IDC WHITE PAPER

End-to-End Traceability in Food & Beverage: From Regulatory Compliance to Competitive Differentiation

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Section 1: Why Traceability Matters Today

Why the urgency? In a time of accelerated disruption fueled by global events and challenges such as trade wars, environmental changes, epidemics, trade across borders and ever-changing and increasing regulatory pressures, to name but a few, global manufacturing supply chains face unprecedented pressures. Nobody understands this better than food & beverage manufacturers that already must master fulfilling high customer expectations in terms of product quality and compliance with regulations while keeping prices competitive. On top of that, they are dealing with the complexity that their end-to-end supply chain brings, entailing shipping and storing perishable goods within strict temperature parameters, and information requirements about the origin and ingredients of products.

According to IDC's latest supply chain survey, 64% of brand-oriented manufacturers admit that the lack of supply chain visibility and flexibility will cause major issues in the future if not addressed appropriately, and 46% of brand-oriented companies reported that supply chain visibility is a focus from a supply chain risk management perspective (compared to only 30% in 2018). Our research also shows that the vast majority (96%) of food & beverage companies will focus on improving their visibility, with 51% particularly concentrating their efforts on the end-to-end supply chain.

AT A GLANCE

KEY STATS

Recognizing the risk, 96% of food & beverage companies focus on improving their visibility, with 56% particularly concentrating their efforts on the end-to-end supply chain.

56% of manufacturers still have manual processes for traceability, and 18% do not have it at all in a formalized way.

KEY TAKEAWAYS

Consider moving from a reactive (regulatory-driven) to a proactive (value-add) approach, which requires appropriate digital technology investments.

Food & beverage manufacturers that have a higher commitment to traceability and invest in it in an active way, can reap the full scale of compound benefits that traceability can generate.

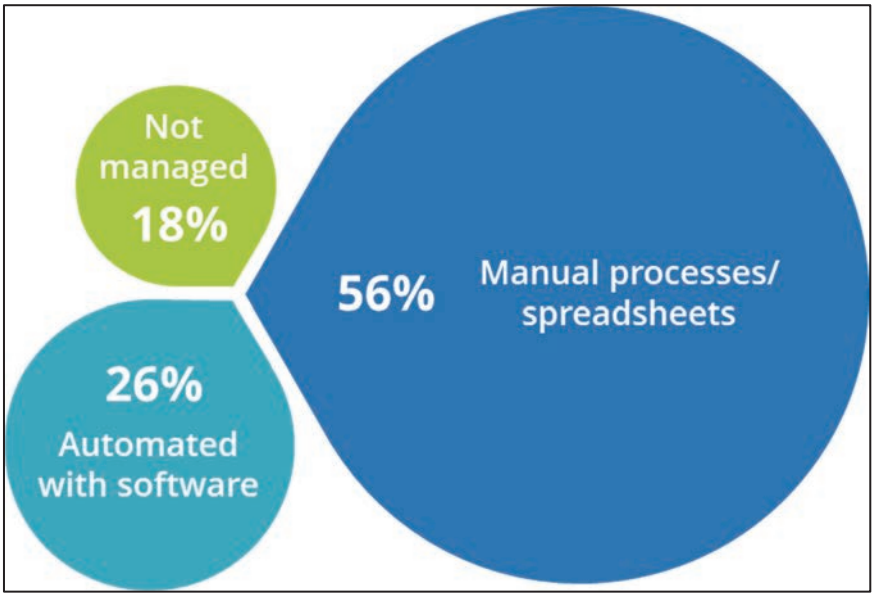
In this challenging environment, traceability is not just a matter of mere regulatory compliance but is gradually becoming an enabler of competitive differentiation. While the industry used to simply react to events, today's food & beverage industry must demonstrate an increased focus on preventing problems before they even arise.

However, the reality is that 56% of food & beverage manufacturers still have manual processes for traceability, and 18% do not have it at all in a formalized way. This is higher than in other industries, but the food & beverage industry still has some catching up to do when it comes to driving traceability. This IDC study mostly features medium to large-sized organizations, but also observes that better traceability does not relate to company size. In other words, larger organizations are not necessarily better at traceability.

