

Traceability in Food & Beverages Industry



Wipro Technologies

Kasthuri Rengan.P, Associate Consultant
Mahish Kumar Lodha, Business Analyst



Synopsis

*Food & Beverages (F&B) industry is recently witnessing an increase in the frequency of product recalls and other food safety related threats. The reason behind these recalls could range from quality issues to bioterrorism. **Traceability** as a concept enables manufacturers to carry out these recalls.*

*There are various **drivers** that enable traceability in the F & B industry. These drivers include regulatory compliance, managing recall risks, meeting customer expectations & supply chain process improvements. Through this paper, we would be discussing two of these drivers in detail which are **Regulatory compliance and Supply Chain improvements**. Apart from the drivers mentioned above, the growing power of retailers is proving to be a major driver for traceability. We will be citing specific cases like Wal-Mart and Target through this paper.*

By embracing traceability, a manufacturer also benefits through unparalleled visibility of the inventory at various stages of the supply chain. Adding to inventory visibility, the manufacturer is able to establish a collaborative environment with all the entities in the chain. The need to encompass multiple entities requires capturing myriads of data through the system. This paper would talk in detail about the various entities, transactions details, associated data in the supply chain and corresponding process steps which connect them.

*Having discussed about the need & fitment of traceability in F&B industry, this paper would also talk about the technology that is required to implement traceability. Capturing data is one of the key aspects of traceability. There are various methods of capturing data ranging from manual data entry to bio-metric techniques to enable traceability. **Radio Frequency Identification (RFID)** is one of the popular technologies used to capture data to enable traceability. This paper aims to detail RFID in conjunction with Information Technology (IT) to achieve traceability. We also discuss two prevalent approaches which utilize RFID technology. They are (i) Enterprise wide traceability (ii) Global traceability through Collaboration. The paper provides an illustration of Leveraging RFID to achieve Traceability in a catch to consumer scenario This paper will illustrate the technology trends & business processes in the area of traceability for F&B industry.*

Key words: Traceability, Food & Beverage, ERP, Consumer goods, RFID, EPC, Recall,

Traceability in Food & Beverages Industry

November 2007: **Cargill Inc** recalled more than 1 million pounds of ground beef distributed in the United States because of possible *E. coli* contamination.

July 2007: **Nissin Foods (USA) Co., Inc.** issues allergy alert for cod and lobster in certain noodle products & announced a voluntary nationwide recall of selected products.

April 2007: **Nestle** voluntarily recalled its "Caramel Kit Kat Chunky" bars and "KitKat Cookie Dough Chocolate" bars due to some traces of hard plastic.

Feb 2007: **ConAgra Foods** recalled all Peter Pan and Great Value peanut butter beginning with product code 2111.

June 2006: **Cadbury-Schweppes** announced that there has been a salmonella scare in their products, causing millions of chocolate bars from stores across Ireland and the UK to be recalled.

Magazine March-April 2006: An estimated 2 percent of adults and 5 percent of infants and young children in the United States suffer from food allergies. (FDA Consumer)

Introduction to Traceability

According to the International Standards Organization (ISO) traceability is, "the ability to trace the history, application or location of an item or activity by means of recorded identification". Traceability involves the use of tracking and tracing systems and processes that match the attributes of incoming raw materials to outgoing product specifications for the purpose of improving business and/or

follow a food, feed, food producing animal or substance through all stages of production and distribution.

Traceability in F&B Industry

Recent alarming outbreak diseases like foot and mouth disease, mad cow disease and avian flu compounded by contamination recalls and bioterrorism are beating back strict newer legislation on food traceability. Traceability has

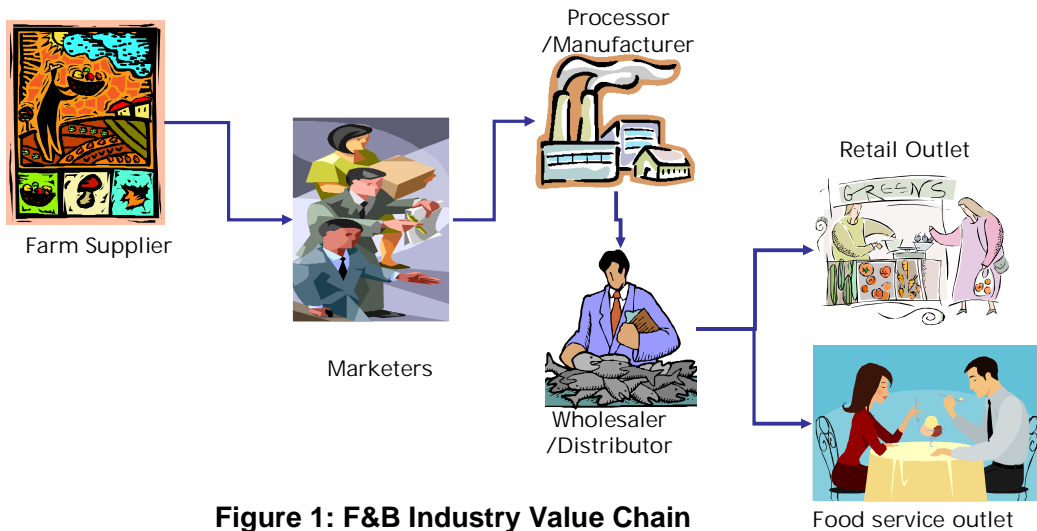


Figure 1: F&B Industry Value Chain

product performance. In the food chain, traceability means the ability to trace and

become a buzzword in the food industry. Consumer's demands for better and

higher quality and variety in the food business are growing exponentially. Stimulated by the recent food scares around the world, governments are enforcing the companies to adopt food traceability systems.

