Unlocking Blockchain Potential in Supply Chain Using a Three-Step Framework

Abstract

In 2010, the Securities and Exchange Commission (SEC) made it mandatory for public manufacturing companies to disclose the use of conflict materials in electronics and other ubiquitous items such as cell phones. The regulation was aimed at increasing supply chain transparency of minerals sourced from regions such as the Democratic Republic of Congo and adjoining countries, which are known to fund the sale of the conflict minerals. However, more than 80%[i] of the manufacturing companies failed to file the disclosure on time, and 30%[ii] of businesses were unable to analyze their full supply chain due to lack of supply chain visibility, putting their businesses at risk. Even though SEC has backed away from the ruling, what is striking is that the manufacturers do not have visibility about their supplies.

With mounting pressure on companies to ensure ethical sourcing while innovating, mass customizing, reducing costs and improving quality, supply chain visibility acquires critical importance.

Transparency is fundamental to not only ensuring ethical sourcing but also enhancing decision making, process efficiency, and customer satisfaction.

A well-designed blockchain solution can help companies gain real time supply chain visibility in a secure and seamless manner. The paper delves into the challenges of blockchain adoption in supply chain and suggests a framework for companies to identify when and how to successfully adopt blockchain.

Taming Supply Chain Complexity

With the smart manufacturing market expected to reach USD 299.19 billion by 2023[iii], robots, chatbots, artificial intelligence (AI), and internet of things (IoT) are presenting promising opportunities across the manufacturing ecosystem (see Figure 1). Companies are increasingly using data generated with the help of these technologies to improve internal process efficiencies. However, the siloed nature of data, minimal visibility into external variances, and lack of stakeholder collaboration hamper continuous process improvement. For instance, advanced mathematical models often fail to improve forecasting accuracy as the demand figures (provided as input) are based solely on the sales orders provided by their immediate customer, ignoring the possibility of bull-whip effect.

