



Product Tracing in Food Systems: Developing a Product Tracing Plan Using Critical Tracking Events and Key Data Elements

Background

Since the November 2009 release of the FDA-commissioned IFT report *Product Tracing in Food Systems*, the IFT-coined terms “critical tracking events” (CTEs) and “key data elements” (KDEs) have gained broad acceptance. As a result of the legislation passed by the 111th U.S. Congress relative to product tracing, members of the food supply chain have been gearing up to improve their ability to trace products. This document expands upon the CTE and KDE concepts to guide food industry members as they improve their product tracing systems.



What is Product Tracing?

Product tracing is the ability to follow a product (or its ingredients) forward or backward through the supply chain. Sometimes referred to as traceability, knowing where a product came from and went to is important. In the event of a product recall, it is critical to have records that show where all products were distributed so that potentially contaminated product can be removed from distribution so that people don't consume it and become ill.

Why is Product Tracing Important?

Product tracing is more important today than ever before. Through attempts to optimize efficiencies in order to feed the world's population in an economical way, the food supply chain has evolved into a tangled web.

Markets are generally quite efficient in driving production, transportation, processing, storage, sales, and consumption. Product volumes are huge and the pace is quick. Problems are





relatively rare, but when they occur, health and lives are at stake, as well as the livelihoods of industries, companies, and employees. Had the supply chain been created to optimize product tracing, it probably would look different. Our ability to better trace paths of products through the supply chain will help to improve food safety and avoid devastating economic shocks to the food system.

Unfortunately, too many outbreaks have shown that it's sometimes difficult to trace the path of a product from creation to consumption. Although there are regulations that require firms to record where they received a product from, and who they sent it to, there is no law that requires a company to associate an incoming ingredient with a finished product. Of course, many firms do keep these records, but sometimes they are handwritten, sometimes information is kept in multiple places, and sometimes receiving companies will assign their own internal numbers because the original product information isn't meaningful to them.

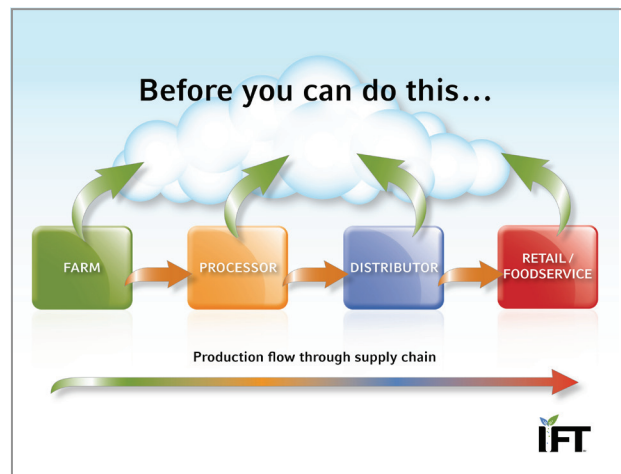
The current system of globally sourced products handled by brokers, distributors, processors, retailers, and others is unlikely to change.

Who Needs to Trace Products?

IFT feels that all supply chain partners, even those that may not take possession of the product, have an important role in product tracing.

Improving the ability to trace products through the supply chain will require a commitment by all involved to make it work. The supply chain is literally a chain whose strength is always defined by its weakest link. Traceability is important to everyone since successful traceability will add value for all supply chain stakeholders. Therefore, all supply chain participants should be committed to traceability solutions that are flexible, adaptable, efficient and low cost.

Given this perspective, the government should set clear objectives for those in the food supply chain and allow the industry to determine how to reach those objectives. Principally, the system should be simple, user friendly, and globally accepted, as well as have the ability to leverage existing industry systems. Solution designs and tools should be open and interoperable. Each supply chain participant should have the ability to choose solutions and methods that best suit their





operations. Additionally, any data generated by a supply chain stakeholder should remain the property of that stakeholder whereby permissions and appropriate credentials would be needed to access such proprietary information.

Ultimately, IFT envisions a system of interconnected networks much like the way the internet functions. Ideally, when food illness outbreaks occur, it should be possible to run rapid queries against the network to quickly and accurately identify all products intimately associated with the tainted item. This should narrow the scope of recalls and help to avoid unnecessary illnesses and death. Additionally, as outbreaks occur, it should be possible to overlay epidemiology data over supply chain data in order to more rapidly pinpoint the cause of the outbreak. This will help to avoid implicating products that are actually safe to consume.

It is through the identification of critical tracking events and establishment of key data elements at each critical tracking event by each supply chain partner, without regard to where in the world they operate, that true product tracing will become a reality.

What are critical tracking events?

