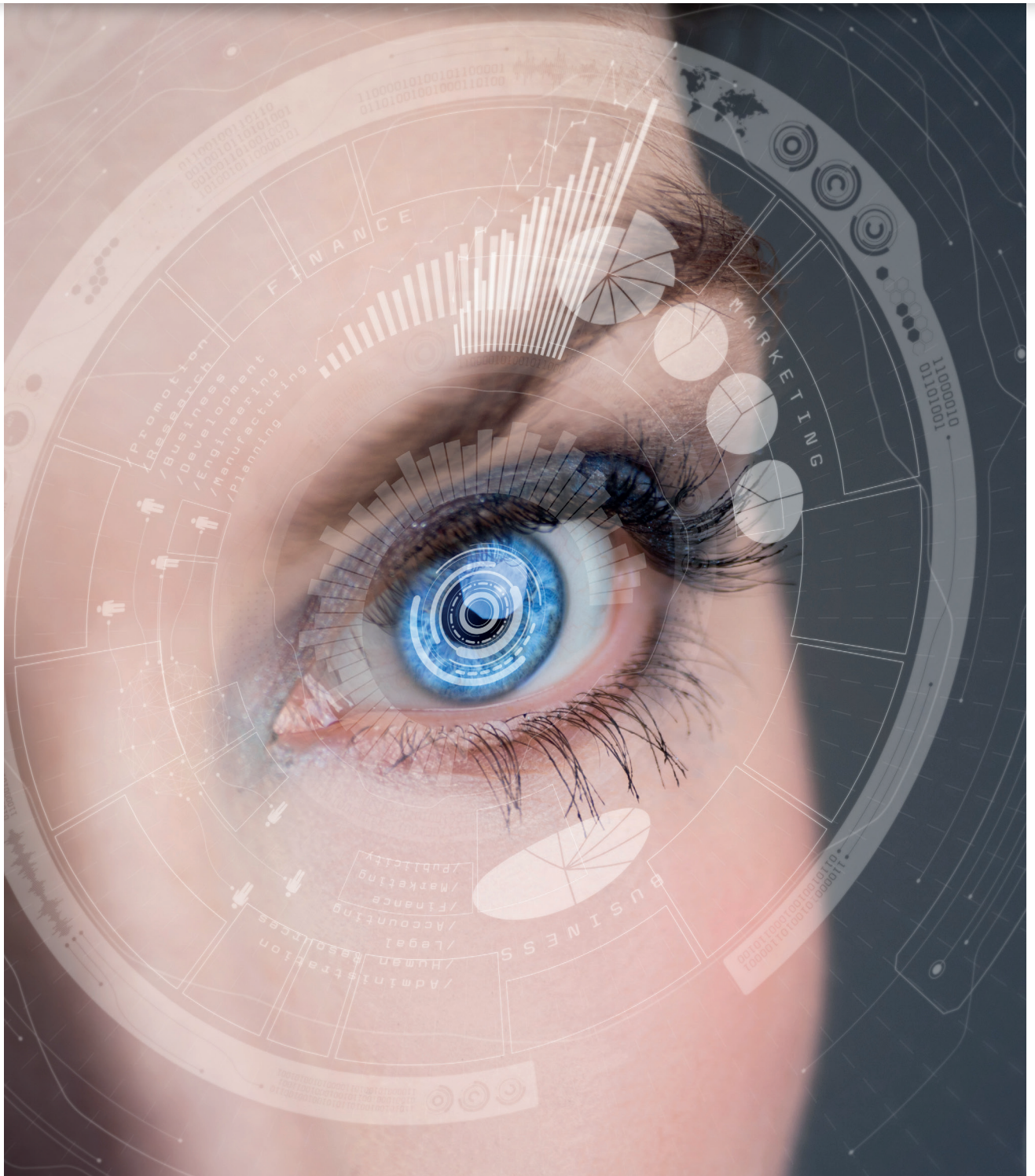# What is the alternative to manual traceability methods for the FMCG sector

Introduction

The breadth and scope of traceability has expanded significantly over the years along with advances in technology, making it a critical application for today's world-class manufacturers. We'll explore the evolution of traceability and explain why the latest phase, Traceability 4.0, is not just about tracking products throughout the supply chain but also optimising productivity, quality and brand reputation within the manufacturing operation by tying product to process parameters.

Traceability is a much-used term these days in manufacturing and supply chain management. Like many industry phrases (Internet of Things, for example), traceability can mean different things to different people or organisations. For that reason, "Traceability 4.0" has been adopted to describe the current and future phases of traceability in a global context and how is applies to the food & commodities sector. Traceability definitions have been evolving since the invention of automatic data capture equipment – primarily barcode readers – over 40 years ago. Since then, traceability applications have evolved to support industrial development from both a product technology and business process perspective.