The F&B industry is on major move. The candidates list covers the entire spectrum ranging from Food services to large format retail chains. McDonald's the world's largest outlet for cooked meat recently mandating full traceability from suppliers and Wal-Mart, the world's largest retailer, mandating RFID on all incoming pallets and cases.

On the other side, there has been a lot of pressure from various governments to ensure that the industry adopts traceability. Root causes of the regulations towards food safety are:

- *BSE*

Commonly known as mad-cow disease, Bovine Spongiform Encephalopathy (BSE), infected 179,000 cattle and 4.4 million cattles were killed as a precaution in the UK alone in the initial days of its onset. In humans it appears in a modified form and is known to kill few hundreds of humans who consumed the same.

- *E-coli (Escherichia coli)*

The E.Coli outbreak in September and November 2006 left hundreds of spinach /spinach related products and Lettuce consumers in fatal ill health. This evoked various regulatory bodies (including US, Canada and Europe) not only avoid consuming Spinach from US but also recall all the spinach related products. Since the 2006 outbreaks, various legislative proposals have emerged which require stricter food production, processing and handling.

Industry participants were also compelled to take voluntary measures to improve food safety.

The following are the source details of any ingredient that would be of interest in Traceability systems:

- ✚ Farm
- ✚ Region
- ✚ Country of Origin
- ✚ Product and Geographic Branding

Traceability Drivers in F&B Industry

The main drivers that would be discussed through this paper are as follows:

- (i) Food Safety
- (ii) Regulatory Compliance
- (iii) Efficient Recall Management
- (iv) High Customer Expectations
- (v) Retail Mandates

(i) Food Safety

Concerns over safety of food consumed are one of the key drivers for traceability. This has gained importance with increased globalization leading to production shifting to low cost nations across the globe. Traceability has been mandated as a fall back measure to prevent contaminated food being consumed by executing a quick product recall. "Prevention is better than Cure" – enhanced measures to track food safety can avoid the situations leading to a product recall & thus the complex task of identifying batches to be recalled.

(ii) Regulatory compliance

One of the major drivers towards implementing traceability systems is Regulatory compliance. Sensing the risk involved in food contamination,

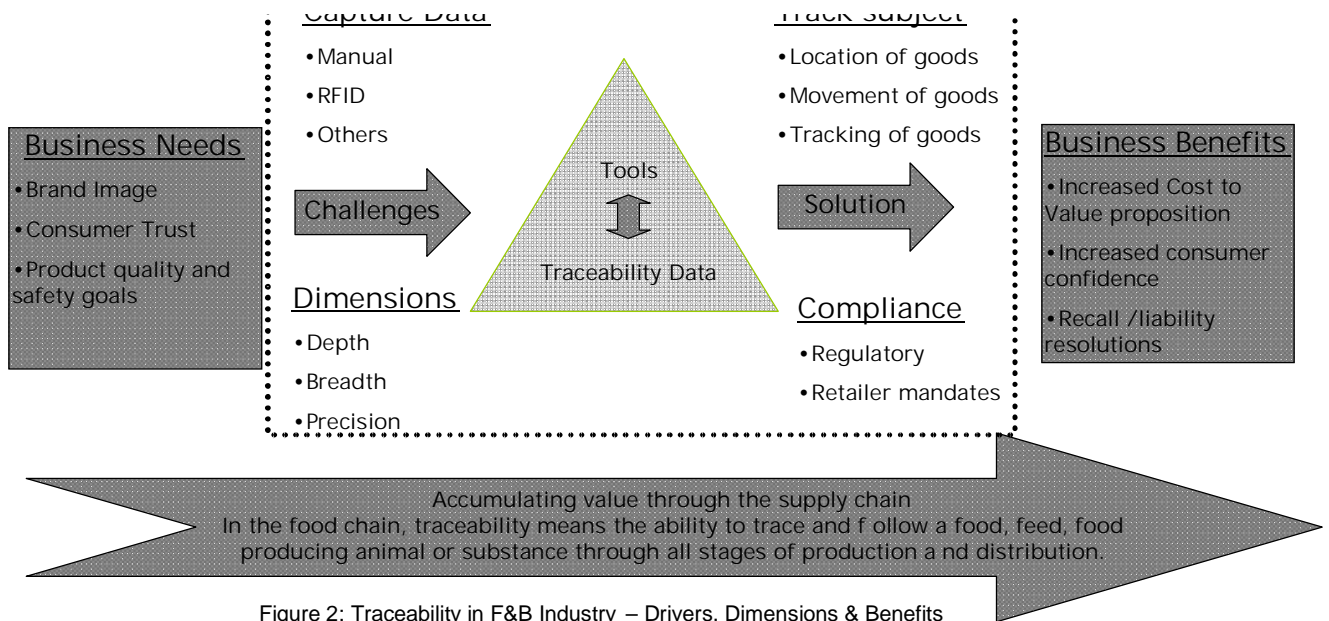


Figure 2: Traceability in F&B Industry – Drivers, Dimensions & Benefits

governments across the globe have (or in the process of having) strict laws that mandate Traceability.

- ✚ EU General food law 178/2002
- ✚ US bio terrorism Act laws
- ✚ USFDA Country Of Origin Labeling (COOL)
- ✚ Food Allergen Labeling and Consumer Protection Act (FALCPA)

(iii)Efficient Recall Management

In the unfortunate event of a recall, companies who have sophisticated traceability systems would be able to exactly locate the batches that could possibly contain the contaminated ingredient. Only those batches can be recalled thus minimizing the cost & inconvenience of recalls. Assuming a company that doesn't have a robust traceability in place, would end up recalling everything from the retailers. If the contamination is reported in one of the key basic ingredients that go into multiple products, then the manufacturer doesn't have an option but to recall all product ranges containing that ingredient. Financial implications of such a move are severe on the companies. Recalls also result in significant erosion of brand value due to

the reduced confidence among the consumers.