As products move through the supply chain, they are subjected to specific events that define their ultimate path through the supply chain. If you think of an entire supply chain, there are several points in time and locations where data need to be collected to enable traceability. Once determined, each physical location should be uniquely identified and strategies for creating and/or reading unique identifiers, creating date/time stamps, and entering these data into a system that can be queried should be developed.

There are a variety of events that could be considered to be CTEs. Often, food products start out in a continuous form (e.g., milk, corn, etc.) and then end up in products that are in discrete form. The following incomplete list describes some CTEs that may be found in supply chain operations:

- Product creation/repacking
 - Origination (create a unique identifier – product enters supply chain)
 - Aggregation (bring discrete items together)
 - Disaggregation
 - Convert (repack or re-label)
 - Commingle
- Product receipt
- Product shipping
- Product consumer sale (retail)
- Product depletion (retail and foodservice)

Did You Know...

- In 2006, the average grocery store stocked about 45,000 items
(http://www.fmi.org/facts_figs/superfact.htm)
- The average American meal travels 1,500 miles before reaching your plate
(http://www.cuesa.org/sustainable_ag/issues/foodtravel.php)
- In 2005, about 15% of the US food supply (by volume) was imported
(<http://www.ers.usda.gov/amberwaves/february08/datafeature/>)



Each type of CTE might require different KDEs from others. Ultimately, however, the objective for each CTE is to collect sufficient data to permit traceability backward and forward through the CTE.

Another way of thinking about this is from the perspective of an investigator. If you needed to follow product backwards, what are the “forks in the road” where there might be confusion as to whether a product came from one source or another? Those points are the critical tracking events.

This concept requires that the supply chain be evaluated as a whole — from the beginning of each product or ingredient through all handlers and all stages of processing, ideally to the final consumer. Currently several industries are examining what CTEs comprise their supply chains.



Process depicted is used with permission of UFPC/Yum! Brands, Lexington, KY.

What are key data elements?

KDEs are those data required to successfully trace a product and/or its ingredients through all relevant CTEs. Each CTE must be carefully analyzed to ensure that sufficiently granular data are collected to permit traceability. The ability to trace product paths through the supply chain depends on logging KDEs associated with these events. Critical tracking event data generally includes a minimum of:

1. Unique item identification
2. Unique identifier for the location of the event
3. Date and time stamp

At each CTE, there is a certain set of data that must be obtained to enable tracing. Unique identifiers should only serve as pointers to secure back-end data so that only properly credentialed entities with appropriate and timely permissions would be able to access and use it. This operational philosophy has been deemed to be superior to another approach that would involve accumulating and storing data on products as they move through the supply chain (e.g., pedigree). In this way, for example, a unique identifier might point to data such as product name, net weight, gross weight, package dimensions, quantity, etc.

KDEs fall into two main categories: those that fall in the area of transactions and those that are tied to the actual product. While this may help clarify the way one considers KDEs, neither category is more important than the other.



The types of data that might be appropriately collected at each CTE, whether through a unique identifier or through an a la carte collection of the data, are illustrated below.

Overview of CTE KDEs

EVENT ID	EVENT OWNER	EVENT DATE	EVENT LOCATION	PRODUCT IDENTIFIER	BATCH/LOT	QUANTITY	LOT CONTROL DATE	INPUT PRODUCT	INPUT BATCH/LOT	INPUT QUANTITY	INPUT LOT CONTROL DATE	SHIPMENT NUMBER	DESTINATION ADDRESS	ORIGINS ADDRESS
1 - Product Creation\ Repackaging	✓	✓	✓	✓	✓	0	0	✓	✓	✓	✓			
2 - Product Shipment	✓	✓	✓	✓	✓	✓	0					0	✓	
3 - Product Receipt	✓	✓	✓	✓	✓	✓	✓					0		✓
4 - Case Product Depletion*	✓	✓	✓	✓	✓	✓	✓							
5 - Product Sale To Consumer**	✓	✓	✓	✓	0	✓	✓							

EVENT DATA
PRODUCT DATA
INPUT DATA
TRANSPORT DATA

Possible Sources of Data

Can be pre-set	Present on case	Calculated	Can be obtained from invoice docs
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*This includes product prepared for sale to consumers as well as "shrink."
 **Capturing product tracing information at the point of sale to consumers is generally not possible today. Key data elements are provided to illustrate what would need to be captured to enable this in the future.

✓ Mandatory data elements	0 Optional
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Definitions

Product identifier	The name or code used to designate a specific product, which may also include unit size, case configuration, etc.
Lot control date	"use by," "best by," "manufactured on," or other date appearing on a consumer level or individually packed item.

Originally developed by Douglas Bailey, USDA AMS and mpXML. Used with permission.