FIGURE 1

Approach to traceability in manufacturing

Q. Which of the following strategies does your organization leverage or plan to leverage for traceability?

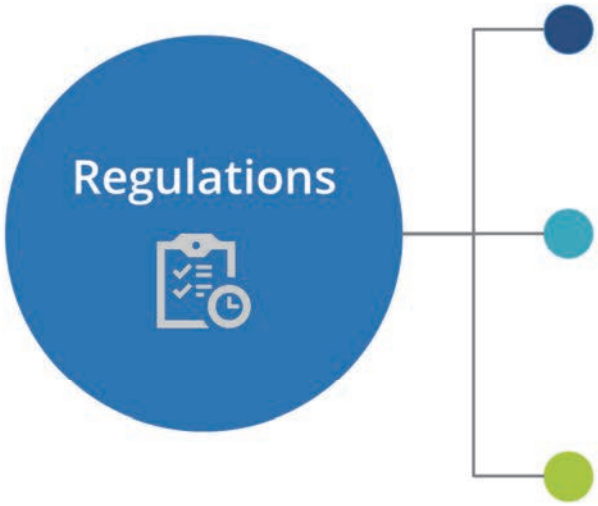


Source: Industrial EH&S Survey, IDC, June 2020, Brand-oriented value chains (a large proportion of which include food & beverage manufacturers) N=44

Regulations. It is no surprise that, as highlighted repeatedly by IDC research, the acceleration of compliance ranks among the top 5 strategic initiatives of food & beverage makers worldwide, given the various traceability regulations the sector is facing (see Figure 2).

FIGURE 2

Traceability regulations across the world



US The Food and Drug Administration's *Food Safety Modernization Act* regulates the way foods are grown, harvested, and processed, and includes mandatory recall authority. The law was prompted after many reported incidents of foodborne illnesses during the first decade of the 2000s. Recently, the FDA started investing in technologies such as blockchain, IoT, and artificial intelligence to create a more digital and safer system to help support its traceability efforts for the wider public.

Europe Traceability is currently regulated by the *General Food Law*. In particular, Article 18 requires food business operators to keep records of food, food substances, and food-producing animals supplied to their business as well as other businesses to which their products have been supplied.

Businesses may also choose to comply with non-mandatory private standards, such as the *Global Food Safety Initiative* (GFSI), the *Safe Quality Food* (SQF) *Program*, the *International Featured Standards* (IFS) or *Red Tractor*, the UK's largest food standards scheme, to name but a few.

Asia/Pacific In 2019, China's State Council published the Regulation on the Implementation of the *Food Safety Law*, outlining rules for food surveillance, food safety standards and inspection, food import & export. The regulation contains a definition for "recovered food" which includes food recalled due to violation of the law, but excludes food continued for sale after the correction of labelling defects.

Japan carries out food safety work under the *Food Safety Basic Law*.

Food Standards Australia/New Zealand is responsible for developing food standards for Australia and New Zealand, respectively.

Source: IDC analysis

While compliance with regulations is important to food & beverage manufacturers to keep executives "out of jail," there are limitations to this approach. It's just a bare minimum to be compliant, and it doesn't add business value per se. But even greater is the fear of the costs associated with food contamination and product recalls, which in some cases can be the biggest threat to profitability yet. A recall incident can cost a food & beverage manufacturer and its associated retailers millions in direct costs and huge damages to brand value. Considering this cost aspect alone is motivation enough to have detailed visibility across processes along the value chain to be able to limit any recalls to just those truly impacted products, batches, or lot size(s). Alarmingly, the Food Standards Agency (FSA) reported a 36% increase in allergy and food alerts across the UK in 2019, a trend that is indicative of a wider global development.

Meeting consumer expectations. Traceability is more than just a capability for quality and recall readiness. It also meets consumer demand for more information. Consumers today are much more knowledgeable and demanding about the foods they purchase. A report released from the Food Marketing Institute (FMI) and Label Insight in 2018 revealed that grocery shoppers exhibit loyalty to those products that create deeper relationships through information exchange. In fact, shoppers increasingly demand transparency and a closer connection to their food, so much so that 75% are more likely to switch to a brand that provides more in-depth product information, beyond what is already provided on the physical label. The latest study, released in 2020, highlights that 81% of shoppers see transparency as either important or extremely important both online and in-store.

Traceability is more than just a capability for quality and recall readiness. It also meets consumer demand for more information.