(iv)High Customer Expectations

In today's competitive world, customer expectations are soaring to new heights. In matters regarding food, customers are more demanding and would want manufacturers to guarantee food safety and at no additional cost. Quick recall through traceability systems would help in restoring customer confidence in the event of an outbreak. Though F&B companies have designed strict quality control measures to prevent contamination, they would need a fall back measure to ensure quick response in case of an emergency.

In short, high customer expectations act as a key driver for companies to adopt traceability as a fall back for product recalls.

(v) Retail mandates

Gone are the days when products in the market used to be supplier driven – this is a demand driven era. Retailers like Wal-Mart, Costco, Target, Best Buy etc. are driving the supply from the manufacturers and determine how products should be delivered at their warehouses /stores. Retailers are of the

view that identifying items by RFID tagging would be the first step towards traceability. Apart from enhancing traceability, RFID tags also helps retailers by facilitating automatic check-out & enhanced theft control.

The industry for once was spellbound when an announcement by CIO of Wal-Mart aired during June 11 2003 that their top 100 suppliers would be required to utilize the RFID tags on their cases and pallets by January 2005. Since then, there is no looking back on the traceability mandates using RFID enforced by the retailing giants. Wal-Mart gradually brought in more meat to this drive by making over 250 locations RFID enabled and later asking its top 200 suppliers to be RFID enabled by 2006 end. In fact Wal-Mart has matured to such an extent that its planning is in progress to evolve a traceability standards for the fresh foods industry.

If Wal-Mart is there, can Target, Albertsons (now acquired by Supervalu) and other retailers be far behind? Other leading retailers like Target, Albertsons have placed their say on the manufacturers on traceability compliance. After completing a year long testing of RFID with a small group of suppliers for case and pallet level tagging in Texas, Target is already considering implementing RFID for its imported goods after using RFID in its supply chain. These giants share about 100,000 suppliers on whom these mandates have been enforced making this as a big initiative. This is aimed at cost reduction and improved customer service but there are improvements to traceability expected as well. All these

initiatives seem only a precursor of item level tagging.

Supply Chain Benefits

Apart from the drivers mentioned above, having a full fledged traceability system also has various benefits for the consumer goods industry especially in the area of Supply chain management. A few of them are listed below:

a) Inventory Visibility

By way of tracking the inventory lots that traverse through the chain, the companies also get a better visibility of inventory across the chain. Through better visibility, companies will be able to do their plan their supply chain better.

b) Efficient Batch Sizes enforced by traceability

Lot sizing has always been a topic for research in the area of operations management. There are various theories on how do we optimize the batch size based on various factors like holding cost, FTL discounts (Full Truck Load), production batch size, ordering costs etc. After the advent of traceability, a new dimension has been added to this problem that could potentially dictate the batch sizes. The limitation being that every lot that is from a supplier needs to

be identified with the corresponding downstream lots in the chain. Companies need to trace forward all the lots that were made from the specific inbound lot from a supplier (which was probably contaminated).

Thus traceability has added more constraints to the already complex logic of determining the optimum batch size. Thus, the scientifically derived batch sizes (with traceability constraints) would go a long way in streamlining the logistics operations.

c) Improved Logistics efficiency – better shipping & receiving

Logistics cost incurred by the company not only includes the cost of transporting goods, but also the costs associated with packaging, warehousing and handling. Traceability streamlines the whole process of warehousing through pre-fixed lot sizes. Eliminates ad-hoc or random ways of storage & enforces systematic way of warehousing goods. Thus, streamlining also helps in better utilization of warehousing assets.

Traceability process Steps and supporting Technologies

Establishing traceability is a three step process: They are:

Step 1: Unique Identification in the value Chain

Step 2: Data Capture & Recording

Step 3: Establishing Links

Step 1: Unique Identification in the value Chain

Any object that goes into production of a consumable finished product needs to be identified & tracked at all points in the supply chain.

The depiction adapted from the industry standard SCOR (**Supply-Chain Operations Reference**) model for supply-chain management explains the interaction points between various entities starting from supplier's supplier right up to the final consumer (refer next page). Between two levels, entities perform standard operations of sourcing, making and delivering.

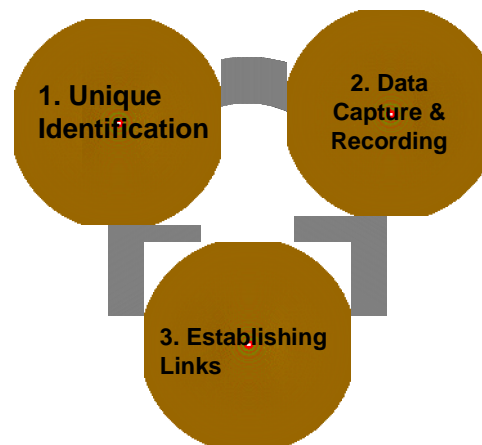


Figure 3: Traceability Process Steps

One-up & One-down traceability is one of the typical regulatory requirements in most of the countries. Every entity in the chain should keep track of the upstream source of their materials and the consumption point down-stream. To comply with the one-up traceability, a manufacturer who uses sugar as one of the ingredients should keep track of the supplier from whom he sourced sugar & the production batch that consumed sugar. To comply with the one-down traceability requirement, he needs to keep track of the supplies of FG that were sent to distributor warehouse. Extending the same to all partners in the chain, we achieve full value traceability.

