Berkshire Hathaway, entered the blockchain arena, they also chose IBM's TrustChain.

According to the Trust Chain website, "this is a unique collaboration that leverages IBM's technology and the UL, independent third-party verification, together with five diamond and jewelry companies that represent the entire supply chain: Rio Tinto Diamonds (diamond supplier for Proof of Concept only), Leach Garner (precious metals supplier), Asahi Refinery (precious metal refinery), Helzberg (US jewelry retailer) and the Richline Group (global jewelry manufacturer)." The TrustChain initiative is intended to include the full range of jewelry materials, from gemstones to metals.

An interesting aspect of the TrustChain initiative is the inclusion of Underwriter Labs (UL). UL has a long history as an independent (3rd party) verifier of supply chains. This adds another layer of confidence to the TrustChain platform. Like the Tracr initiative, the TrustChain initiative plans to welcome “all responsible jewelry firms, suppliers, and retailers” in 2019. Both the Tracr and TrustChain initiatives are being developed by their sponsoring companies on behalf of the jewelry industry. There will be no charges to join either system, though all blockchains require minimal transaction fees for the networks to function. Individual companies will be responsible for updating their processes and writing their system integrations to the blockchain platform. Both platforms can readily communicate with modern ERP and stock-tracing systems, and will likely introduce integration “layers” for jewelry supply chain partners to tap into. Both Tracr and Trust Chain have also put privacy controls in place throughout their platforms. This means that companies can participate in the platform without exposing sensitive data like pricing. Traceability, and not full transparency, is the goal of these systems

### **1. Counterfeit Products:**

Counterfeit items not only result in financial losses for businesses but also damage the reputation and trust of the industry. Identifying and addressing this challenge is crucial to ensure authenticity and protect consumers. Counterfeit Diamonds.

### **2. Lack of Transparency:**

Limited transparency can lead to fraudulent practices, including the use of conflict minerals, undisclosed treatments, or inaccurate grading information. Lack of transparency also affects the ability to provide ethical sourcing and sustainability credentials, which are increasingly important to consumers.

Blockchain technology offers a distributed ledger system that can ensure the traceability and authenticity of gemstones and jewelry. This technology will provide consumers with greater confidence in their purchases and reduce the risk of fraud. The Gems and Jewellery Export Promotion Council (GJEPC) has already initiated several projects to implement blockchain technology in the industry. These projects aim to create a secure platform that tracks the entire supply chain, from mining to the final product, ensuring ethical sourcing and transparency. With the potential to revolutionize the industry, blockchain technology is set to play a crucial role in the future of the gems and jewelry industry.

### **3. Complex Supply Chains:**

Managing these intricate networks can be challenging, leading to inefficiencies, delays, and information asymmetry. Coordinating activities, ensuring compliance with regulations and industry standards, and maintaining visibility across the supply chain are essential but difficult tasks. The Jewelry Industry Prepares For Supply Chain Trace-Ability]: This article illustrates how complex supply chains in the jewelry industry involve multiple stakeholders, such as miners, traders, manufacturers, retailers, and consumers. [Bringing Blockchain, IoT, and Analytics to Supply Chains]: This article shows how complex supply chains in traditional supply chain management systems can result in inefficiencies, errors, and delays. [How Blockchain Can Help Simplify Jewelry Supply Chains]: This article demonstrates how blockchain technology can help simplify supply chains by streamlining processes, reducing costs, and enhancing collaboration.

#### **4. Traceability and Certification:**

Ensuring the validity of certifications, such as gemstone authenticity, grading reports, and ethical sourcing certifications, can be cumbersome and subject to human error or fraud. This is one of the important aspects of the gems and jewelry industry, as they can provide information on the origin, quality, and sustainability of gemstones and jewelry products. It can help address some of the challenges faced by the industry, such as counterfeit products, lack of transparency, complex supply chains, ethical and environmental issues, regulatory compliance, and consumer demand. This can also offer various benefits to the industry, such as increased transparency, improved traceability, enhanced trust, reduced fraud, increased customer loyalty, reduced operational risks, and new business opportunities. Traceability and certification can be achieved by using various mechanisms and technologies, such as blockchain, chain of custody, trace elements, digital certificates, and shared platforms. Traceability and certification can be supported by existing gemological approaches, such as geographical origin determination, to enhance traceability and transparency measures. Addressing these challenges requires innovative solutions that can enhance transparency, traceability, and operational efficiency. Blockchain technology has the potential to provide a decentralized and immutable ledger that can address these challenges by creating a transparent and auditable record of transactions and product history throughout the supply chain. By leveraging blockchain, the gems and jewelry industry can enhance trust, mitigate risks, and provide consumers with verified and authenticated products.

#### **Challenges Analysis:**

- a. Investigate the specific challenges faced by the gems and jewelry industry, such as counterfeit products, lack of transparency, and complex supply chains. This analysis should involve conducting interviews or surveys with industry stakeholders, including miners, manufacturers, distributors, retailers, and consumers, to gain a comprehensive understanding of the challenges and pain points.

