



**FOOD SAFETY,
QUALITY,
TRACEABILITY**

.....
**IT'S THE DATA
THAT MATTERS**



BOARDWALKTECH

FOOD SAFETY, TRACEABILITY, AND SUSTAINABILITY PROGRAMS

Food safety, traceability, and sustainability programs are increasingly becoming critical agenda items for everyone in the extended food supply chain and yet for most Food Business Operators (FBO) their programs are not able to reach far enough, at the appropriate cadence, and with sufficient detail into their supply chains to be fully effective. Since food products are produced across multiple parties in multiple locations, and then moved through various countries, warehouses, weather conditions, handling methods, and storage environments before final products reach end consumers, it is essential that physical and operational factors related to food lifespan and sustainability are visible, identified, and measured at every step in the supply chain.

A major driver of this need is that foodborne diseases and the resulting food product recalls are a major threat to the entire food value chain and consumers. Food recalls cost companies an average of \$10 million in direct costs alone, according to a study by the Food Marketing Institute and the Grocery Manufacturers Association (GMA) in the US. A separate GMA sponsored survey found 5% of companies incurred over \$100m in direct and indirect costs.

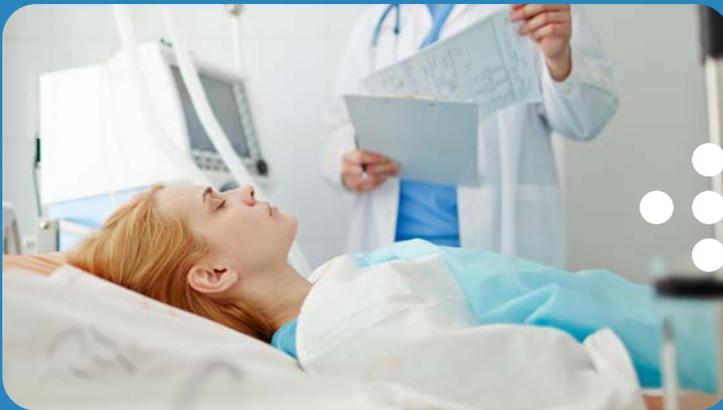


They result in a disruption in operations while managing the recall, direct costs of recalling stock, plus the associated activities and the indirect costs caused mostly by reputational damage. This effect on consumers can result in significant long term financial losses for a company due to loss of sales, but the effect on consumers is possibly the most significant factor. A survey by Harris Interactive found that 15% of consumers would never buy that product again and 21% of people at a center of a recall would not buy any product from the same manufacturer. And it is not just recalls driving this need. Increasingly, sustainability is emerging as an equally important driver. About 75 percent of seafood sold today is not certified or rated as sustainable and yet the number of retailers and consumers who are concerned about sustainability is increasing at a pace faster than the available supply of sustainably labeled products.

THE CDC ESTIMATES THAT EACH YEAR ROUGHLY:

1 IN 6

Americans (or 48 million people) get sick



128,000

Are hospitalized

3,000

Die



CURRENT TRACK & TRACE SOLUTIONS

Of course, tracing food products from source to consumer is not a new topic. Most companies use technologies including data interfaces, electronic data interchange (EDI), B2B reporting, scan codes, and RFID/GPS tags. These technologies are often used in conjunction with warehouse management, ERP, and other systems for product traceability. Purchase order numbers, lot codes, SKUs, shipping notices, quality reports, and inspections scattered across a specific value chain of different vendors and their systems are regularly tracked. This tracking, however, is generally limited to the data needed to support the transactional requirements of the parties involved—often the requirement is only "one up, one down" which means that FBO's only have a system in place enabling them to identify the immediate supplier(s) and immediate customer(s) of their products without providing visibility across the entire value chain. During these transactional exchanges, some data is captured in non-digital and unstructured format with no single authority or method to verify data integrity or accuracy. There is also no support for secure, multiparty information sharing and collaboration across all members of the food supply chain, which is essential for minimizing negative consequences, identifying, and mitigating incident root cause, and managing the work in process (WIP)



exchanges through final resolutions. The net result is everyone faces a labor-intensive, error-prone, and lengthy reconciliation process.