The foundation of traceability lies in identifying every object uniquely across the chain. As there are a lot of players involved in getting the products to the final consumer, and each of them have their own priorities. In most cases, the onus is on the F&B companies to enforce standard identifiers for the

products and in some cases, it could also be due to Retail mandate.

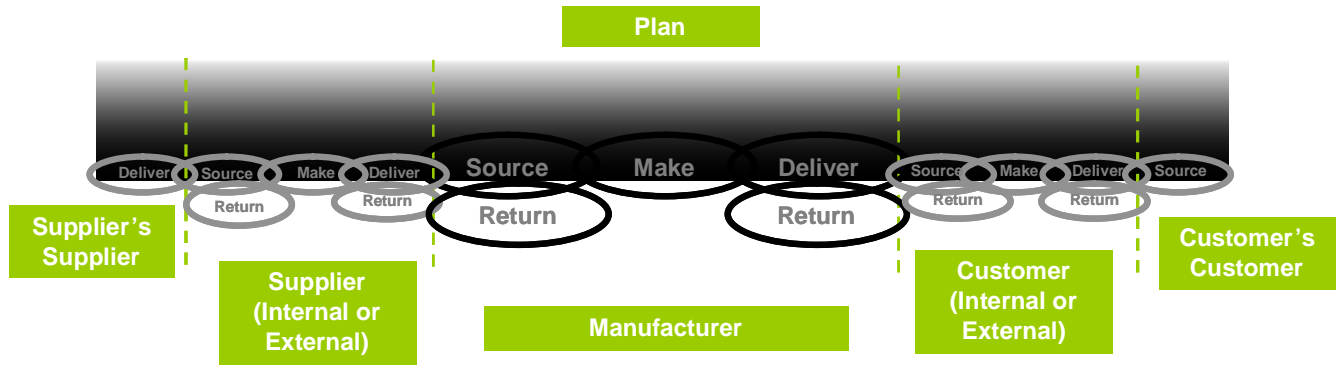


Figure 4: SCOR - Process Reference Model for Supply-Chain Management

Why do CPG companies find it difficult to manage product codes?

1. Complex IT architecture

A. Specialized IT solutions to meet growing needs: The F&B industry is witnessing an exponential growth in the product categories. Growing product offerings and managing the categories is not an easy task. Companies have started to realize that implementing an ERP solution cannot solve all the problems. To handle the growing business complexity, IT service providers have started to offer specialized solutions resulting in plethora of IT applications to be maintained. A lot of applications have thus evolved in the recent past to handle specific white spaces that were not handled by ERP. This has resulted in a complex IT architecture with too many functional application silos at various levels each having their own way of identifying/interpreting product codes.

B. Frequent Mergers & Acquisitions: In today's competitive world, only the bigger & better ones can survive. In order to gain quick economies of scale, companies tend to take the in-organic path to growth. As more & more companies consolidate by mergers & acquisitions, the biggest task ahead is the integrating and re-wiring of their IT applications. This results in myriad of IT applications each having their own way of storing data.

2. Power at downstream

As retailers & distributors grow bigger, they tend to impose their internal product codes onto manufacturers; there are additional overheads involved in translation these codes to enterprise wide products codes recognized by legacy/ERP applications. Moreover, as distributors need to feed sales data to multiple CPG companies, it is impossible for them to maintain mappings of product codes of every vendor. Therefore, CPG manufacturer has to carry out the cumbersome task of mapping Distributor's product codes to his own codes.

How do we solve this problem?

All players can migrate to industry standard product codes like EPC which is explained in detail in the later part of this paper.

CPG companies are realizing the need to harmonize numbering & identification scheme by using global & industry standard product codes that would help in the following ways:

1. Within the company, across various business divisions, there is uniformity in the way a product is identified. Thus, data flows across applications seamlessly.

2. Seamless flow of transactional data through the supply chain as suppliers, manufacturers, distributors & retailers use the same notation to refer products.

The **Electronic Product Code (EPC)**, is a family of coding schemes designed to meet the needs of various industries, while guaranteeing uniqueness for all EPC-compliant tags. EPC tags were

designed to identify each item manufactured. An important point is that the data required in the EPC tag is based on EAN.UCC GTIN (Global Trade Item Number) or SSCC (Serial Shipment Container Code) which are the codes contained in bar codes on shipping labels.

Step 2: Data Capture & Recording

The overall scope of traceability should be to capture enough data to have a full genealogy on parts and processes of the organization. The amount of data that the organizational systems can rake in will define the granularity to which they can get down to nail a casualty's root cause.

At a high level, the flow in a food supply chain is Supplier -> Manufacturer -> Distribution centre -> Wholesaler/distributor -> Retailer -> Consumer. Major entities of a food supply chain from a data capturing (using RFID tags) perspective are Manufacturer, Distributor and Retailer. Broadly, the roles of each of the entities are:

Manufacturer: The manufacturer creates an initial catalog based on his requirements for tagging the raw material/ingredient. *Catalog is a secure file that stores data about each move a product makes through the food supply chain.* Catalogs can help reduce counterfeiting of food and other products. The manufacturer then tags the raw material /ingredients procured from the supplier.

Distributor: The distributor confirms on the shipments received using the catalog sent along with an Advance Shipment Notice (ASN) by the manufacturer.

Retailer: Retailer confirms the shipment received using the catalog sent by the distributor.