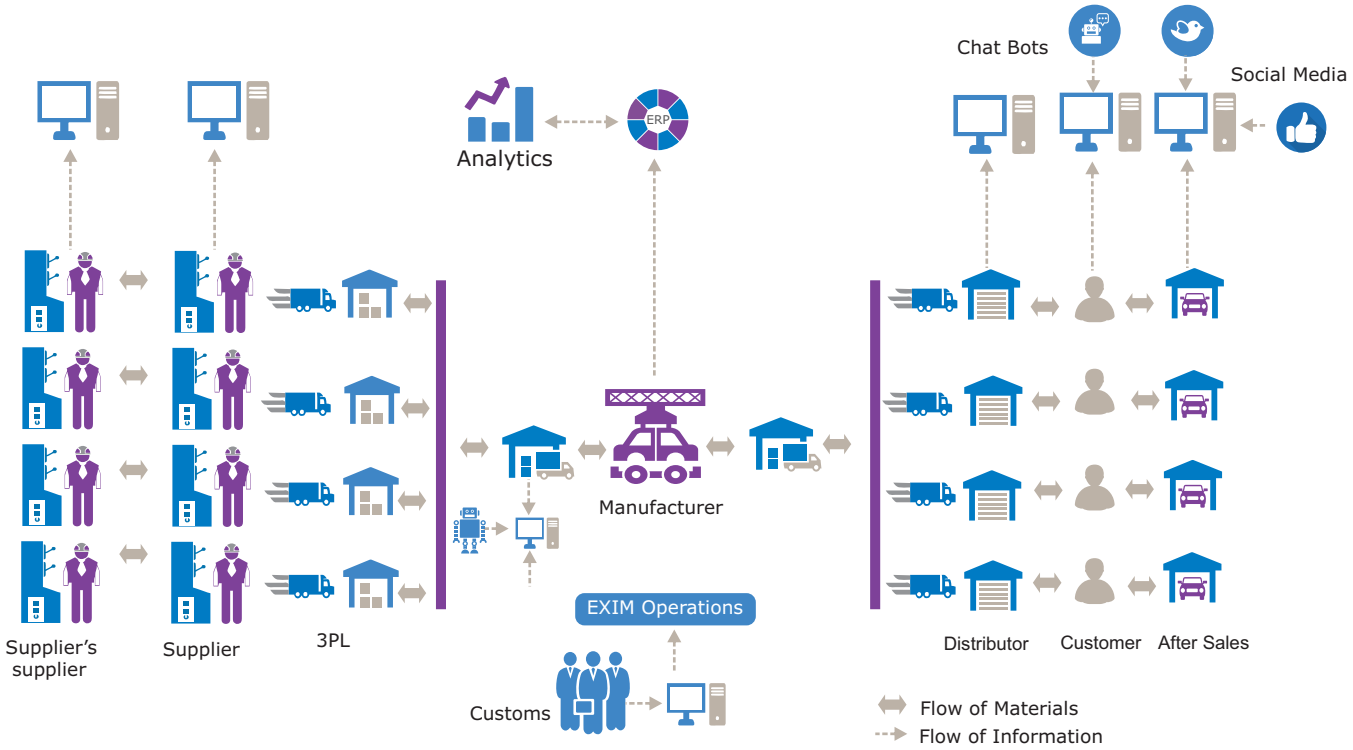

Figure 1: The smart manufacturing ecosystem

The need of the hour is an end-to-end transparent supply chain that provides accurate information to the manufacturers to improve demand planning and forecasting accuracy. Almost 65% of Chief Procurement Officers reported limited visibility beyond their tier 1 suppliers, in a survey by Deloitte[iv].

Enabling supply chain transparency requires collaboration with multiple stakeholders across the supply chain with data shared in a secure and seamless manner. Blockchain with its intrinsic capabilities such as validating, recording and sharing

information across a distributed network, can provide immutable transparency across the manufacturing ecosystem in a safe and secure manner.

However, certain questions continue to haunt supply chain leaders. How and where do we implement blockchain? How will the resulting transparency improve efficiency? To answer these, let's consider the challenges in the current manufacturing process and how blockchain can help address them.

Transforming Asset Life Cycle Management with Blockchain

Global industrial product manufacturers offer multiple variants to cater to varied customer segments. Currently, customers place a request for replacement whenever components in their global asset base fail. However, the manufacturer's ability to replace the component is subject to availability of spare parts. Non-availability can result in huge losses and disruptions, leading to potential plan shutdown. Let's consider the case of asset lifecycle management (ALM) of industrial machinery organizations that deal with components such as turbines, boilers, and generators (see Figure 2).

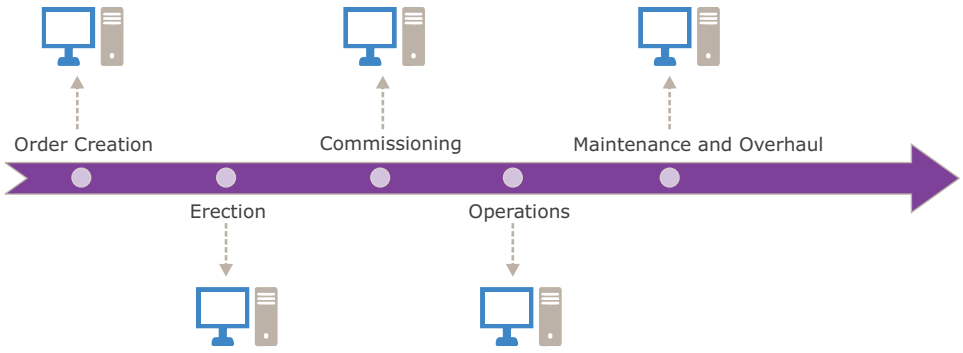

Figure 2: ALM process for industrial machinery

The lifecycle management functions in the industry are quite complex, handled by different stakeholders, and recorded in disparate localized systems, resulting in lack of visibility across the value chain. Sometimes verbal or paper transactions are not recorded at all. This hampers the process of identifying the product model or the version that needs replacement.

Blockchain-enabled ALM helps address these challenges. When business transactions are recorded in a blockchain-based system (see Figure 3), each product is assigned a unique identity that can be used across the lifecycle of the product- from raw material acquisition to final installation. Every transaction is recorded as a block and is readily available with

all the entities of the chain, making it easy to identify the product model and version of the part during a replacement request. Real time data availability not only improves supply and demand planning but also increases the possibility of product availability. In addition, a blockchain-based solution encrypts the recorded data using complex cryptographic algorithms. In case of data deletion or destruction, blockchain auto-replicates data from other entities.