The increased focus on food safety and consumer awareness requires producers to trace backward in the supply chain to inform consumers where a raw material comes from (what farm a chicken was raised on, what field a head of lettuce was grown on, etc.). The rapidly changing nature of what consumers want — including full transparency, or the ability to provide a full history download of a product — may for some food & beverage companies be the worst nightmare, but for others the greatest opportunity. Successful food & beverage producers must be prepared to forecast and meet these fast-changing requirements on demand.

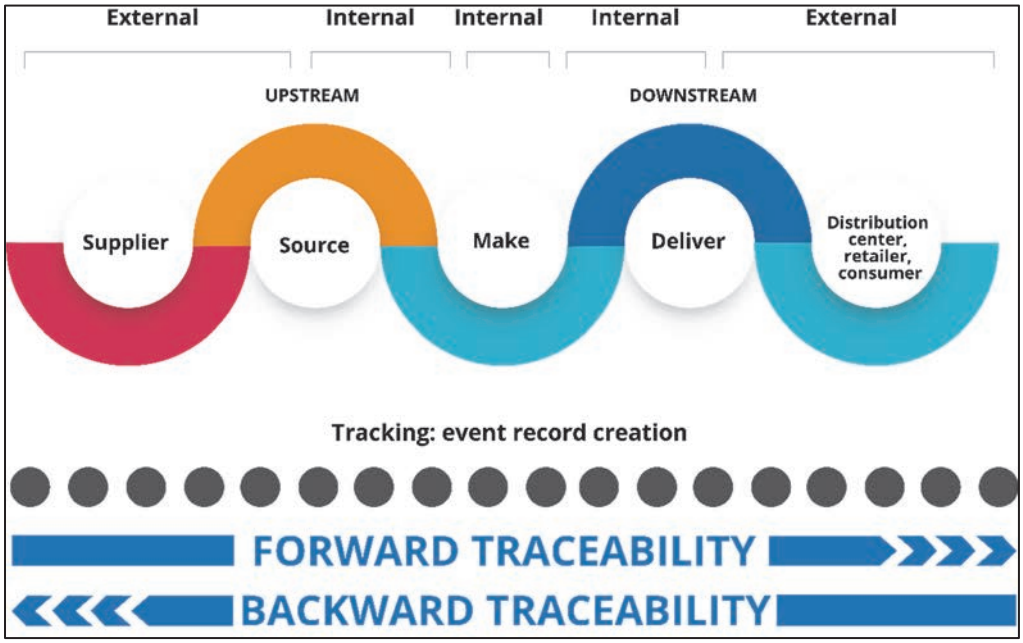
What traceability entails. Traceability is the process that provides the identification of all relevant data (and data relationships) for the materials used in the production and distribution of finished products. Traceability is composed of two essential steps: tracking and tracing.

- Tracking: creating/logging events at a granular level
- Tracing: retrieving information leveraging the tracking log

Good traceability is only possible if 1) enough tracking information is available and 2) systems covering different process steps are connected and integrated ("talking to each other").

Traceability can apply to the entire supply chain of a company, from the upstream section that focuses on tracking the receipt and intake of raw materials to manufacturing processes, then downstream as finished goods are distributed to their final destinations (Figure 3).

FIGURE 3
Traceability explained



Source: IDC Manufacturing Insights

IDC also distinguishes between external and internal traceability:

- **Supply chain or external traceability**. This involves companies' interaction with partners, including providers of raw materials, transportation carriers, and retailers. The type of data being collected at each point along the chain and how that data is being shared are central aspects of external traceability.
- **Manufacturing plant and warehouse or internal traceability.** This refers to the systems to track and record the movements of raw materials through the various processes that result in finished goods and the procedures companies have in place to trace their genealogy should the need arise.

It is very important that food & beverage manufacturers practice both external and internal traceability.

It is very important that food & beverage manufacturers practice both external and internal traceability even though existing regulations tend to focus mostly on external traceability to quickly isolate any suspect products.

Forward and backward traceability: Forward traceability is a manufacturer's ability to identify by lot or serial number all finished goods produced from any one batch or lot of raw material. This includes defining which final customer has these individual lots. Backward traceability refers to the manufacturer's ability to trace which ingredients/raw materials were used to produce a specific product and establish the purposes for which the remainder of those ingredients were used.

