Traceability in Foodservice: The Opportunity and the Challenge

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Purpose: Like many other industry sectors, foodservice is in the midst of a major technological shift away from paper-based, manually-processed transactions using disconnected systems, and toward digital supply chains. Digitization will bring greater visibility of supply chain operations overall, and greater inventory track and trace capabilities, in particular. However, the benefits and costs of implementing required technologies and processes are not well understood.

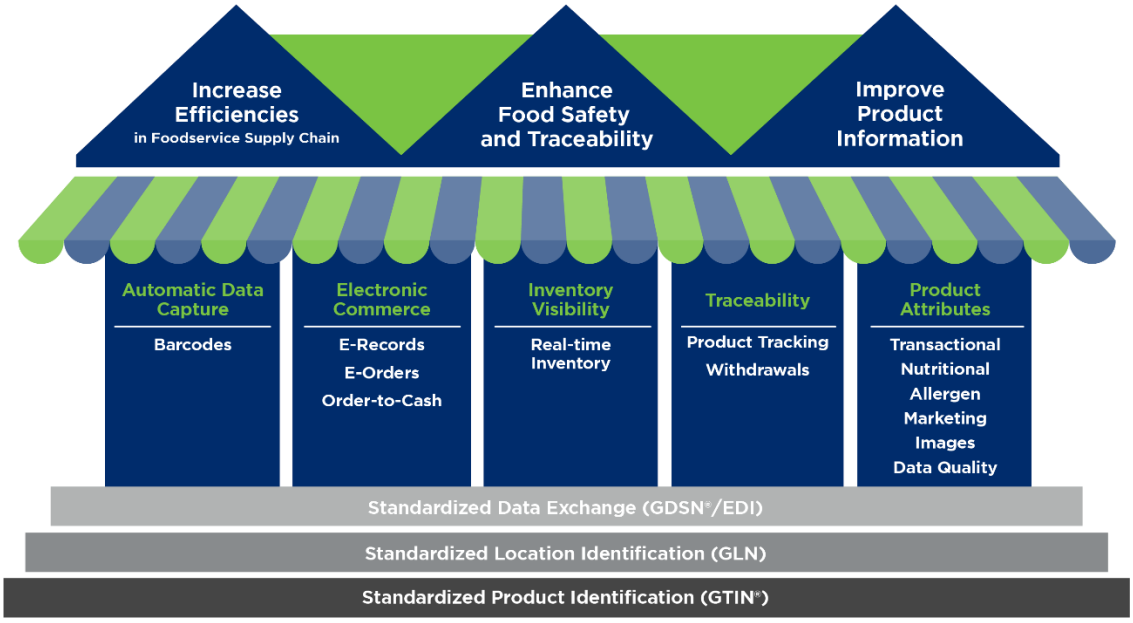
The purpose of this report is to describe the current state of traceability concepts, opportunities, and challenges in the foodservice industry, with recommendations regarding future research and ways forward for supply chain partners who are considering investments in this area.

Definitions:

1. Visibility in the supply chain is the availability to decision makers of timely, high quality data (current, accurate, useful, formatted) collected from various nodes in supply chains (Williams, et al., 2013). Visible data describe attributes including (from detailed to aggregate):
    a. inventory data (quantities, locations, origin-destination pairs, ASNs, batch/lot or serialnumber, condition, dates etc., aka, traceability)
    b. product data (dimensions, weights, sources, nutritional data, allergens, descriptions)
    c. transaction data, including sales (POS, forecasts, consumer demographics) and spend
    d. process data describing assets (locations, utilization, operational status), capacity (utilization, availability, planned uses), and key performance indicators (KPIs such as cost, service, quality)
    e. source and process environments (traffic, weather, disruptions/threats)
    f. macro market level demand and supply data, economic indicators, etc.