Added to this already complex inter-company dynamic across FBOs are recent efforts by government entities like the FDA and organizations like the Consumer Goods Forum to drive consistency across data standards by pushing FBOs to establish and maintain records containing information on critical tracking events in the supply chain, such as growing, shipping, receiving, creating, and transforming the foods. The reality is that it always comes down to being the data that matters. It is hard to effectively manage a safety, traceability, or sustainability program without the right data, at the appropriate granularity, at the right time, and – very importantly – with full provenance of how it changes over time.

OPTIONS FOR MANAGING FOOD SUPPLY CHAIN DATA

Given this widely accepted notion of minimal one-up, one-down accountability, every company in the food value chain typically designs their data from inward out meaning they setup their transactional systems first to run their own business-- setup customers and suppliers, define SKUs, manage orders, calculate financials, and generate reports. This is generally referred to as the data that is needed to “transact” the business. There are a plethora of options to support this ranging from general-purpose ERPs to market-specific applications, to home-grown applications built up over time. They generally all rely on relational database technology, which is difficult to set up, difficult to modify, not collaborative, and difficult to understand how the data changes

over time. Each company in the value chain link has done the same thing to setup their transactional systems. And, since every company runs their business differently, their transactional data is generally not the same. Of course, there are common data elements like customer name, supplier name, etc. but with relational database technology, there needs to be a schema that is very specific about the naming convention, length of fields, record objects—all the attributes of a relational data model. In short, these systems do not easily speak the same language. This means that to communicate across the value chain, typically the dominant party establishes conditions for others to do business with them, and all others need to put in translation layers to talk to each other.

PO	Qty	Ship Date	Latest Ship Date	Product Age	Quality Level Comments
123	500	2/1/20	2/5/20	1 wk	Level 3

PO	Qty	Ship Date	Estimated Ship Date	Product Life	Quality Level Comments
123	500	2/1/20	2/5/20	5 days	Level 3

PO	Qty	Short	Reason Code	Ship Date	Estimated Ship Date	Product Life	Quality Level Condition
123	500			Jan-12	Jan-16	5 days	Level 3

Even in a simple one up, one down exchange, the complexity between naming conventions and units of measure forces everyone to the lowest common, acceptable data conical which is not adequate for today's food safety, traceability, and sustainability programs

This works fine for your key suppliers – often managed through EDI – and works fine if nothing changes, but it is very rigid and generally results in the lowest common denominator of a granular data definition which means the more parties involved, the complexity of managing the needed granular data over time is immense. Given all this complexity and rigidity, you can understand why 2/3 of companies think Excel is a supply chain system. It is the “go-to” tool where you can dump any data from a transactional system as a set of rows and columns and share it as a file with someone else. The problem, of course, is that Excel is not a database so it cannot be used as an integrated, end-to-end solution nor does it work well for managing critical tracking events over time.

WHAT ABOUT DATA STANDARDS?

The FDA, the consumer goods forum, GS1, and other countless organizations or functional groups (i.e., shipping carriers) have defined “standards” for data for a specific supply chain. This extends the transactional data defined for each company one step further. For example, it mandates that specific product codes should always start with a unique identifier or it provides a central hub for identifying a company or product. The FDA has also defined Critical Tracking Events (CTEs) and Key Data Elements (KDEs) for different types of products such as date/time of harvest for seafood and produce. This is putting a further wrapper around transactional exchanges. Whether it is the FDA, GS1, or any other entity, they are all just extending what is still a rigid data model which is already too hard to manage across multiple parties. Plus, and this is the key when you start looking at resolving issues around food safety, traceability, and sustainability programs, the data models these all rely on do not naturally support provenance and they are not collaborative.

It is a zero-sum game.



