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A Block Chain Use Case In Food Distribution

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Abstract:

This paper aims to explain the implementation of blockchain technology in the production and supply chain delivery system for eggs from farm to consumer by a company based in the Midwestern USA. One of the primary research questions answered is how blockchain can be utilized and applied to more accurately and transparently move goods through global supply chains. This company is at the forefront of developing such systems for use in industry, and a use case for egg distribution is detailed. The goal is to track products from farm to fork using blockchain and internet of things (IoT) enabled technologies. By creating traceable and transparent supply chains for food, consumers can attain the information they need to make informed choices about the food they buy and the companies they support. For stakeholders in the food supply chain, having traceability and transparency builds better relationships with their customers, increases efficiency, and reduces the risk and cost of food recalls, fraud, and product loss. The blockchain technology and this business are creating a case for fixing and transforming the world's food system.

Motivation

Compliance in the Food Industry Historically in the United States, food supply chain stakeholders needed only enough traceability for federal regulators to trace products "one-step-forward and one-step-back" per the Bioterrorism Act of 2002 (U.S.

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Customs and Border Protection, 2014). With the passage of the Food Safety Modernization Act (FSMA) in 2011 (U.S. Food and Drug Administration, 2018), the United States Food and Drug Administration is able to require mandatory recalls and full traceability for high-risk products. This implementation is a challenge for food businesses of all sizes, as it requires extremely diligent and time-consuming bookkeeping and labeling by all members of a facility, and necessitates a reliance on technology rarely seen before in the food industry

Proposed system

One use case for blockchain traceability in the food supply chain is currently in testing with Bytable Inc., a blockchain food traceability company conducting a pilot project to track eggs from farm to consumer. Consumers are able to scan a QR code on product packaging and use carton information to access data collected throughout the supply chain. This use case is a proof of concept (PoC) with plans to bring the resulting product to market in early 2020. 3.2. Use Case Project Background Project discussion and planning began in April 2018 when Bytable Inc. partnered with a specialty egg brand for organic, free-range, and pasture-raised eggs in the Midwestern region of the United States. The egg packer collects products from approximately 100 small farms in the region before cleaning, processing, grading, packaging, and distributing approximately 100,000 eggs to retailers per week. The egg processor in this case study was already using internal traceability software on processing equipment, which collects data from human and manufacturing equipment input and stores it in an on-site server. Application development began in January 2019 and the PoC was completed in late February 2019. Primary stakeholders in this use case were farms, the egg packer, test retail stores, consumers and Bytable Inc.

Global food supply chain failure has become a catch phrase for supply systems malfunction. Just look at the last two years to see the failure that supply chains have caused the food industry. Blockchain technology (BT) is one tool that could improve future food systems policies, traceability, and the flow and success of these supply chains. BT can enhance consumer trust, production speed, and product efficiency; things the food industry could use right now. BT can substantially improve global food supply chains by enabling faster and more cost-

efficient delivery of products, improved supply chain transparency and traceability, upgrade the real-time coordination between trading partners, and substantially ameliorate record-keeping by all concerned parties.

So, what is a "blockchain system"? A blockchain is a digital system for recording trade transactions among multiple trading parties in a tamperproof way. Food supply chains are a perfect fit for this distributed and decentralized system of record-keeping. Blockchain record keeping can allow a vast and unlimited number of trading partners to transact privately, anonymously, and securely. No central intermediary is needed for these transactions to occur. Food supply blockchains can be used to allow trading partners to protect their business operations and the supply chain while instituting better performance, control, and systems security. In more basic terms, a blockchain is a digital "record", maintained by a network of multiple computers.

Generally, this decentralized and robust system is currently utilized within global financial systems. Within such a blockchain, records are a distributed database in the form of encrypted blocks, utilized for transactions or executed digital events between participating partners.

So how can this technology be utilized? The Food and Drug Administration (FDA) in 2020 proposed a New Era of Smarter Food Safety Blueprint to enhance food traceability. To amplify this concept and improve food traceability, many trading partners are looking to expand the use of blockchain technology. Blockchain technology can be utilized to trace a finished or marketable product back to its origin (from 'farm to fork'), with strengthened security. If BT is utilized with IoT (Internet of Things), the entire food supply chain can be tracked almost instantaneously. The IoT/QR code can be scanned and tracked for complete transparency in seconds.

Since the passage of the Food Safety Modernization Act (FSMA), the FDA has worked toward full product traceability. As a FSMA requirement, record keeping for designated high-risk foods is included under section 204(d) *Enhancing Tracking and Tracing of Food and Recordkeeping*. "FSMA section 204, Enhancing Tracking and Tracing of Food and Recordkeeping, instructs the FDA to develop additional recordkeeping requirements for certain foods to help establish clear tracing of a food product's source when needed to address food safety risks." Technology enhanced

tracebacks will allow pinpoint precision at specific sources allowing the removal of problem foods and supplies (recalls). Additionally, 9 CFR Part 86 Animal Disease Traceability requires traceback.

The value of blockchain technology for food supply chain management is enhanced within four specific areas:

- Smart contracts between trading partners
- Improved product data security
- Food supply chain disintermediation
- Improved product visibility and traceability

BT technology enables systems to be checked for food fraud and product tampering instantaneously, permits the identification and classification of product waste within supply chains, can rapidly identify food contamination issues, aiding in rapid product recalls, and can improve transit security, thereby reducing food spoilage.

Who is currently utilizing blockchain technology within the food industry? Bumblebee Foods, Tyson Foods, Kraft Heinz, Nestlé, and Walmart all are currently utilizing or testing out BT.

Bumble Bee Foods utilizes BT to record its tuna operations and to improve product traceability while deterring acts of food fraud. Products are traced through the supply chain from catch to sales.

Nestlé utilizes a blockchain approach to enhance product traceability of its Rainforest Alliance certified coffee brand, Zoégas.

Walmart has been utilizing BT to digitize their food product supply chain to enhance Tech-Enabled Traceability and to reduce the time it takes to track the source of food contamination. Walmart requires all trading suppliers of leafy-green vegetables to comply with data record input into a system blockchain platform which can traceback their produce. They now can trace the source of contaminated produce within seconds.

Tyson Foods is using BT management to trace their supply chain from farms to their production facilities. Tyson is currently partnering with a platform FoodLogiQ on a food safety pilot project.

Conclusion

This study was developed to understand if blockchain technology could be a value add to food businesses and support the claim that blockchain can improve food traceability.

The authors compiled relevant research in the field of blockchain traceability of food and agricultural products, then leveraged them to develop a practical approach towards implementation with a specialty egg brand. Furthermore, this is the first study known by the authors to use blockchain technology to track eggs from farm to consumer in major markets and capture traceability and engagements data at nearly every step of the supply chain. The consumer-facing captured data element presents an opportunity for further exploration of consumer interaction with blockchain traceability data. Finally, the implementation methods highlighted in the study, such as the use of IoT sensors and integration into existing systems, provide a framework for further studies to capture data and analytics relating to the impact of their implementation.

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