2. Traceability is the ability to verify the history, location, or application of an item by means of documented recorded identification. (Wikipedia). In foodservice, traceability is "… a visibility application that enables foodservice trading partners to track and trace product (at the case or inner-pack level) throughout the supply chain. It involves each trading partner collecting and maintaining product information that supports, at the very least, 'one up/one down' visibility of the product's movement through the distribution channel" (Foodservice Implementation Guideline for Case-Level Traceability using GS1 Standards, 2017).
    a. *Internal traceability* links a customer's internal processes and information to a globally unique product number (GS1 Global Trade Item Number), a batch/lot or serial number and relevant dates (production date, best by date, etc) of raw materials to the GTIN, batch/lot or serial number and relevant dates of finished goods.
    b. *External traceability* communicates product identity as well as batch/lot or serial number and relevant dates with transport information between trading partners.
    c. *End-to-end traceability* enables supply chain partners to identify the direct source and direct recipient of traceable items at the batch or serialized (item) levels, a combination of internal and external traceability

3. GS1 Standards: provide a common platform for structuring and sharing product information globally and uniquely. The GS1 Standards for unique identificationinclude: Global Location Numbers (GLNs) for location identification, Global Trade Item Numbers® (GTINs®) for product identification. The Global Data Synchronization Network™ (GDSN®) supports the exchange of product data information through a network of certified electronic data pools.