In today's scenario, there are a good number of methods available to capture data. Starting from conventional methods of capturing data manually to automated methods to pull/push models of data capturing exists. The various methods of capturing data include:

- Manual tracking
- HMI /SCADA
- Electronic Identification
- Bar Codes
- RFID

Radio Frequency Identification (RFID) is one of the most popular and leading technologies used to capture data to enable traceability. Hence this paper would aim to detail RFID in conjunction with Information Technology (IT) to achieve traceability.

Typically in the F&B Industry, the items are tagged at an individual level at an early stage in the food supply chain starting from the food processing unit. Subsequently the items are packed and labeled to comply with labeling requirements. After initial packing, cases are formed into pallets and pallet tags are attached. The manufacturers are responsible for creating an initial catalog and shipping catalog at this phase. These catalogs hold information (not restricted to) on the product, item and transaction.

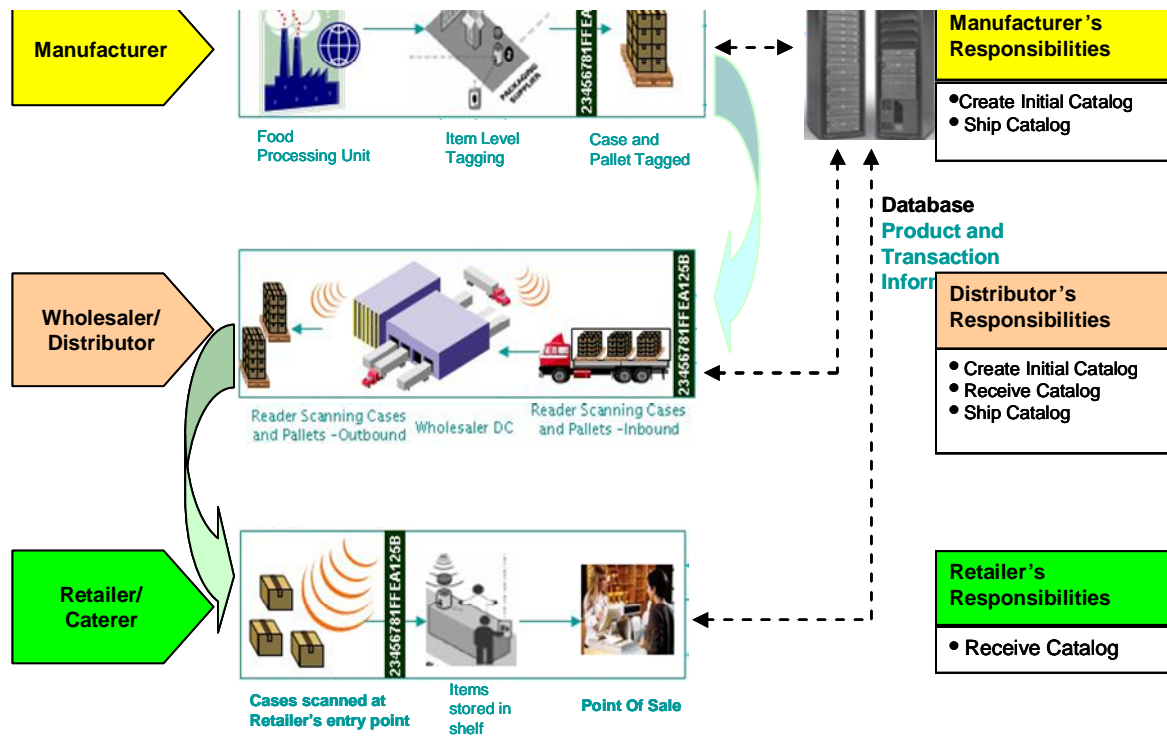


Figure 5: Capturing Traceability Data among Business Partners

Later, the item passes through other hands such as wholesalers and distributors before reaching the final point of consumer sale. When the items reach the wholesalers the RFID tags are read by the reader, thereby identifying the shipments. An automatic data collection system converts the information received from the reader through the EPCIS (Electronic Product Code Information Service) database and identifies each part of the data. The distributor is responsible for shipping and receiving the catalogs. Wholesalers sell these items to a whole range of retailers and caterers. Processes similar to that of distributor point is followed and the cases are scanned at the retailer's entry point and the items are stored in shelf.

Capturing other attributes:

We all know that traceability can help achieve trace and track a product throughout the supply chain. But traceability can bring in more benefits than that of the traditionally spoken

ones. If cultivated effectively, traceability can help synergize the existing systems to yield more information across the breadth of the chain. The breadth could include anywhere from locating the product to identifying the conditions in which it is maintained. Not only coordinate attributes but also other attributes such as temperatures, humidity, and transporting environment can be tracked closely to ensure that the products reach in the best of its state.

RFID enabled temperature sensors

RFID can be combined with temperature monitoring devices to allow full visibility of a product's life cycle through the cold chain in real time. For some food items like meat, it is necessary that the optimal temperature level is maintained throughout the supply chain to sustain the food in a consumable state. Using temperature tag, one can handle this scenario. Temperature enabled RFID tags can record and keep track of the temperature,

finally helping us validate if the food is good for consumption.

Step 3: Establishing Links

The technical impact of traceability becomes obvious as the system links all the information that is captured throughout the supply chain. The tagging

above provides a simplistic illustration of capturing traceability related data & linking them to trace backwards.