The Food and Drug Administration is proposing to establish additional traceability recordkeeping requirements for persons that manufacture, process, pack, or hold foods the Agency has designated for inclusion on the Food Traceability List. The proposed rule would require these entities to establish and maintain records containing information on critical tracking events in the supply chain for these designated foods, such as growing, shipping, receiving, creating, and transforming the foods



A BLOCKCHAIN IS NOT A DATABASE NOR COLLABORATIVE

There was a lot of excitement about blockchain technology in the past couple of years supported by some big marketing spend. IBM's food trust and TradeLens were deployed in conjunction with Walmart and Maersk and others involved in tracing and moving food products. They famously pointed out they could trace the lineage of a produce item in minutes rather than the weeks described earlier or that they could clear shipping and customs handshakes more quickly and cheaply. This was not accomplished without a lot of heavy lifting. First off, relational database technology was a non-starter, so most blockchain systems rely on key-value pair data management technology. With it, data pairs are appended to a ledger as transactions over time, but the schema definition hurdle is not removed and there is a lot of custom coding required to support the required "if/then" data management and logic needed for a

"smart contract" transaction which could be pushed to a blockchain ledger. This is where many companies ran into trouble with blockchain. It is not a database nor collaborative. It is a ledger of transactions that are strung together in an immutable chain using transaction hashing. This works fine for exchanging transactional data about bitcoins or for "final" transactions between trading partners, but it faces the same hurdles that EDI has faced for years in that it does not work well for the complex data models you see in a food supply chain. It also does not support the collaborative, work-in-process (WIP) exchanges that are essential for effectively managing food safety, traceability, and sustainability programs.

A NEW CLASS OF DATABASE- THE BOARDWALK UNITY DIGITAL LEDGER

The Boardwalk Unity Digital Ledger (Boardwalk) is designed specifically to support multi-party, enterprise data management and collaboration where the provenance of all interactions are captured. Boardwalk is a patented digital ledger database technology that provides the key capabilities needed for an effective food safety, traceability, and sustainability programs:

Immutable Address/Value

Work with information at the granularity required for the application, not constrained by concepts such as records, objects, documents, or files

Collaborative Alignment

Enables rapid, continuous alignment on information and decisions while reducing misalignment and friction between parties

Permissions and Data Access Control

Control permissions and access at the lowest data granularity required for each participant across the entire value chain.

Workflow Based Consensus

Flexible multi-party data exchange and workflow-based consensus capabilities that can happen simultaneously with different participants only affecting their data

Transaction Chaining

Boardwalk appends all changes to the Digital Ledger rather than updates records. It also chains all transactions making them immutable while also enabling tracking the provenance of all transactions

Tamper-Proof Data Provenance

All changes are automatically versioned, fully auditable, and blockchain verifiable bringing the provenance of your food supply chain data to a new level

Machine Learning

Advanced machine learning can be applied to unbiased collaborative data to create powerful predictive models

Unstructured Data

Research and correlate both structured and unstructured data over time to better understand relationships between data and derive all relevant insights

The Boardwalk Digital Ledger platform is fully extensible to the lowest/further data granularity and provides the required flexibility to enable continuous collaborative sharing of data across the extended food supply chain so FBOs can effectively track critical events.

WHY BOARDWALK UNIQUELY MEETS THE REQUIREMENTS OF A FOOD SAFETY, TRACEABILITY, AND SUSTAINABILITY PROGRAM

The Boardwalk Digital Ledger Platform solves the trust and collaboration issues that FBO partners face when trying to establish food safety, traceability, and sustainability programs. Boardwalktech's patented information exchange technology enables simple, efficient connections between different data sources both inside a single company and between companies. These connections enable businesses to configure flexible data networks ready for the collaborative exchange of fine-grained changes and events on a Digital Ledger while maintaining isolation of key vendor information with access control. The Boardwalk application will allow data capture/data entry of both structured and unstructured data, the ability to curate and correlate critical process data via the Network of Words (NOW) control tower visual editor, and support multi-party, concurrent collaboration using a browser or via Excel, while also providing multi-point system integration capabilities into FBO systems.