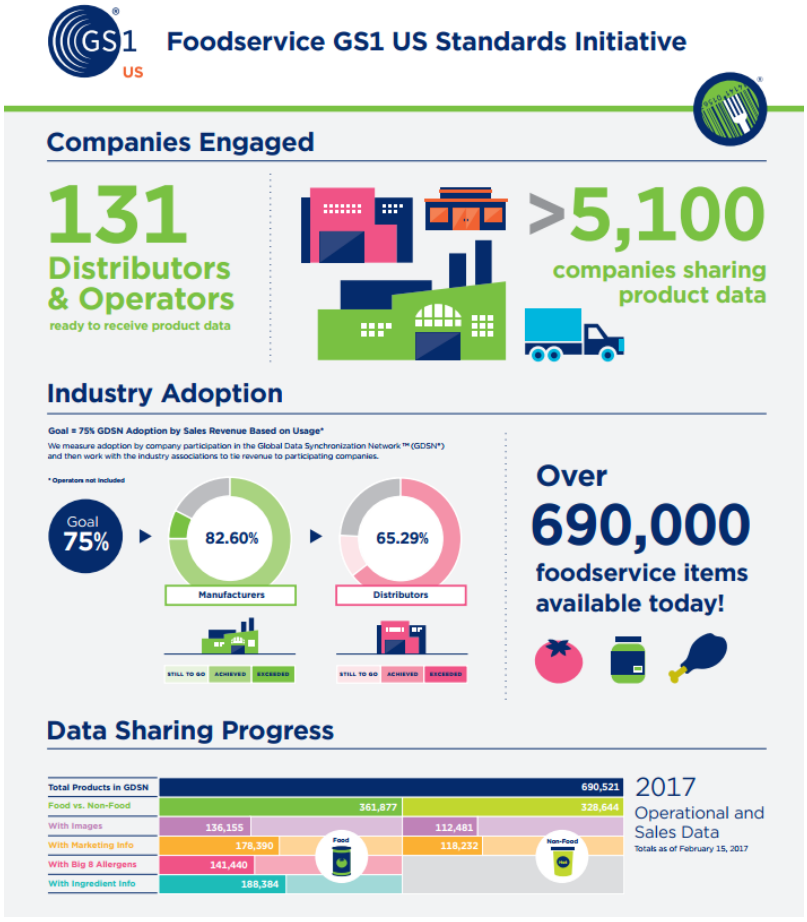
Source: GS1 US

4. Data *identify-capture-share* technologies
   a. GTIN®: Global Trade Item Number identifying company and product (at any level of packaging)
   b. GLN®: Global Location Numbers (GLNs) for location identification
   c. GDSN®: Global Data Synchronization Network™ (GDSN®) the electronic transfer of standardized product information between trading partners and the continuous synchronization of that information over time through a network of certified electronic data pools
   d. U.P.C. barcodes: contains the GTIN®; used to identify item level product at retail point of sale.
   e. GS1-128 barcodes: contain the GTIN® plus information such as batch/lot or serial numbers, weight, expiration date, etc.; used to identify units in warehouses such as cartons, cases and pallets.
   f. GS1 US Mobile Scan: digital watermark integrated into packaging artwork, scanned with smartphone or POS scanner
   g. RFID: Radio Frequency Identification tag uses electronic product code (EPC = GTIN® + unique serial number) to identify individual items, or cases, or pallets

h. Blockchain: is a shared database concept that creates an open, distributed ledger to record transactions across a peer-to-peer network (in bitcoin or other tokens) between two parties efficiently and in a verifiable and permanent way using cryptographic trust and assurance mechanisms. The ledger itself can also be programmed to trigger transactions automatically (Wikipedia, Gartner Glossary).

Current Level of Traceability in Foodservice

The current perception of many executives is that the Foodservice industry lags other industries in adoption of GS1 Standards and systems. According to conversations with industry leaders, few, (if any), chains have implemented full traceability leveraging GS1 Standards on an end-to-end basis for a majority of items that they purchase. The chart below provides a recent summary of the progress of the industry-driven Foodservice GS1 US Standards Initiative. The Initiative was launched in partnership with the National Restaurant Association, International Foodservice Distributors Association (IFDA), and the International Foodservice Manufacturers Association (IFMA) as an industry collaboration to eliminate waste in the foodservice supply chain, enhance product information, and establish a foundation for improved traceability and food safety.



It is difficult to find consistent data with which to compare levels of GS1 Standards adoption across industries. Over the past few years, GS1 US has conducted several surveys in its key industries. The table below provides a summary of key metrics which can be used to compare "depth of use", with the survey results that are available. Though the data are rather spotty, the metrics and existing scores provide a foundation for a more comprehensive benchmarking effort.

Depth of Use Comparison across Four Industries (Source: 2015 GS1 US surveys)

Depth of Use Metric	Foodservice	Apparel/Gen Merchandise	Retail Grocery	Healthcare
Share/number of companies participating in the GDSN or using GS1 standard	5,100 mfg 131 dist	70%		90% mfg 59% health
Revenue share of companies participating in the GDSN	83% mfg 65% dist			
Number of products with assigned GTINs	690,521			
Share of products with assigned GTINs	69% mfg 91% prv label dist	73% mfg		67% devices 19% pharma
Share of company locations with assigned GLNs		60% retail		56% health
Percent POs sent by EDI		67% retail		
Percent of invoices received by EDI		61% retail		
Percent of EDI POs containing GTINs	52% mfg 56% dist	66% mfg 79% retail	49% suppliers 39% buyers	54% mfg 50% health
Percent of EDI POs containing GLNs			37% buyers	54% mfg
Share of ASNs containing GTINS		65% mfg 69% retail		41% mfg 50% health
Share of ASNs containing GLNS		53% mfg		
Share of items having RFID tags		33% mfg		
Share of shipping units with GS1-128 bar code	37% prv label dist	73% mfg 77% retail	30% suppliers 53% pvt lab buyers	68% mfg
Invoices sent by EDI		70% mfg 61% retail		
Share of EDI invoices containing GTINs	52% mfg 56% dist	64% mfg 64% retail	58% suppliers	49% mfg 50% health
Share of EDI invoices containing GLNs		49% mfg 45% retail		
Companies scanning outbound cases	70% mfg 71% dist			
Share of cases having any barcode			75% supplier 62% buyer	
Share items with RFID tags		33% mfg		
Share transactions processed with GLNs				33% health