Quality and traceability: Although quality and traceability are two distinct disciplines, they have a mutual relationship. From one end, traceability directly improves overall quality. At the other

end, advanced quality management practices provide the granularity of information that a company can use to improve its traceability practices.

Operational Excellence: As a byproduct of most internal traceability projects, companies achieve better knowledge of their processes, and this opens further process optimization opportunities. In reality, traceability, good manufacturing practices, and operational excellence are all connected. A disciplined and well-organized production process makes traceability easy to implement. Vice versa, a clear model of the material flow and operational activities — traceability, in a word — is the basis of a well-managed manufacturing environment.

Retailers at the front line of impact. The importance of traceability is also increasing for retailers, and in some cases even becoming a requirement. According to IDC's Worldwide Retail Innovation Survey, 55% of food stores globally report that increasing customer trust (including supply chain transparency and goods quality) is now a major driver of their sustainability strategy. Food & beverage retailers need to demonstrate high commitment levels to finished goods traceability given their direct connection to end consumers, and clearly assign responsibilities along the whole supply chain in the case of recalls. In fact, they are the gateway to consumers. Therefore, they have the power to ban unreliable suppliers from the value chain and substitute them with their own private-labelled products.

Section 2: The Benefits and the Broader Opportunities — From Reactive to Proactive

There are several ways of looking at traceability. Traceability initiatives vary across food & beverage manufacturers, all the way from a reactive approach to a more proactive one that delivers more value-added benefits in return. We have ranked these approaches with their associated benefits in order of ascending value-add) below.

A more proactive approach to traceability delivers more value-add benefits in return.

1. Compliance with regulations: At this basic level, food & beverage manufacturers ensure they fulfill the bare minimum traceability requirements in each country/region to demonstrate that they are legally viable to have a market presence to begin with. Nonadherence to regulatory requirements would result in costly fines and other legal repercussions ("jail terms"), as well as a potential ban from operating in a given market.

2. Speed of recalls: If a recall is required, the ability to pull the affected products off store shelves efficiently and in a timely manner is key for damage remediation, brand protection, and most importantly, ensuring public health. Nonetheless, the reality, as mentioned earlier, is that visibility and control across the extended supply chain still requires improvement. Overcoming this will help in more successful management and execution of recalls.

3. Higher efficiency (and as a result, lower cost) in processing recalls: Being able to identify the exact source of potential contamination quickly and accurately has the following benefits:

- More targeted recalls (i.e., lower/smaller recalled batches or lot sizes)

- Less cost in factory downtime associated with investigations
- Lower administrative costs associated with processing recalls/investigations, informing media, damage compensation to retailers as well as end customers, and stock recovery

Up to this point, traceability initiatives are considered rather reactive and narrowly focused on business as usual, with minimum change involved. However, there are other benefits that are directly linked to superior business performance.

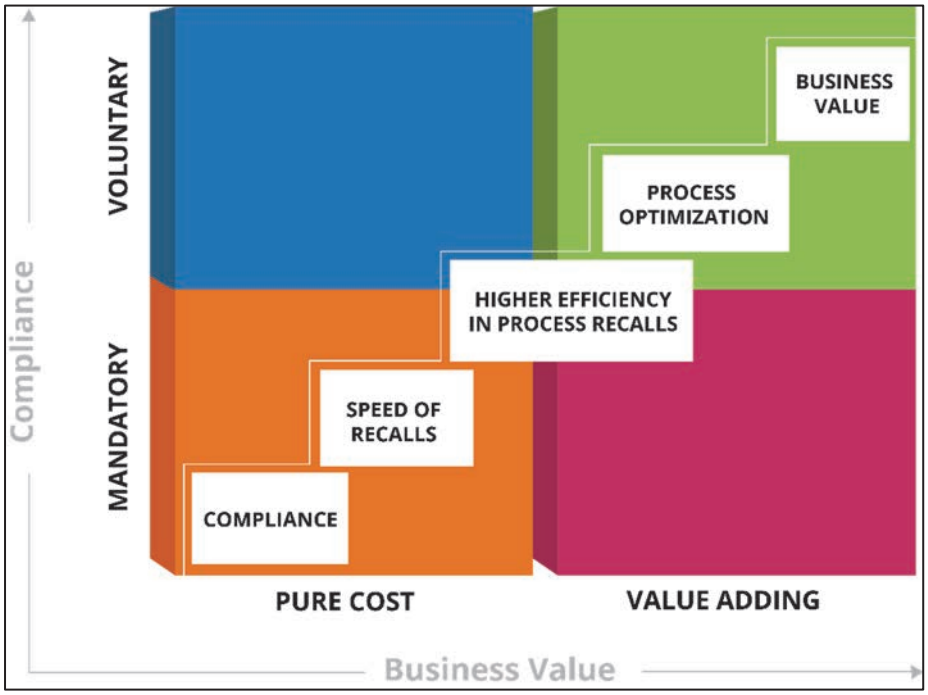
A more sophisticated approach to traceability makes it easier for food & beverage manufacturers and retailers to understand the entire process journey (from farm to fork) that products and their related ingredients have undergone. This requires granular knowledge of any details from sourcing to delivery in an extended way, potentially multisite, multicompany, and multi-legislative. Having access to this data across the product value chain provides insight into details such as who supplied the raw materials, who validated them, which steps went into processes, who handled and signed off the final product, who shipped and delivered it, and who on the customer side validated it. The process control enabled by traceability is a steppingstone driving business value by creating other business opportunities.