Analogy to HACCP

For food safety professionals who are familiar with HACCP, the process of determining CTEs and KDEs has some similarities to HACCP (although this is not to say that product tracing is part of HACCP).

HACCP

- Conduct a hazard analysis
- Identify critical control points
- Determine critical limits
- Establish monitoring procedures
- Establish corrective actions
- Establish verification procedures
- Ensure record keeping

Product Tracing

- Identify products and product inputs to be traced
- Identify critical tracking events
- Determine key data elements
- Establish data capture procedures
- Establish a system to detect "red flags"
- Conduct mock tracebacks
- Maintain a written record of the product tracing plan

A key step in being able to truly trace a product throughout a supply chain, which is not evident in the table above, is sharing data between trading partners.



Product Tracing Plan Considerations

When first developing a product tracing plan, the following questions should be considered:

1. What is the product I am tracing?
2. Does this product have ingredients that also need to be traced?
3. Are these ingredients identified by the manufacturer in a way that I can distinguish them (for example, by lot, case, etc.)?
4. Do I record this incoming information? If so, where and how? How can this information be readily accessed?
5. Do I rename or renumber ingredients to fit my internal systems? If so, is there a link between the manufacturer-supplied information and the information my company assigns to the ingredient?
6. Do I know what lot or case of ingredient goes into a specific product? How is that recorded?
7. Do I distinguish the finished product by lot?
8. Do I know exactly what lots of finished product are shipped to specific customers?
9. Is that lot number communicated to my customer?
10. Does my ingredient supplier ask himself the same questions I've asked about the manufacture of the ingredient?
11. Does my customer ask himself the same questions I've asked regarding how my product is used or re-distributed?

More About CTEs and KDEs

How Many KDEs Are Needed at Each CTE?

This is a good question for each company to ask itself. CTE data should be minimal for data transmission and storage efficiency as well as data security. The KDEs at a particular CTE will depend on the CTE. For example, at ingredient receiving, it would be appropriate to record things like the lot number, who the product was received from, date, etc. At the point where the ingredient was used to manufacture a finished product, then the KDEs would include the lot numbers of all ingredients used, the finished product lot number, and perhaps other data such as production date, line number, etc., which would depend on the ability of the KDEs to differentiate product in a way that enables accurate tracing.

Are There Any Tracking Events That Are Not Critical?

Most likely there are other tracking events for which data capture might be useful, but are not critical to tracing the product. Some have offered that there are aspects of palletizing and storage that might be tracking events where a firm might find it worthwhile to capture information related to those events for other business purposes.

Are There Any Data Elements That Are Not Key?

Sure. Food companies capture a lot of information related to products for reasons unrelated to product tracing. Other useful information—data elements—may also be collected and/or transferred during a CTE such as important environmental variables. These could be immediate observations, logs of observations or important predictive data calculated from measured values. Examples might be current temperature, temperature logs and/or prediction of remaining shelf life based on actual exposure to temperature.



Are There Standards for Expressing Key Data Elements?

Yes and no. Standards generally exist for the various key data elements; however, they are often not used. As described in *Product Tracing in Food Systems*, in some instances, there are a number of competing standards, which may defeat the purpose of having a standard. Some key data elements, such as lot number, seem to be very company-specific. Standardization will facilitate the eventual sharing of data between supply chain partners and standardization of KDEs, or at least some of them. This should be a goal.

Data Sharing and Electronic Systems

The idea of sharing data tends to make people nervous. There is fear that some data will wind up in a competitor's hands and that business may suffer. However, today we see businesses and industries suffer when a product cannot be traced (whether backward or forward) in an outbreak situation. Several models and commercially available systems exist to facilitate data sharing, and consensus on data sharing should be reached. IFT favors the use of unique identifiers that serve as pointers to secure back-end data. This operational philosophy has been deemed to be superior to another approach that would involve accumulating and storing data on products as they move through the supply chain (e.g., pedigree).

Ultimately, IFT recommended that supply chain partners be able to communicate key data elements for each of their identified critical tracking events within 24 hours, in an electronic format, to the requesting Agency.

For more information, including free access to the *Product Tracing in Food Systems* report and other product tracing resources, please visit www.ift.org/traceability.

About IFT

The Institute of Food Technologists (IFT) exists to advance the science of food. Our long-range vision is to ensure a safe and abundant food supply contributing to healthier people everywhere.

Founded in 1939, IFT is a nonprofit scientific society with individual members working in food science, food technology, and related professions in industry, academia, and government. IFT champions the use of sound science through knowledge sharing, education, and advocacy, and by encouraging the exchange of information, providing educational opportunities, and furthering the advancement of the profession. IFT has offices in Chicago, Illinois, and Washington, D.C. For more information, please visit ift.org.

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