1. Recipe (or BOM) information is generally maintained in the ERP system which identifies the items required to produce a finished good. If Recipe information is too complex

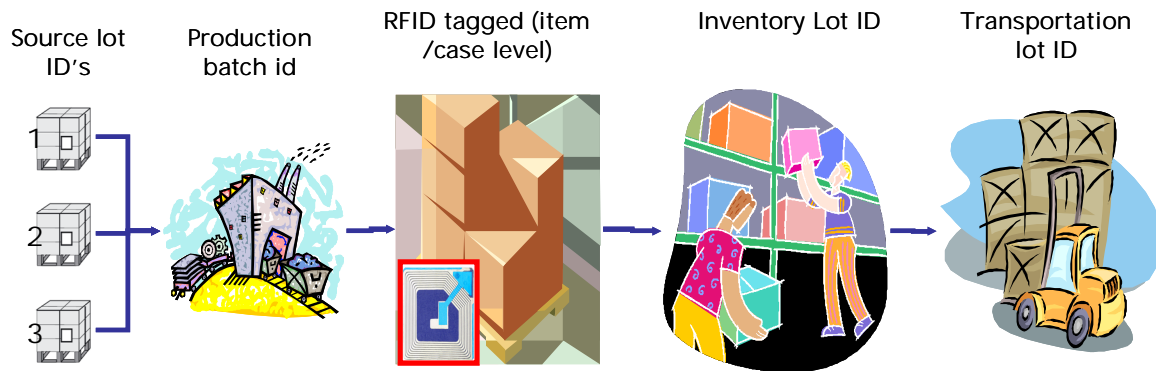


Figure 6: Illustration explaining the links for establishing Enterprise-wide traceability

or naming could be a typical system generated number /sequence. All the tagging numbers will hold one or more key values that can be directly mapped to the numbers generated in the previous link in the chain, providing us with a mechanism to trace upstream or downstream in the chain. A deeper system will enable the establishment of links among more agents further up or down a supply chain.

Role of ERP in establishing links for Enterprise-wide traceability

ERP systems cut across various departments of the company like Finance, Accounts, Operations, Sales & HR and provides single view of the enterprise. As ERP acts as the single point of data across the enterprise, they are best suited for capturing and maintaining data related traceability. Hence, ERP systems act as an one-stop shop for data that enables forward & backward traceability. The picture given

for ERP to handle, the hierarchy can be stored in a specialized application to meet the specific needs of that industry.

2. ERP also maintains the supplier details for all recipe elements. MRP releases the expected delivery schedules of each item to the suppliers. Once supplier delivers the items, a lot ID is generated.
3. Multiple lots from a supplier can be stored in a warehouse. A lot ID is generated at this point which identifies a particular batch from the supplier.
4. The production process consumes this inventory. Every batch of finished good is allotted a production batch ID. There are variations of how this ID is generated depending on the type of production. Continuous processing would rely more on exact time of manufacturing to trace back the lot IDs that went into production. Batch processing is

simpler as the link can be established even by a running number with dates embedded in them. ERP systems (Shop floor module) can generate the production batch IDs.

5. The finished goods are then packaged and stored in the form of cases / pallets. Inventory lot ID is generated at this point by the ERP (warehouse module) when these cases are stored in the warehouse for dispatch at a later time.
6. Multiple lot IDs can form a truck that is dispatched to the distributor /

Retailer. A Transportation lot ID is generated for every shipment made. The ownership of this ID is based on who is transporting (Co-packer, 4PL, 3PL etc.,). If the company employs 4PLs for logistics services, then 4PL can generate these IDs for the manufacturer.

This ERP illustration explains how items are linked for traceability within the company. Now, how do we achieve traceability across between, suppliers, co-packers, distributors and retailers?

Traceability using Legacy applications

Companies who are yet to jump onto ERP bandwagon don't have an option but to continue to use existing legacy applications to capture data related to traceability. We should note that these legacy applications were developed to address a specific functionality and not with traceability in mind. Moreover, these applications have their own way of storing data in a local database. As illustrated earlier, establishing links between various lot IDs is cumbersome & requires extensive re-wiring of legacy applications. Bigger companies who have larger IT budgets either implement ERP or tweak their legacy applications to comply with traceability norms. Traceability requirements are seen as an up-hill task especially for Small & Medium Enterprises who do not perceive financial benefits.

How can legacy applications modified to enable traceability?

When it comes to traceability across the supply chain, it requires usage of global coding schemes to linking of identification across the chain. Hence, companies with legacy applications will have to modify the interfaces between these applications to maintain the mapping between their product codes and industry standard codes.

Enterprise-wide Traceability utilizing RFID technology & EPCGlobal Standards

What is RFID & how does it work?

RFID is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. RFID uses radio waves to automatically identify

people or objects. The most common method of identification is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna. The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it.

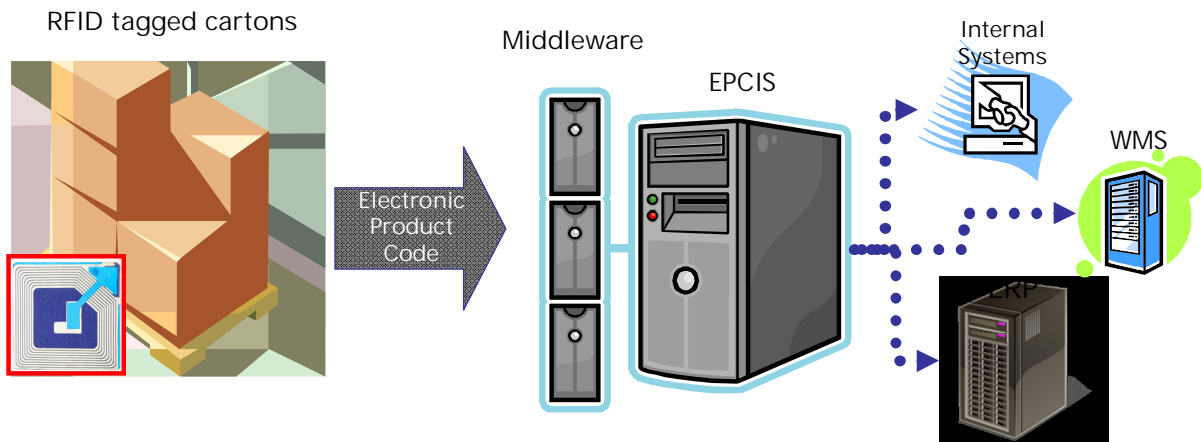


Figure 7: Enterprise-wide Traceability utilizing RFID technology & EPC Standards

The data about an entity that RFID tags carry should be unique so as to identify the individual entities (could be pallet or unit or carton etc.) uniquely and help locate the same without much hassles. The best way to achieve this is through unique numbering scheme like Electronic Product Code (EPC).