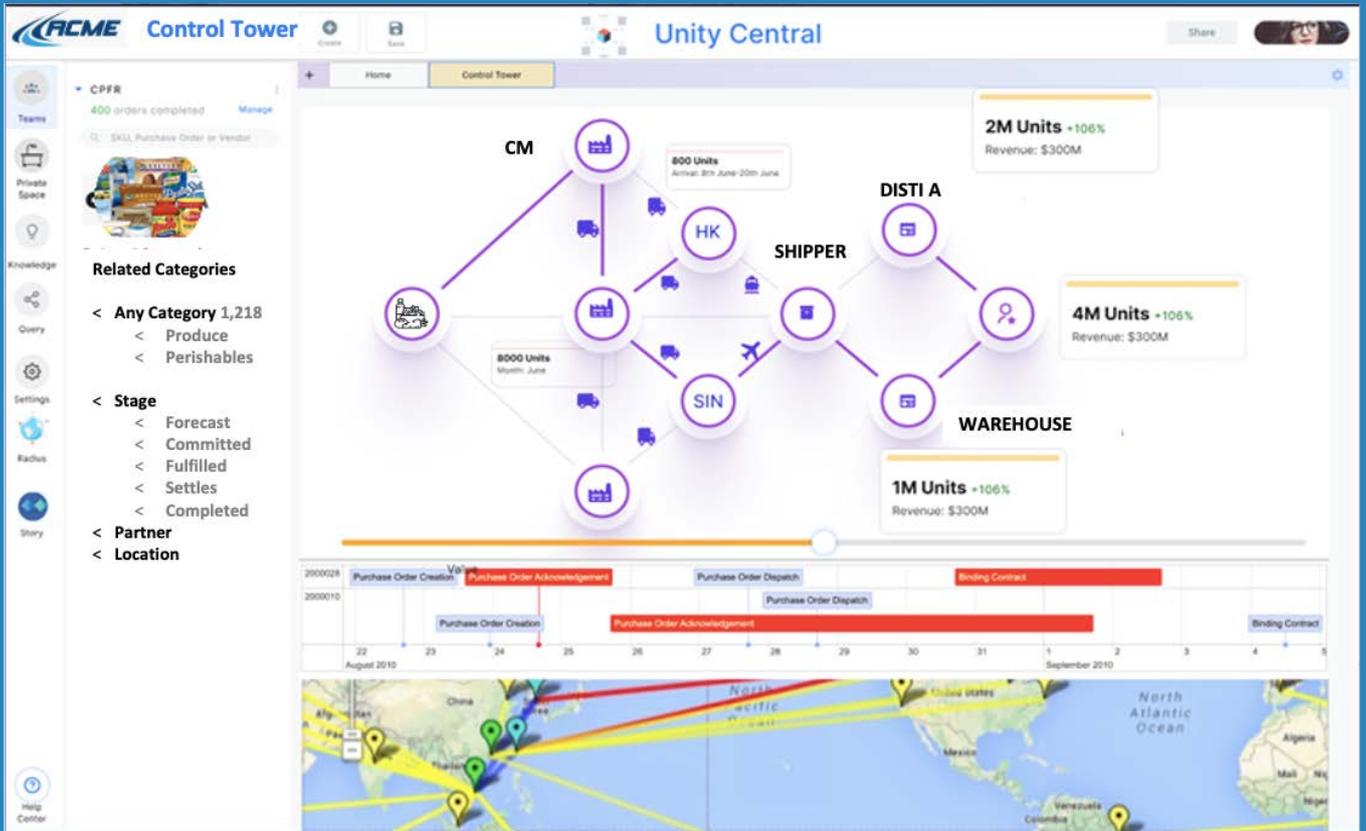
The Boardwalk application will enable all process users across the extended value chain to continuously monitor, collaborate over, and act upon critical traceability and

food safety/security process data. It can predict potential issues for the availability of dependent products throughout the product supply value chain or the readiness scaling of certain products/suppliers by evaluating the dependency on data updates across all touchpoints over time. The Boardwalk system can capture details about the finished product age, work-in-process (WIP) milestone steps, temperature, logistics method, weather, loading and unloading times, and other data elements required for traceability and food safety/security.

The Boardwalk system can integrate transactional systems, electronic data interchanges (EDI), B2B reports, scan codes, and RFID/GPS tags to capture this information on the digital ledger. These events can be then processed at regular intervals using the Boardwalk chain intelligence module to calculate risk and notify teams about food safety. Root cause analysis programs can be written on the ledger to identify potential causes of a food quality issue.