4. Process Optimization: With access to data spanning across the end-to-end process, food & beverage makers are now in a position to analyze the supply chain for insights and improvement. This includes quality control, planning and scheduling, being able to comply with other regulations (e.g., EU rules of origin or sustainability), and being able to appropriately right-size all the quality and sustainability initiatives to the real needs of the individual markets.

5. Business value by better customer relationship: At the point where food & beverage manufacturers have achieved end-to-end value chain traceability, they can leverage this capability for competitive differentiation by demonstrating they are a viable and trustworthy supplier to retailers and a reputable brand to ever more information-hungry customers. On both accounts, this enhances and in some cases even creates brand value. One notable example is UK-based organic baby food maker Ella's Kitchen, which via its "full traceability, field to farm, factory to family" credentials, has become one of the most trusted food brands in the country. Since the inception of the company in 2006, it has managed to achieve year-on-year double-digit growth or more. Food & beverage companies can use their brand differentiation to higher levels by creating a direct relationship with end consumers via direct-to-consumer (D2C) channels.

When food & beverage manufacturers have achieved end-to-end value chain traceability, they can leverage this capability for competitive differentiation.

FIGURE 4
Traceability maturity model



Source: IDC Manufacturing Insights

Section 3: The Role of Technology

The opportunity of data everywhere: This is how IDC sees data affecting the modern supply chain. IDC sees modern manufacturing supply chains dealing with data across three dimensions:

- **RECEIVE:** Data is captured at any point of activity and made available in real time. CPG manufacturers are increasingly relying on suppliers and downstream data, point of sale (POS), supplier/customer inventories, supply chain partner forecasts, and sensor data (IoT, RFID, barcodes, and AI-enabled cameras and inspections).
- **DISTRIBUTED:** Data seamlessly flows through departments, plants, organizations, lab facilities, and partners in the same value network. The combined use of machine-to-machine (M2M), mobile devices, internet and ERP allows information to seamlessly flow through departments, factories, suppliers, and partners, enabling quick response and alignment.
- **ANALYZED:** Data is analyzed and correlated in real time, allowing timely decisions, capturing new opportunities, and initiating and managing corrective actions.

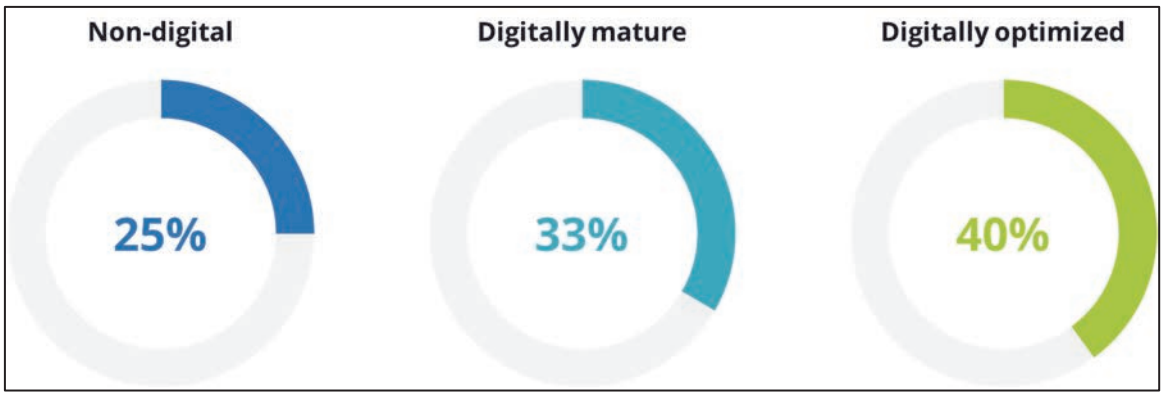
Being able to easily access accurate, real-time information is key to traceability: there are pockets of siloed data stored in applications throughout the organization. All of this can be harnessed for traceability purposes, but must be captured, made available, and shared across the organization via a digital thread.