The **EPC** presents a unique numbering scheme that can be assigned to individual items in cases /pallets within the supply chain for identification and tracking.

The **EPCGlobal Network** envisions a system that leverages the Internet infrastructure to create a low-cost, set of services based on standards for trading partners to use RFID and the EPC to capture and share information on items throughout the supply chain.

Traceability using EPCGlobal:

Working in conjunction, the above components provide the ability to capture, store and share information in the EPCglobal Network. To capture

data, the RFID tags carrying a unique EPC number are affixed to objects in motion in the supply chain. The EPC readers at gateways throughout the supply chain will read each tagged object as it passes and communicate the EPC number, the time, date and location of the read to the EPCglobal Network.

EPC Middleware will control and integrate the EPC tags, readers, and local infrastructure at the individual site. EPC Middleware manages real-time read events and information, provides alerts, and manages the basic read information for communication to EPC Information Services (EPC IS) and a company's other existing information systems.

Once the information is captured, the EPCglobal Network then uses the Internet technology to create a network for sharing the captured information among authorized trading partners in the global supply chain. Discovery Services enable users to find data related to a specific EPC and to request access to that data. Actual access to the data in the Network is managed locally by the EPCIS. EPCIS enables users to exchange EPC-related data with trading partners through the EPCglobal

Network. Here the company designates which trading partners will have access to its information. The outcome results in a network that helps tracking real time product movements.

Global traceability through Collaboration


In today's world where collaboration supersedes competition, manufacturers and other parties in the supply chain have started to realize the fact and are coming closer to integrate their information systems that help drive the business.

Traceability can go beyond the traditional synonym to redefine what can be termed as 'collaborative traceability' – encapsulating and bringing all the supply chain traders closer. The benefits that can be reaped are immense. Starting from collaborated tracking of suppliers' supplier (like procurement of feeds for the fishes cultivated, fertilizers used for farm yields) to distributor's retailer, all the traders can be looped in for better visibility and the flow of the product throughout the supply chain.

To achieve this, the manufacturers can leverage a third party subscription based solution that will sit atop all the players' information systems and interact with

every other authorized candidate in the network.

This solution will be capable of interacting with all the interested traders in the supply chain providing an end-to-end eye on the product and its associated attributes of our interest. They will be able provide a user interface for the participating traders using which the individual traders can perform their business operations with respect to traceability. The operations can be of varied nature. The operations include logging of received product and its related information, tracking the product of its location and various stage gates etc. Mutually agreeing, Manufacturer also can define the level of transparency that each participating trader holds in the supply chain. This will help the manufacturer (the host of the network) to get an end-to-end picture providing only relevant information to the other traders in the network. The following will become the key components of collaborative traceability.

 **Technology used:** Any Third party traceability solution (like Trace tracker, AginfoLink etc.)

 **Elements in the Network**

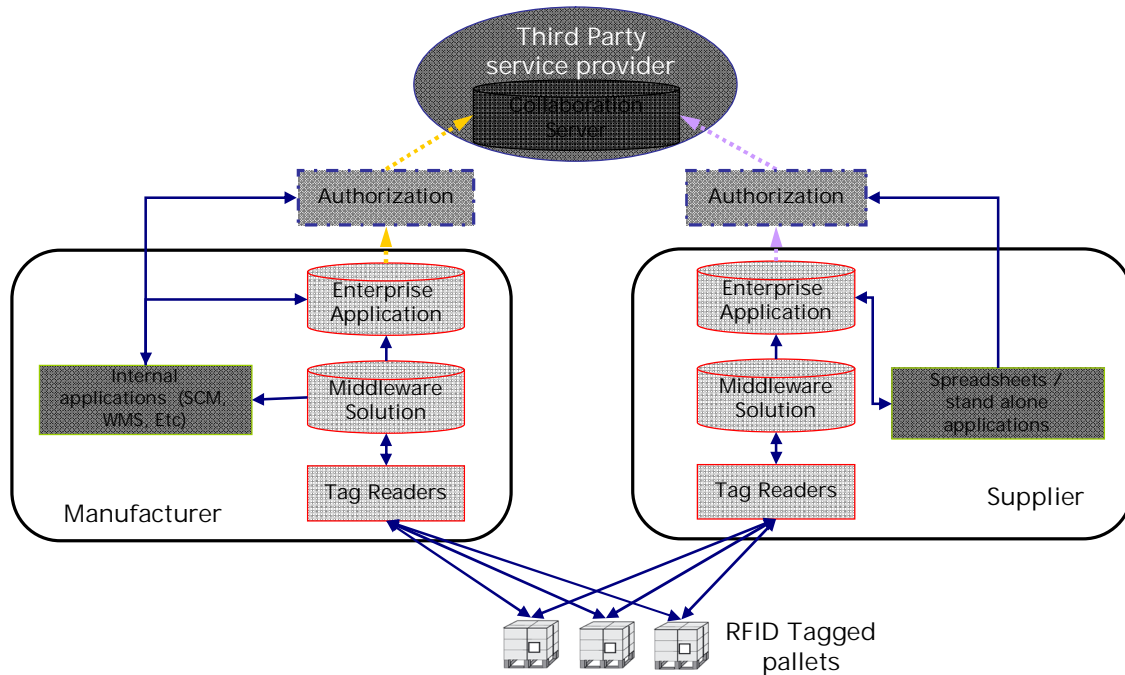


Figure 8: Global traceability through Collaboration – IT systems view

1. Traceable entities identification – Traceable Unit Link information
2. Property information such as product attributes, process history, etc.

relationship between them is defined within the solution for further mapping inside the traceability model.