Making the Business Case for Traceability

Discussions with industry leaders provide a range of perspectives on the need for, and potential payoffs from, improved traceability. Some managers argue that regulatory mandates on food safety are looming, and in some cases are already here, and this forms the primary justification for investments. From this perspective, traceability investments are seen as a "cost of doing business," and a "must do" for the industry. According to one executive, it is "better to create our own standards and capabilities than to have the government do it for us." In other interviews, managers suggest that traceability capabilities are already satisfactory, at least for larger chains, and that increased precision in traceability may not be warranted. For example, the cost of withdrawals is largely born by suppliers, and the difference in costs of withdrawing entire shipments or regional quantities of an item are sometimes not perceived to be that much more than the costs of withdrawing precise lots that may be defective or contaminated. However, some published case studies suggest that the differences in cost can be substantial (e.g., see Frontera and Sunfed cases referenced at the end of this document). Even so, some managers question whether such cost savings justify the added investments and costs required to gain lot-level precision in traceability, given the infrequency with which withdrawals occur.

Rather than focusing only on withdrawal-related benefits and costs, other managers identify potential operational benefits with better traceability. In addition, some note possible marketing and branding opportunities provided by improvements. Below, we provide comprehensive lists of the benefits, required investments, and costs, associated with GS1 Standards adoption, and other changes required to create fine-grained levels of traceability.

<u>Potential Benefits</u>

1. Precision recalls/withdrawals
    a. Traceability investments enable more precise and surgical withdrawals (by batch/lot or serial number). This reduces costs and the food waste associated with the collection and disposal of uncontaminated product.
    b. Improves consumer safety, which in turn provides brand protection.
    c. Aids trace-back and root cause analysis so as to help prevent reoccurrence.
2. Operational benefits
    a. Better ability to manage product shelf life. This opens the potential to institute system "alerts" when items are nearing expiration dates or re-order points.
    b. Creates potential for dynamic inventory and auto replenishment, where distributors and manufacturers can see depletion downstream, ultimately at the operator level. While this would require operators to scan depletions each day, dynamic inventory could create a number of benefits including:
        i. Store managers no longer need to spend time gathering information to generate orders
        ii. Fewer incidents of mistakenly or inadvertently ordering unneeded product, (e.g. a busy manager simply repeating the previous order without making adjustments for current inventory).

iii. Can reduce labor hours associated with "will calls," (i.e. sending an employee to pick up needed items from a distributor), or transshipments, (i.e. swapping inventory from store to store).
iv. Eliminates or reduces need for periodic physical inventory counts.
v. Can reduce distributor expediting, supplier production ramp-up/ramp-down.
vi. Better trust of forecasts (less hoarding, returns, order cancellations).
vii. Can moderate disruptive variance in supply chain flows; eliminate bullwhip effects (especially for promotions and LTOs). This builds confidence in predictions of product movement.

c. May provide greater picking/order accuracy at distributors. This can create a faster learning curve for pickers.
d. Provides greater audit and verification ability for invoice data (prices, weights, overcharges, contract discrepancies, etc.). Creates material handling and transport cost savings (e.g., see IPC case study).

3. Creates foundational capabilities (visibility, accuracy, data standardization, etc.), for higher order initiatives
   a. Fully leverage planning, execution, and transaction management systems (e.g., demand planning, inventory optimization, blockchain).
   b. May increase opportunities for vendor managed inventory (VMI) and other partnering arrangements.
   c. Allows better definition and enforcement of processes (sequences).
4. Sales/Branding benefits
   a. Provides more accurate, standardized, and up-to-date product information to support sales and promotion (e.g., see Ben-E-Keith, UniPro case studies)
   b. Provides better consumer information on operator, items, sources, highlighting branded items (see "Branded Menu Items" article).
   c. Better ability to show sourcing info for sustainability purposes (e.g., cage free eggs).
   d. Demonstrates commitment to consumer safety, enhancing brand image and building goodwill
   e. Enhances ability to perform market tests, watch early sales to improve forecasts and responses to LTOs, for example.
5. Avoids regulators making decisions for the industry.