UNITY CENTRAL



A Control Tower enables a bird's eye view of the food supply chain network showing the time-based relationship of all moving parts to ensure that they are moving together and performing as expected.

BOARDWALK AWARDED DLA CONTRACT

The Boardwalk solution's capabilities have been recognized by the U.S. Defense Logistics Agency, which recently awarded Boardwalktech an R&D contract to utilize the Boardwalk Digital Ledger's track & trace capabilities to address food safety and other traceability concerns.



BENEFITS OF USING BDL FOR FOOD SAFETY, TRACEABILITY, AND SUSTAINABILITY PROGRAM



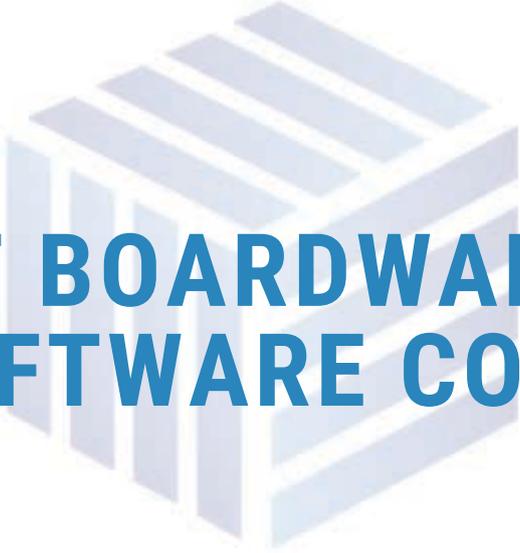
Improved supply chain visibility provides everyone involved in food safety, traceability, and sustainability programs increased assurance of food safety and security. Boardwalktech's Digital Ledger and NOW Control Tower visual editor can be configured to detect and mitigate/ amplify a variety of positive and negative supply chain events and touchpoints. Combined, they provide a more granular and timely traceability/chain of custody capability for food safety/security purposes, such as product recalls, mock recalls, and support process incident root cause analysis for critical events.

The FDA estimates that a more detailed and extensive critical event tracking capability will result in an 84% faster identification of foodborne illness sources, meaning fewer costly recalls... Recalls bring negative publicity to producers, and safer food means more satisfied consumers, which can translate into better sales.

Reduced waste through better visibility and collaboration is another benefit. Food losses and waste in global food supply chains are currently estimated at 35 percent, and traceability is a key way to reduce them. A collaborative data sharing capability with immutable and verified transactions can also lower operating costs. For example, the cost and the waste associated with chasing dispute resolution can come down

dramatically. In one case, over 70% of invoice disputes at peak times were reduced to under 2%.

It used to be that simply knowing the locations and quantities of the assets needed within your organization's four walls to conduct current operations were deemed good enough. In other words, it meant knowing "where is my stuff?" Today's world-class organizations realize they need to take a more expansive view of their end-to-end supply chain to avoid critical risks to current operations and protect future profitability. The colloquial answer you might hear today from industry vanguards is multi-faceted: "Where is the stuff I am going to buy in the future from my network of supply partners? Where is the stuff I already sold to my immediate customers but is languishing in distribution channels? At what stage of its lifecycle is the stuff that is in the hands of my end users and do I know that it's all been sustainably produced?" Boardwalk is uniquely able to address the critical capabilities needed for a more effective food safety, traceability, and sustainability programs yielding benefits that will result in freed up capital, improved cash flow, and better margins as well as stronger relationships with all trading partners.



ABOUT BOARDWALKTECH SOFTWARE CORP.

Boardwalktech has developed a patented Digital Ledger Technology Platform used by Fortune 500 companies running mission-critical applications worldwide. Boardwalktech's patented digital ledger technology and its unique method of managing vast amounts of structured and unstructured data is the only platform on the market today where multiple parties can effectively work on the same data simultaneously. Boardwalktech can deliver a collaborative purpose-built enterprise information management application on any device or user interface with full integration with enterprise systems of record in a fraction of the time it takes other non-digital ledger technology-based applications. Boardwalktech is headquartered in Cupertino, California with offices in India and operations in North America. For more information on Boardwalktech, visit our website at www.boardwalktech.com