Traceability using third party traceability solution:

Establishing a traceability network starts by surveying the actual product of interest and the information flow throughout the supply chain. This helps in defining the traceability model to help the solution understand our problem statement and how we want to establish the traceability chain. The process definition involves identifying information that holds prime importance from the traceability stand point. The information could be anywhere from the physical location of the product to number of units in a pallet to temperature of the product. Similarly the traceable entities are identified and the

Once the initial definition is found to encompass the traceability objective, internal chains are built identifying the various systems participating in the process. These systems would help identify the motion of the traceable objects from one location to another. The organization's entities are mapped together using a subscription based third party solution which helps establish external traceability. The above process is extrapolated to form global traceability with external trading partners identified.

The network, thus established includes all traders in the value chain including the suppliers' supplier and vendor's vendor – giving an end to end trace and track ability of the product.

Illustration:

Leveraging RFID to achieve Traceability in a catch to consumer scenario

Let us look in greater depth on how an RFID implementation in the lifecycle of a fish in a “catch to consumer” scenario will provide the complete traceability. The lifecycle chain in a catch to consumer scenario flows as: *Catch from fisherman -> Collection center -> Fish processing center -> Distribution center -> Retailer -> Consumer.*

In this scenario, all traceable entities like fish containers, processed food, canned food, etc., are tagged using RFID tags. For the ease of understanding we shall restrict the level of traceability just to the containers.

1. Tagging the container at the receiving end

When the catch is acquired from the fisherman, it is usually collected in a container. At the receiving end the container is tagged with Serial Shipment Container Code (SSCC) in the Electronic Product Code (EPC) format which is mapped against details pertaining to the catch (say) supplier name, species of the catch, unique serial number of the container etc. These supplier end details are mapped against an EPC. It is designed to meet the needs of various industries, while guaranteeing uniqueness for all EPC-compliant tags.

2. Shipping with temperature sensors and ASN to the processing centers

Once the container is tagged and shipped, an Advance Shipment Notice (ASN) is sent to the processing center containing the SSCC number of the

container to be shipped to the processing center.

- Considering perishability of the fish, it is necessary that optimal temperature is maintained during the transit or processing. RFID tags with temperature sensors serve the purpose. Once the reader reads the tag, the temperature of the tag attached to the container item is also transmitted; thus enabling the companies to track and preserve the shelf life of the catch.

3. Validating the received containers

At the processing center, verification of the container shipments are performed by validating the EPCs of the container tags against the received ASN. This way it helps the processing plants improve accuracy and ensuring the catch coming to the plants are up to the company’s standards.

4. Tagging the processed fish food

Down the process chain, after processing the catch in the processing center they are canned or packed for consumption. These cans or packs are now tagged with another RFID tag with SSCC which carries a unique EPC number. The tags are mapped against the EPC number of the container that carried the unprocessed catch in to the processing centers. Alternatively the EPC number is mapped against the shipment details as well.

5. Shipping and ASN to the distribution Centers

These canned fishes are sent to the Distribution Centers (DC) against their purchase order. ASN is also sent to the DC. Using the ASN as the base, automatic shipping verification takes

place at the DC. Yet another check on the accuracy of goods received as in the above step 3. The received goods are stocked at the DC's storage area.

6. *Final Destination*

Finally the products are sent to the retail store based on the retailer's orders. As these cans are tagged already, the need for tracing becomes easy throughout the lifecycle.

Closing Comments

Through this paper, we have provided real life illustrations for product identification, data capturing & linking as applicable in the F&B industry. We have also given key insights on practical problems faced by the industry today in maintaining legacy applications to enable traceability and ways to solve the complexity involved with product codes.

We have discussed in detail the use of RFID in achieving enterprise-wide traceability & also suggested utilizing the services of third party subscription service providers to establish a collaborative traceability platform.

As evident from the discussions above, the F&B industry is in the midst of series of recalls. In addition to focusing on removing costs and improving supply chain efficiencies, the industry is trying to figure out ways to handle the crisis & regain customer confidence on their brands. Traceability definitely plays a major role in the organization's objective to improvise on business operations Apart from the traditionally known benefits of traceability; we have also discussed the supply chain benefits that can be derived out of traceability.

Reference:

-  <http://www.epcglobalinc.org>
-  <http://www.tracetracker.com/>
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About the Authors:

Kasthuri Rengan, Associate Consultant at Wipro Technologies has 4 years of IT experience with leading CPG companies in HPC, F&B and AFS Industry segments in India and the US. His specific areas of interest are Trade Promotions Management and Advanced Planning & Scheduling.

Mahishkumar Lodha, Business Analyst at Wipro Technologies has over 4 yrs of IT experience including functional consulting with leading CPG (F&B), Retail and Distribution companies in the US and Europe. His specific areas of interest are Traceability, Manufacturing and Point-of-Sale (PoS).

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