Blockchain offers several other applications as well. For instance, enhancing existing electronic data interchange (EDI) systems that are used to interact and communicate with business stakeholders. Information exchange such as sourcing, production planning and execution, logistics, after-sales service, and regulatory compliance can be effectively enhanced using a blockchain solution.

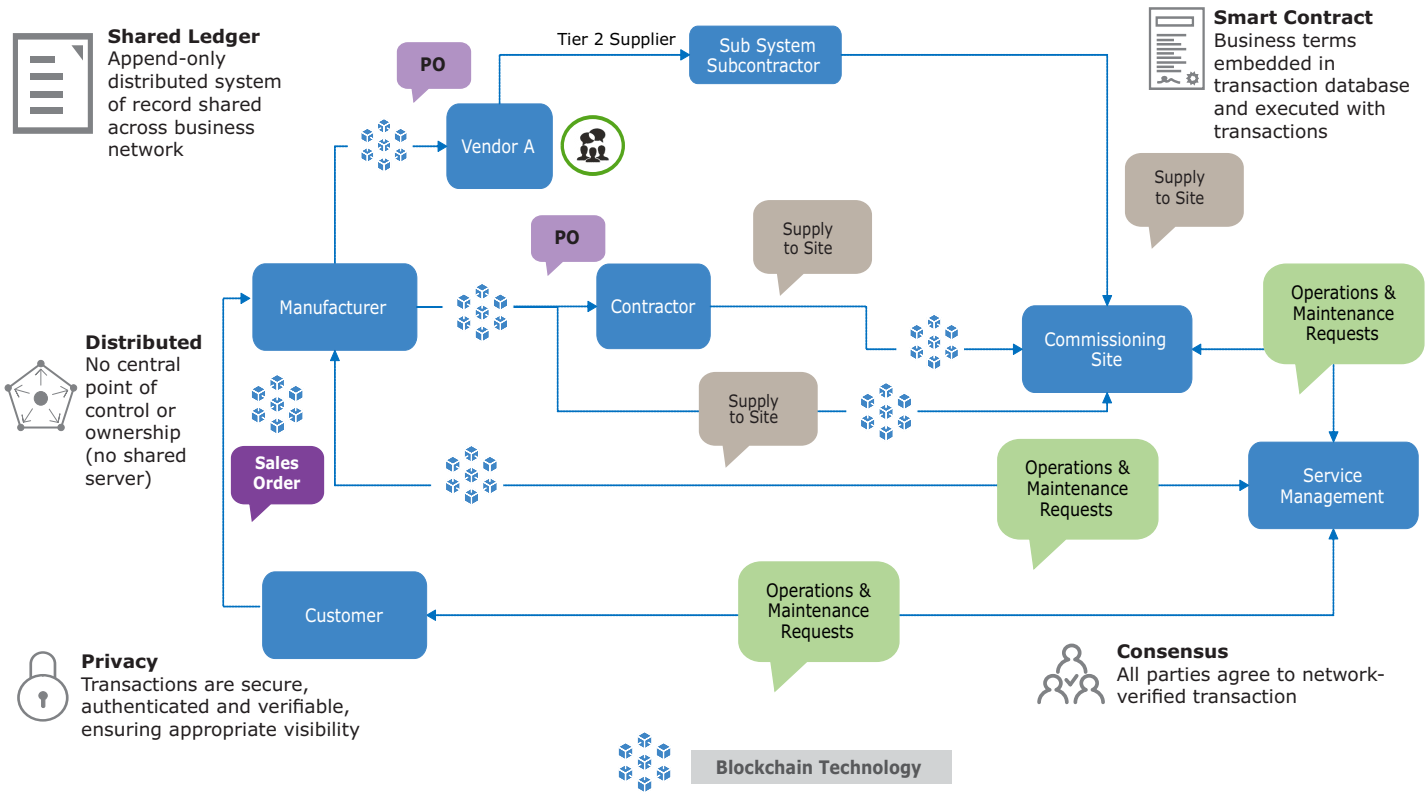

Figure 3: Blockchain-enabled ALM

Key Implementation Challenges

While blockchain offers the potential to interlink internal and external business partners through seamless flow of authenticated and secured information across the network, the current adoption rate of blockchain technology in the industry is low given the complexity of technology and high cost of implementation. According to a recent survey of SCM and

logistics companies, only 20-25% are willing to experiment with blockchain solutions for improving supply chain operations[v].