<u>Required Investments and Costs</u>

According to the Foodservice Implementation Guideline for Case-Level Traceability using GS1 Standards (2017), the creation of an effective traceability system across a supply chain requires:

- Global and unique identification numbers for items and locations that need to be traced.
- Unique identification numbers communicated on product labels and captured in related information systems (links physical products with tracking information).
- Standards that provide the common language that enables trading partners' systems to collect, record, store, and exchange data efficiently.

Initial investments needed to meet these requirements typically include time and effort in learning about GS1 Standards, creating GTINs®, GLNs, building qualityproduct data for synchronizing via the GDSN®, and developing transition plans. Clearly, meeting these requirements can also involve significant investments in software, hardware (e.g., scanners, data storage, etc.), and training. However, several subject matter experts point out that system integration costs and process realignment can constitute the largest investments of resources needed to make traceability a reality. This is perhaps most notably the case for distributors, who face several significant challenges regarding their warehouse management systems. Such systems are often dated and lack the capability to capture and transmit detailed product information. Further, many distributors operate with multiple systems that have been patch-worked together over the course of growth with mergers and acquisitions, making the adoption of standardized information transfer even more daunting when not standardized.

A Return-on-Investment Template

The table on the following page provides a template for evaluating the costs and benefits of investing in GS1 Standards enabled traceability. Decision makers might use the template to organize a benefit/cost analysis of implementation for a given product category, a particular chain concept, a region, or a system. In making such a decision, it is important to identify benefits, costs, and investments at each level of the supply chain, as they are not likely to be evenly distributed.

Pro-forma Return on Investment Template for Investments in GS1-Based Track and Trace Capability

	Grower / Manufacturer	Distributor	Operator	Total Supply Chain
A. Brand and revenue profit contribution (annual)				
- Improved product information				
- Improved safety, brand protection				
- Improved sales support				
- Improved market testing, demand sensing				
B. Cost savings and avoidance (annual)				
- More precise withdrawals				
- Reduced expediting, will calls, etc.				
- Reduced uncertainty, safety stock				
- Increased product weight, size invoicing accuracy				
- Reduced wastage, improved shelf life management				
- Greater picking, order accuracy				
C. Option value (annualized future capabilities)				
- Dynamic inventory				
- Vendor managed inventory				
- Advanced planning systems / analytics				
- Automation: vision, robotics, etc.				
- Regulatory compliance and control				
- Other???				
D. Costs (annual recurring)				
- Maintenance, updates, upgrades, replacement				
- Training				
- Labels and other consumables				
E. Required investments (non-recurring)				
- Software				
- System integration				
- Scanning hardware				
- Training				
- Creation of GTINs, GLNs, other standards				
Return on investment* (A+B+C-D)*(Useful years)/E				
Payback period E/(A+B+C-D)				

* Risk adjusted discount rate may be applied

Revenue benefits, cost savings, and required investments are likely to be disproportionately distributed across manufacturers, distributors, and operators. End-to-end, supply chain level perspectives are needed to share costs, risks, and benefits across the supply chain.

Implementation Barriers and Challenges

In addition to the financial hurdles that must be cleared to justify investments in greater traceability, there are a number of technological and organizational barriers to implementation.[1]