#### **Value Proposition of Blockchain:**

- a. Evaluate how blockchain technology can address the challenges identified and provide value-added solutions. Analyze the unique features of blockchain, such as transparency, immutability, and decentralization, and demonstrate how they can enhance transparency, traceability, and operational efficiency in the gems and jewelry supply chain.

## **Benefits and ROI Analysis:**

- a. Evaluate the potential benefits of implementing blockchain-based solutions in the gems and jewelry supply chain. This analysis should focus on increased transparency, improved traceability, enhanced trust, reduced fraud, and any other benefits identified in the research.
- b. b. Conduct a cost-benefit analysis to determine the potential return on investment (ROI) of implementing blockchain technology. This analysis should consider the costs of implementation, such as development, integration, and training, and compare them to the projected benefits and cost savings achieved through blockchain implementation.

## **Key Performance Indicators (KPIs):**

- a. Identify key metrics and indicators to measure the effectiveness of blockchain implementation in the gems and jewelry supply chain. This could include metrics such as the percentage of counterfeit products detected, reduction in supply chain costs, time savings, customer satisfaction, or any other relevant KPIs that align with the objectives of the implementation. The deliverables will provide a comprehensive analysis of blockchain implementation in the gems and jewelry supply chain, including real-world case studies, an evaluation of challenges, the value proposition of blockchain, benefits and ROI analysis, and key performance indicators for measuring success. These findings will serve as a valuable resource for industry stakeholders, decision-makers, and researchers interested in leveraging blockchain technology to enhance supply chain management in the gems and jewelry sector. To measure the effectiveness of blockchain implementation, you need to define some key metrics and indicators that reflect your specific goals and objectives. Depending on the type of blockchain application and the business domain, these metrics and indicators may vary. However, some common categories of metrics that can be applied to most blockchain scenarios are:

## **Performance metrics:**

These metrics measure the speed, throughput, latency, and scalability of the blockchain network and its transactions. They can help you evaluate how well the blockchain system can handle the workload and meet the service level agreements. Some examples of performance metrics are:

1. **Transactions per second (TPS):**

The number of transactions that the blockchain network can process in one second<sup>2</sup>. This metric indicates the capacity and efficiency of the blockchain system.

2. **Transaction latency:** The time it takes for a transaction to be confirmed and finalized by the blockchain network<sup>2</sup>. This metric reflects the responsiveness and reliability of the blockchain system.
3. **Blocks per hour/day:** The number of blocks that are generated and added to the blockchain ledger in a given time period<sup>1</sup>. This metric shows the activity and growth of the blockchain network.
4. **Read latency:** The time it takes for a query to retrieve data from the blockchain ledger<sup>2</sup>. This metric measures the accessibility and availability of the blockchain data.
5. **Read throughput:** The number of queries that the blockchain network can handle in one second<sup>2</sup>. This metric evaluates the performance and scalability of blockchain data storage.

**Quality metrics:** These metrics measure the accuracy, consistency, security, and suitability of blockchain data and transactions. They can help you assess how well the blockchain system can ensure data integrity, prevent fraud, and comply with regulations. Some examples of quality metrics are:

1. **Data provenance:** The ability to trace the origin, ownership, and history of any data or asset on the blockchain ledger<sup>1</sup>. This metric demonstrates the transparency and accountability of the blockchain system.
2. **Data accuracy:** The degree to which the data on the blockchain ledger matches the real-world data or events<sup>1</sup>. This metric indicates the validity and correctness of the blockchain data.
3. **Data security:** The level of protection and encryption of the data on the blockchain ledger from unauthorized access or modification<sup>1</sup>. This metric shows the confidentiality and resilience of the blockchain system.
4. **Consensus quality:** The degree to which the nodes on the blockchain network agree on the validity and order of transactions<sup>1</sup>. This metric reflects the robustness and stability of the blockchain system.

**Business metrics:** These metrics measure the impact and value of blockchain implementation on business processes, outcomes, and customer satisfaction. They can help you evaluate how well the blockchain system can improve operational efficiency, reduce costs, increase revenue, and enhance customer loyalty. Some examples of business metrics are:

1. **Operational efficiency:** The ratio of output to input for a given business process or activity<sup>3</sup>. This metric measures how well the blockchain system can optimize resources, eliminate waste, and streamline workflows.
2. **Cost savings:** The amount of money saved by using blockchain technology compared to traditional methods or systems<sup>3</sup>. This metric shows how well the blockchain system can reduce operational expenses, transaction fees, intermediaries, and errors.
3. **Revenue generation:** The amount of money earned by using blockchain technology to create new products, services, or markets<sup>3</sup>. This metric indicates how well the blockchain system can increase sales, profits, or market share.
4. **Customer satisfaction:** The degree to which customers are satisfied with their experience with a product, service, or organization that uses blockchain technology<sup>3</sup>. This metric measures how well the blockchain system can meet customer expectations, needs, and preferences.