In addition, successful blockchain solution implementation requires seamless onboarding of stakeholders and integration with existing IT systems along with business process overhaul. Little wonder, Gartner Future Supply Chain 2018 predicts that by 2020, 90% of the supply chain blockchain initiatives will only be at the level of proof of concept (POC)[vi].

Plugging Blockchain into the Supply Chain: A Three-Step Framework

Leveraging a comprehensive framework spanning three important steps can help companies overcome the challenges in embracing blockchain, act as a platform for stakeholders to address their fundamental issues, and deliver optimized results for the ecosystem.

Step 1: Assessing Value Chain Maturity

The first step towards building an effective value chain is assessing its level of maturity vis-à-vis industry benchmarks (see Figure. 4). This helps identify value blocks in the ecosystem that require improvement and upgradation. Here's a step-by-step guide to conduct the value chain maturity assessment.

- Divide the value chain into separate and independent functioning value blocks.
- Map the value blocks with business drivers such as process, people, system and performance.
- Utilize qualitative methods and techniques to collect information and evaluate value blocks across the value chain.
- Compare the mapped results with industry benchmarks and best practices.
- Rank the business drivers for each of the value blocks on a five level model - from level 0 that is undefined to level 4 that is optimized - based on benchmarking with the best in class in the industry.

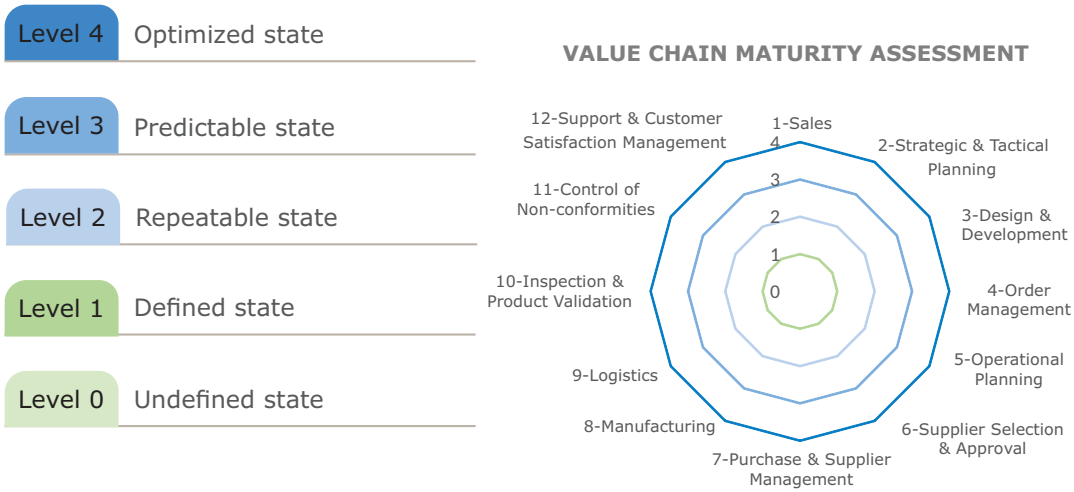

Figure 4: Value chain maturity assessment levels

Step 2: Identifying Key Focus Areas

Next, identify key focus areas that need immediate attention by:

- Building an exhaustive list of relevant use cases in each value chain and mapping it to probable business impact
- Checking the feasibility of implementing a blockchain-based solution by applying a list of questions (see Figure 5) to the selected use case
- Assigning priorities for different focus areas based on business impact and complexity