The focus on traceability goes hand in hand with digital maturity. IDC research shows that traceability as a change agent increases with digital maturity in all the companies IDC tracked. This implies that digitally mature companies have a better handle on traceability as a direct result of having digitized their data and their processes. Another way of looking at it is that by the very act of starting an end-to-end traceability journey, the digital transformation program of a company receives a boost, essentially by helping to lay down a foundation of digital initiatives. Figure 5 shows that companies that are digitally optimized — with more advanced digital initiatives than their peers — have a much higher focus on traceability as a way of improving their supply chain.

Traceability increases with digital maturity in all companies IDC tracked.

FIGURE 5
Importance of traceability by digital maturity

Q. How much is traceability driving change in your supply chain?



Source: Worldwide Supply Chain Survey, IDC, April 2020. Manufacturing N=613

Several classes of IT applications are typically used for traceability, but not all of them have the same impact, according to IDC. Here we list these from most to least viable for the purposes of full and modern end-to-end traceability practices:

Not all IT applications for traceability have the same impact on the organization.

"Intelligent" ERP

Intelligent ERP (iERP) is a new generation of ERP that is cloud enabled and unifies data and processes from different sources into one single digital thread. The intelligence comes from more information/data, in-context learnings, and the application of the knowledge to deliver better business outcomes. In fact, iERP can process, analyze, and act on large volumes of data generated by the Internet of Things (IoT) in real-time. This turns ERP not only into a strategic decision-making tool but also a suitable technology to enable full traceability. In fact, many iERPs include advanced business-relevant features such as integrated quality control management, full traceability, and project management capabilities.

With an iERP solution, food & beverage companies can also simulate or even perform practice recalls knowing that they can pull the data needed to deal with a recall quickly and efficiently to minimize any potential harm caused to consumer safety.

Blockchain

Blockchain or distributed leger technology seems to be a promising solution to tackle the transparency and traceability challenge in the food & beverage industry. Blockchain can trace and record transactions along the supply chain. This strengthens food management safety and quality and reduces the time required to source comprehensive information on suppliers (and communicating this back to end customers). Even though IDC research shows that traceability is one of the fastest growing use cases for blockchain, it is limited by the technology itself, which represents a challenge due to its relative immaturity and the inherent limitation that all players in the supply chain must comply for this to be effective.

"Traditional" ERP

ERP is ubiquitous and is the system of choice for countless enterprises. As such, many ERP systems have crossed the boundaries of traditional back-office processes and extend their direct coverage to many aspects of production processes, including traceability. Most of the manufacturers adopting ERP applications for internal traceability find it convenient as this doesn't require purchasing new licenses and because ERP is the system of records for lots of data that is necessary to implement traceability. But, although the traditional ERP can handle traceability to a certain extent, it lacks the ability to manage real-time data or connection to control systems. In most of today's food & beverage production processes, traceability systems have to deal with multiple orders with different materials being processed on the same line, parallel mixing phases, and addition of preblended materials, among others. The traditional ERP generally cannot handle this complexity well enough and is limited by its transactional capability.

Manufacturing-Specific Applications

Manufacturing-related applications such as management execution systems (MES), warehouse management, and sales and operations planning (S&OP), to name but a few, are suitable for internal information gathering. MES, for instance, are the real-time backbone of the plant floor. They can capture data automatically, model complex processes, and store information about production in real time. As such, plant floor traceability is one of the MES native functions designed to meet even the most stringent and detailed regulations. However, the drawback of these applications is that even though they can act as a diagnostic tool, they do not provide a holistic view of the journey a product has undergone.