1. Firms must come to agreement on using GS1 global standards as the foundation of their identification and information exchange processes, such as the use of GTINs®, batch/lot or serial numbers, relevant dates, data synchronization, electronic data interchange, and GLNs. In some cases, the information that is supposed to be contained in barcodes (i.e. GS1-128 barcode) is currently not collected – or even created. For example, some manufacturers don't create category relevant dates, such as production date or pack date. Adding a date requires "in-line" printing of labels, which is more time consuming and requires more careful control versus simple stick on human-readable labels. Distributors and Operators must work with Manufacturers to ensure such information is being generated and captured.
2. Partners need to clarify investments, costs, and benefits associated with implementation. Regarding recalls, there is a perception that Distributors and Operators bear much of the costs while Manufacturers receive much of the benefit. However, the allocation of costs and benefits related to other inventory efficiencies may be switched. A manufacturer bears the initial cost of GTIN allocation (including GCP acquisition, product description defnition and exchange, continuous updates), barcode application (hardware & software), database and operations process update, etc. Distributors' investments are in equipment, upgrades to warehouse management systems, and use of the barcodes/databases, including database integration efforts. The benefit often touted in discussions of the technology is the ability for precision recalls. Since Manufacturers are typically the party responsible for recalls, they seem, at first glance, to be the party that stands to benefit the most. On the other hand, Operators reap the benefits of brand protection. In addition, if other inventory and labor savings can be developed from operational efficiencies, a stronger ROI case may be developed for distributors and operators.
3. There is an overall lack of technology readiness in the supply chain. Currently, many readers being used don't read GS1-128, and in some instances back-end systems are unable to store data beyond the GTIN. This prevents information from being collected and disseminated at the various touch points.
4. Distributors operate with exceptionally thin margins, making it difficult to undertake necessary investments. Cash flow limitations are a factor, as are fears concerning potential impacts on profitability.
5. Uncertainty exists regarding the true cost (per case) of implementation and the true benefit (cost savings) per recall.
6. In some cases, there seems to be a lack of communicated desire for end-to-end implementation on part of operators. The potential benefits of precision recalls aren't perceived to be significant.

[1] The Foodservice GS1 US Standards Initiative and the GS1 US Retail Grocery Initiative have been established to discuss and address barriers to implementation

7. Operators seem to be expecting the distributors to drive the overall initiative in the supply chain, when in fact each individual operator has specific, sometimes unique, requirements. Operators fail to recognize the need to be primary drivers in defining requirements and getting manufacturers to establish numbers, codes, etc.
8. Operators must express to distributors the ways in which they should interpret data feeds from suppliers. This presents a significant cost for distributors as suppliers typically have different formats, even EDI has variable formats.
9. There are widely varying degrees of requirements between customers regarding levels of traceability. In addition, it is not clear who is responsible for generating reports, etc.[2]
10. Many suppliers currently lack the capability to print labels on a case by case basis, and/or lack the ability to synch label generation to production processes. Further, in some cases there is a lack of understanding concerning the technology required to achieve label generation and synchronization. this.
11. There is a need for one source of "truth" in terms of product data/information. Operators' databases were created independently from GDSN, thus potentially creating discrepancies. In these cases solution providers are needed to map GDSN data into existing operator systems and overwrite data which may be outdated or incorrect.
12. Systems would require rationalization and accurate verification of product data (weights, dimensions, attributes, nomenclature). While all trading partners are likely to benefit from more accurate data, resolution of pricing errors might favor one party over another.

Future Research

Given the general confusion and lack of understanding regarding the value proposition for traceability in the foodservice industry, a focused research project could provide insight and guidance for managers who are considering investments in traceability programs

A potentially useful research project could have the following objectives:

1. Thoroughly assess levels of adoption for manufacturers, distributors, and operators across different commodities (produce vs frozen vs dry, etc.)
2. Identify and understand drivers/inhibitors of adoption, leading to creation of a "readiness model" that can be used to assess potential for deployment for specific manufacturer-distributor-operator supply chains
3. Develop a "maturity model" that gauges the degree to which a chain has fully exploited the potential benefits of a track and trace system
4. Estimate the dollar value of GS1 Standards adoption through longitudinal case studies

[2] GS1 US has created industry guidance to help alleviate these issues/concerns which defines the Key Data Elements (KDEs) that should be captured at each Critical Tracking Event (CTE). Please see the Foodservice Traceability Guide.

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Implementation Guideline for Case-Level Traceability Using GS1 Standards
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GS1 US Fresh Foods White Paper
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Videos:

Genius of Things: Blockchain and Food Safety with IBM and Walmart (Feb 16, 2017)

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Conversations/interviews:

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