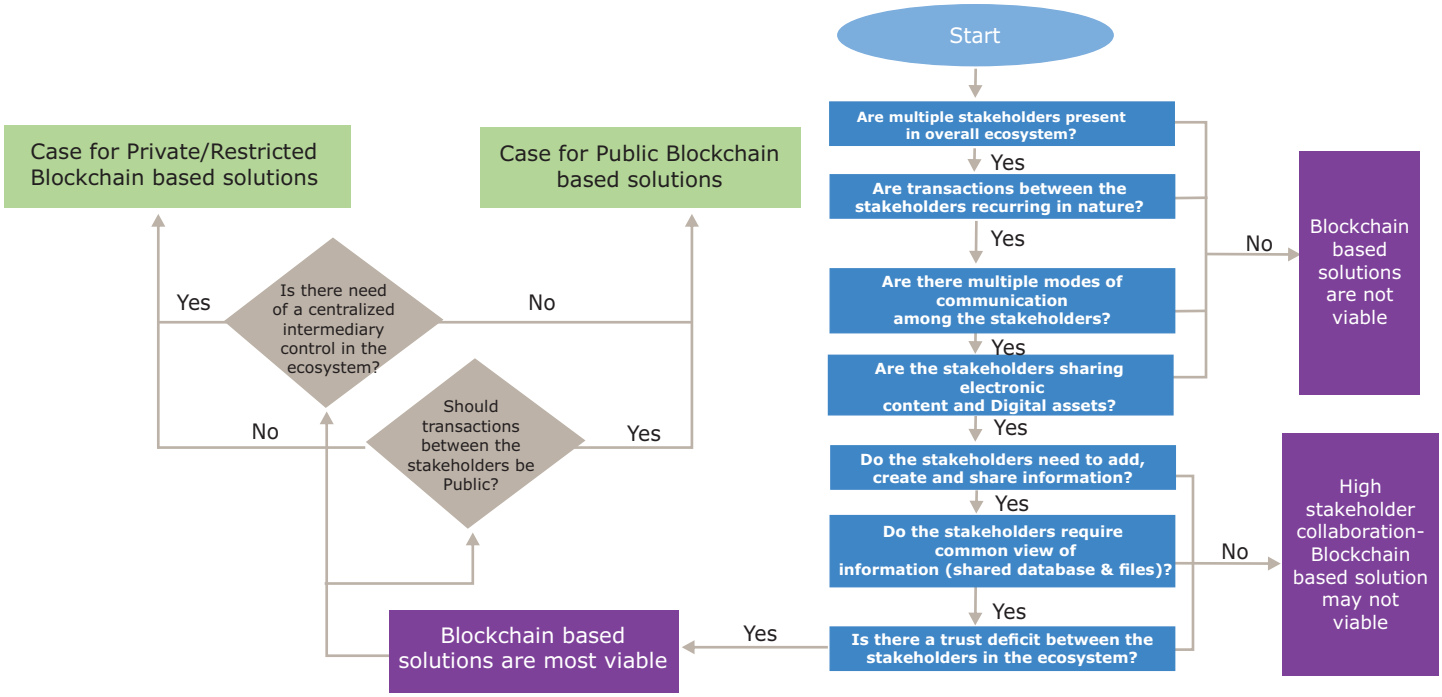

Figure 5: Blockchain solution implementation questionnaire

Organizations can then use the analytical hierarchy process (AHP) methodology to identify key focus areas for blockchain implementation. The method helps assign relative weights to calculate overall score for each use case (see Figures 6 and 7). Once the overall score is determined, the scores are plotted in the focus area matrix (see Figure 8) for easy visualization of business value relative to the effort required to implement the use case. The result: ability to implement blockchain solutions for use cases with highest business impact and lowest implementation complexity.