Spreadsheets and General-Purpose Personal Productivity Tools

Personal productivity tools have been widely used in the industry to manage complex business processes, including traceability. They are readily available and easy enough to use for organizations that are trying to address any given issues quickly and with no additional investments needed. However, these tools have serious limitations for traceability. They are homegrown and can only handle very specific and dedicated requirements. Maintaining or

extending these spreadsheets becomes almost impossible over time. Sharing the information is also very difficult, and quite often, companies adopting this technology force themselves to work in organizational silos. They cannot enforce procedures or manage complex workflows. They give too much freedom to modify data structures and input forms. And they hardly scale in terms of volume of data and number of users.

While all these technologies enable traceability in the food & beverage industry, none of them is a true "killer app" when it comes to end-to-end multi-enterprise traceability, with the exception of the "intelligent ERP." This is because the modern ERP provides end-to-end visibility across the value chain by organizing data in a consistent and homogeneous way across different business processes, enabling manufacturers to dismantle silos and enable collaborative processes.

Case Study

ARA Food Corporation

Improved traceability, quality control and product recall management leading to better compliance and ability to compete worldwide

ARA Food Corporation is a Miami-based family-owned business specializing in the production of snack foods and is particularly known for its plantain and cassava chips. ARA has a tradition as a make-to-order enterprise, operating on very little stock. To make its products as fresh as possible, the snack producer processes raw materials as they come in. As a result, lead time from order to shipment is just a few days.

ARA had relied on standalone applications and spreadsheets that had to be managed manually and offered little visibility. This made it more challenging to comply with the product traceability and quality checks needed to meet tough food safety requirements.

With the future focused firmly on growth, ARA invested in Sage X3 for manufacturing and finance, including a reporting tool. ARA also uses Sage X3's Business Intelligence capabilities to optimize resource use, while managing seasonal variations in sales and supplies.

The implementation of Sage X3 enabled greater visibility across the business and led to better costing and load planning as well as the reduction of raw materials waste and more efficient resource usage. Another benefit was the availability of real-time data which improved customer service. Most importantly, however, ARA was able to instantly improve traceability, quality control, and recall management and could therefore to deliver better compliance necessary to support its growing international business.

Conclusion — Where do You Want to Be?

Consumers and governments respectively are becoming increasingly more demanding in terms of food safety and health and the provision of detailed product information. Food recalls and scandals have illustrated the devastating impact that food safety issues can have on sales and, even worse, brand value. These risks can be mitigated by a detailed traceability policy but more importantly, there is a lot of opportunity to be gained by moving beyond the regulatory pressures and embracing end-to-end traceability as a business differentiator.

Food & beverage manufacturers need to determine where they want to be on the traceability spectrum.

Ultimately, however, food & beverage manufacturers need to determine where they want to be on the traceability spectrum. Here are some actions to consider:

- Consider moving from a reactive (regulatory, cost-driven approach) to a proactive (value-add) approach, which requires appropriate digital technology investments.
- If you are driven by differentiating for competitive advantage, consider enterprise application software for end-to-end visibility of operational processes across the value chain, allowing you to download the entire product history as and when you need to, from the ingredients used through to finished goods.
- Use traceability as the business case for digital transformation if you haven't already. Digital maturity not only puts you in a good position to fulfil requirements related to quality, documentation, and traceability, but by using end-to-end visibility enabled by the digital thread, you can optimize your supply chain and improve your customer experience.

FIGURE 6

Technology for competitive advantage — Where do you want to be?

Source: IDC Manufacturing Insights

But most importantly, while the adoption of traceability technology for the mere purpose of regulatory compliance is a start, it does not deliver business value per se, although it satisfies cost avoidance.

Many food and beverage companies that focus mostly on traceability from a reactive point of view end up having an expensive technology solution in place to comply with business and regulatory requirements. But they fail to extract the value that this generation of technology can deliver because they do not see traceability as a driver of competitive intelligence.

On the other hand, food & beverage manufacturers that have a higher commitment to traceability and invest in it in an active way can reap the full scale of compound benefits that traceability can generate and hence can drive higher value for money from their technology investments.

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