Hot Topics Briefing: Blockchain in Food Service

Supply Chain Demands in the Food Service Industry

An essential mandate for food service providers is to improve food quality and safety while also satisfying changing consumer demands, maximizing profits, and minimizing risks. Uncertain and turbulent operating environments make this task increasingly difficult. Consider the following facts:

- Supply chain operational costs account for two-thirds of the final cost of traded goods in food service. Seven percent are documentation costs alone (Niforas, 2017).
- Technological advances are transforming traditional linear supply chains into dynamically connected digital supply networks; however, most organizations are not properly prepared for such disruptions (Kehoe 2017).
- Restaurant customers are demanding more label information describing the ingredients and sources of food (FoodlogIQ, 2017).
- The food supply chain is increasingly more global and difficult to regulate (Ades et al. 2012; Crossey 2017).

Supply chain visibility seems to be the key to ensure food quality and safety. However, providing traceability and transparency with swift service and low costs is far from easy. Blockchain is an emerging technology that promises new ways to achieve these goals by efficiently connecting all stakeholders of a restaurant supply chain who move food from "farm to fork". Leaders expect blockchain to help restaurant chains meet growing traceability pressures while they continue to introduce thousands of new items, many made with specialty ingredients sourced globally (Vitasek, 2017).

What is Blockchain?

Blockchain is an open-source technology that enables organizations to record and monitor the exchange of assets without the need of financial intermediaries (Niforas, 2017). In basic terms, a blockchain is a digital ledger utilized by a distributed network of independent users. These distributed participants, whose computer systems are considered "nodes" within the network, collectively manage the data in the entire blockchain (i.e., rather than being managed by a central authority). This structure provides timely and widely distributed access to data to network members while also ensuring that the data is essentially "tamperproof." When a user requests a transaction, the network:

- collectively validates or rejects the transaction via consensus;
- adds a validated transaction to the network's present set of transactions, creating a "block";
- links the new block of transactions to existing blocks in the systems.

Thus, a "blockchain" is formed, where any block in the system contains history of all prior blocks in the network.

A blockchain is a tamper-evident, shared digital ledger that records transactions in a public or private peer to peer network. Distributed to all member nodes in the network, the ledger permanently records, in a sequential chain of cryptographic hash-linked blocks, the history of asset exchanges that take place between the peers in the network (Brakeville and Perepa, 2018).

Once a transaction is recorded, any node within the blockchain network can access it. A recorded transaction can only be altered when a large proportion of the blockchain network members collectively agree that such a change is warranted.

Proposed blockchain protocols include:

a) public blockchains (e.g., including cryptocurrencies such as Bitcoin);
b) permissioned blockchains; and
c) private blockchains.

While experts agree that public blockchains are still a long way off. Food service firms, along with firms in finance, real estate, government, and pharmaceuticals, are evaluating applications of private and permissioned blockchains for their supply chain partners.

Potential Impacts of Blockchain in Food Service

Speed	Efficiency	Security
Faster, frictionless transactions	**Less required oversight**	**Immutable records, preventing tampering and fraud**
One source of data	**Involvement of fewer intermediaries**	**Improved trust among members**
	Less duplication effort	**Privacy (e.g. in private permissioned blockchains)**

Blockchain Essential Benefits

Food service supply chain managers can leverage blockchain in the following ways:

1) Traceability and Transparency: Blockchain can provide a means to more easily record, validate, and monitor complete information about a product (e.g., origin, destination, lot code, etc.) For instance, Walmart and IBM are collaborating on developing a blockchain solution to trace the journey of food products from China to their final destination overseas (McKenzie, 2018). A blockchain creates end-to-end visibility, enabling foodservice companies to tackle a variety of risks (e.g., distribution issues, "food fraud", etc.) (Johnson, 2014).