Use Cases	Complexity Scenario 1	Complexity Scenario 2	Complexity Scenario 3	Complexity Scenario 4	Complexity Scenario 5	Overall Score
Focus Area 1	0.2	0.3	0.1	0.4	0.3	**0.2842914**
Focus Area 2	0.2	0.2	0.2	0.1	0.0	**0.1346197**
Focus Area 3	0.1	0.1	0.1	0.2	0.0	**0.1452156**
Focus Area 4	0.2	0.1	0.2	0.1	0.2	**0.1765674**
Focus Area 5	0.2	0.1	0.1	0.1	0.1	**0.1146152**
Focus Area 6	0.0	0.0	0.2	0.1	0.1	**0.0930401**
Focus Area 7	0.0	0.0	0.0	0.0	0.1	**0.0516507**

Figure 6: Overall Score for focus areas based on complexity

Use Cases	Business Impact 1	Business Impact 2	Business Impact 3	Business Impact 4	Business Impact 5	Overall Score
Focus Area 1	0.3	0.2	0.2	0.4	0.3	**0.2870975**
Focus Area 2	0.2	0.2	0.2	0.3	0.2	**0.2245302**
Focus Area 3	0.2	0.2	0.1	0.1	0.1	**0.1598612**
Focus Area 4	0.1	0.1	0.1	0.0	0.1	**0.0681390**
Focus Area 5	0.1	0.1	0.2	0.0	0.2	**0.1408048**
Focus Area 6	0.1	0.1	0.1	0.1	0.1	**0.0810981**
Focus Area 7	0.0	0.1	0.0	0.1	0.0	**0.0384692**

Figure 7: Overall Score for focus areas based on business impact

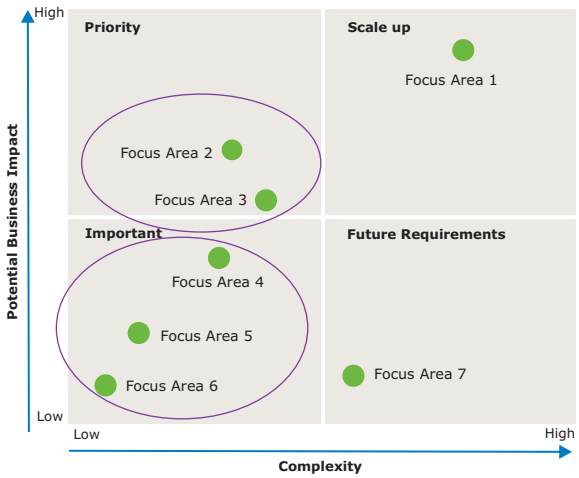

Figure 8: Focus Area Matrix

Step 3: Building Execution Strategy

Successful execution of blockchain-based solution requires creating prototypes and selecting a pilot location for implementation that represents the global business scenario (see Figure 9). Stakeholders can identify the right pilot site for implementation by assigning weights to each factor (sum of weights should equal 1) and assigning scores for each geography on the scale of 1 to 4. To arrive at the final score, the weight is multiplied by the score (for each location/geography). The geography with highest score is considered as the ideal pilot site. In case of multiple geographies having similar scores, the geography with the highest weightage is considered for pilot implementation (see Figure 10).

Figure 9: Execution Strategy

Factors	Weights	Geography 1	Geography 2	Geography 3	Geography 4	Geography 5	Geography N
Scope	0.5	3	4	3	2	1	1
Data	0.2	3	1	2	4	2	1
Audience	0.05	1	2	3	3	2	4
Sponsors	0.1	2	3	1	4	3	2
Duration	0.15	2	4	2	1	1	2
Final Score	Weighted Average for each geography						
Scope	Is the scope in line with the existing business problem?						
Data	Is it easy to get the data required for the implementation?						
Audience	Are the audience receptive and representative enough for the transformation program?						
Sponsors	How viable the location is for implementation according to the sponsors?						
Duration	Do the site have enough bandwidth for implementation without business interruptions?						

Figure 10: Pilot Site Selection Framework

Once a company derives business value from the blockchain-based initiative, it can scale up the solution for other relevant stakeholders. Based on solution's provenance and stability, businesses can also implement the solution across business units and geographies - in a phased manner.

Blockchain: Enabler of Supply Chain Value Creation

Today's supply chain ecosystem features more players than ever before. At the same time, there are growing concerns and regulations around data privacy such as the General Data Protection Regulation (GDPR) in the European Union. To maximize stakeholder value in this dynamic environment, it is important to realign the supply chain strategy towards creating transparency and security. For forward thinking businesses that implement blockchain, even small improvements in transparency can lead to significant value creation across the supply chain - such as improved inventory levels, reduced operating and manufacturing costs, and improved product quality - without compromising on data privacy.

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