2) Flexibility: Changing consumer preferences, and demand fluctuations require flexible supply chains. Blockchain provides continuity and fluid access of information for all stakeholders, enabling real time data tracking, which can help managers better understand supply chain processes and redesigns opportunities. In addition, blockchain provides a single source of vast amounts of data that food service companies can analyze using advanced data analytics and machine learning. For example, these data might improve forecasting and risk management capabilities (Laurent et al. 2017).

3) Product Compliance: Food service supply chains often contain diluted, out-of-date, mislabeled, or misrepresented products, collectively costing up to $40 Billion every year (Bloomberg News, 2017). Blockchain provides a timestamped source of transactions (e.g., including product information). Because the data are distributed across all nodes in the network, blockchain also provides the authenticity and integrity required to meet regulatory standards.

4) Stakeholder Management: Blockchain enables peer-to-peer interactions that build trust across the supply chain. Specifically, it provides stakeholders with digital signatures that reassure the tamper-proof nature of a distributed ledger. This streamlines communications, reducing operational costs and superfluous documentation associated with traditional quality management practices, etc.

5) Environmental Compliance and Sustainability: In addition to tracking the origin and flow of products, blockchain can also track raw materials and work in progress. Each material can be assigned a digital token so that the blockchain can track the digital history (including location and timestamps) of each material/product within every step of the production/distribution process. This record enables monitoring of environmental compliance standards by providing readily transparent information on how a product was manufactured, handled, and transported. In addition, complete tracking helps ensure compliance with the global sustainability practices, such as preventing "green-washing" (i.e., shifting polluting activities to developing countries) (Niforas, 2017).

An Example of Blockchain in Action

Coda Coffee Co. (based in Denver) is offering its customers "the world's first blockchain-traced coffee". Each Coda customer can scan the code from their coffee purchase at the retail store, trace it back to the initial batch of coffee beans, and view the date and location where it was grown, processed, exported, roasted, and ultimately delivered to the retail store. Beans are funneled through a machine at each farm that analyzes the beans and assigns them a traceable lot number. In addition, the machine performs a three-dimensional scan of each bean, providing more detail on quality and characteristics of the beans at the farm level. These data help wholesalers and roasters learn which attributes produce certain tastes – useful information for future sourcing decisions.

The technology provider (Bextmachine) charges producers and roasters 1%-2% of the wholesale price for use of the machine. The blockchain-based service is expected to be a hit with tech-savvy coffee enthusiasts who want greater insights into the products they purchase. Producers who participate can better manage their operations, reduce paperwork, and eliminate the need for middle men – thus allowing Coda to pay coffee farms higher prices for their product. Starbucks is currently conducting a pilot study to develop a blockchain technology to track its own coffee beans back to its supplying farms

Challenges for Implementing Blockchain

Nascent Technology: As with any new technology, current understanding of how effectively implement and utilize blockchain is limited (Laurent et. al, 2017). While traceability seems a likely application of blockchain in food service, there may be other yet unidentified uses. At this point, few actual use cases currently exist. The industry also lacks technical skills for the technology of blockchain development.

Scalability: Blockchain is fundamentally a distributed ledger, making the synchronization and distribution of information challenging to scale. Governance is needed to ensure standards in blockchain development to allow for interoperability across industries and supply chains (Niforas, 2017). The food service industry has been slow to adopt data standards such as GS1.

Process Redesign: Blockchain requires participation from all the stakeholders in a supply chain for a given item. This will require collaboration, investments, and business process changes, which could be a substantial task as it makes such demands among multiple organizational partners.

Next Steps for Food Service Managers

Food service providers face increasingly complex and dynamic supply chains, with rising expectations to deliver quality, safety, visibility, and low costs to customers. Blockchain is worth considering, because it has the potential to have revolutionary impacts on supply chain practices. Possible next steps include:

- Assign responsibility to investigate the possibilities of blockchain. The analysis should combine inputs from both quality assurance and supply chain organizations to evaluate all relevant costs and benefits.
- Investigate how blockchain developments might dovetail with GS1 and other standards
- Work with an industry solution provider to assess the potential and gauge the progress of blockchain.
- Form an industry consortium to develop a blockchain development roadmap and timeline.

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