Traceability 4.0: The fundamental element of global manufacturing

4 phases are distinct and overlap, to bring the full value of Traceability
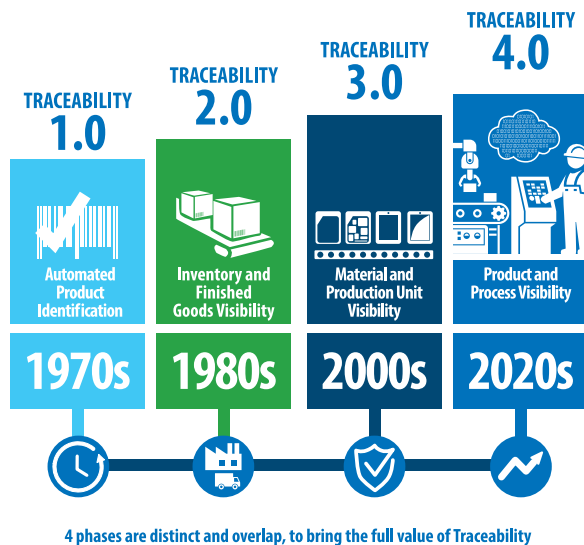
Traceability 1.0: Product visibility

Traceability 1.0 is about automatically identifying products to drive accuracy and efficiency. Barcode readers were initially used in simple manufacturing processes yet grew rapidly in adoption. The ability to mark a part and then track it was ground-breaking.

Traceability 2.0: Supply chain visibility

Traceability 2.0 is about managing inventory and meeting the needs of society. Now that barcodes were being applied to manufactured items, manufacturers recognised additional uses for them. They could track materials within the manufacturing facility and throughout the supply chain.

Traceability 3.0: Line-item visibility

Traceability 3.0 is about the optimisation of manufacturing and supply chain security by focusing on material, the second of "the 4Ms of lean manufacturing": Man (People), Material, Machine and Method. For this paper, "Material" applies to all that is necessary to build a product: raw material, components and subcomponents, as well as the finished product with serial number. Manufacturers began to extend traceability to their suppliers by requiring barcodes and other identifying information be placed on components and packaging. Some refer to this as component, subcomponent or line-item traceability. As more suppliers began adding information, manufacturers were able to optimise manufacturing processes and product quality even further by employing traceability within the manufacturing facility.

Traceability 4.0: Process visibility

So far, we have discussed product, component and supply chain tracking as key traceability goals. Traceability 4.0 is the union of all these, along with machine and process parameters to achieve the highest level of manufacturing. This includes Overall Equipment Effectiveness (OEE) as well as production and quality data to improve overall manufacturing effectiveness. Although some manufacturers are already employing Traceability 4.0, it represents the future for the majority of manufacturers.

Food & Beverage 4.0 traceability

The four phases of traceability previously discussed have not cannibalised one another. They have in fact been accretive and will continue to build upon each other. Transactional efficiency, social needs, supply chain management, and manufacturing optimisation will only become more important in the coming decades.
So why is it **in today's digital age where we are implementing technology at the fastest rate than ever before across both our commercial and domestic environments, so many producers of food still allow paper to dominate as the source of information in the process of food traceability?**

A lack of a comprehensive traceability system, can potentially have disastrous outcomes for everyone in the supply chain, from producer to consumer. Paper does not control anything. It is just a written record, there's no validation, and no control.

In the food and beverage industry, authenticity is essential. Consumers need to know that the foods they're purchasing consist of the things listed on their labels, as food allergies and expired foods can cause serious illness and possibly death. Since both public health and consumer satisfaction depend so heavily on product integrity, the food and beverage packaging industry is highly regulated.

One of the main things mandated by food and beverage regulation is "traceability" the practice of maintaining thorough records on the origins and whereabouts of products and raw materials by scanning printed barcodes, direct part marks (DPMs) or radio frequency identification (RFID) tags throughout the production process and the supply chain. From raw materials supplier to production line to supermarket to customer, the creation and distribution of a particular food item should be as transparent as possible.

TRACK

RAW MATERIAL SUPPLIERS	MARKETERS	PRODUCERS MANUFACTURER	WHOLESALER DISTRIBUTOR	RETAILER	CUSTOMER
Origin ID	Bulk ID	Serialization Aggregation	De-Aggregation		

TRACE

Traceability involves the use of tracking and tracing systems and processes to follow a product through all stages of production and distribution.

Serialization means assigning and marking each item with an unique identifier during the manufacturing process.

Food and beverage manufacturers also benefit directly from traceability protocols that minimise the occurrence and effect of costly issues such as product recalls by providing real-time data on supplier materials, processes and machinery involved in production. These protocols can significantly reduce cost of a recall by isolating tainted items and making it unnecessary to pull large amounts of non-tainted product off the shelves.

This white paper discusses several key trends, challenges and strategies pertaining to traceability that food and beverage manufacturers are experiencing today.

Complying with industry regulations

Regulations are one of the primary forces spurring food and beverage manufacturers to adopt robust traceability systems. In the United Kingdom, the foremost source of regulation is the Food Standards Agency.

After a number of high-profile outbreaks of food related illnesses in 2000, the Food Standards Agency (FSA) was established as an independent government department working to protect public health and consumers' wider interests in relation to food in England, Wales and Northern Ireland.

In the wake of Brexit, food and beverage regulations in the United Kingdom have changed and evolved while retaining some relevant provisions laid out in EU legislation. While Northern Ireland remains subject to EU law alone, Great Britain, Wales and Scotland fall under the provision of the Food Standards Agency (FSA) as the government organisation responsible for setting and enforcing traceability requirements.

A quick reference guide published by FSA specifies that food business operators (FBOs) must maintain traceability information for suppliers and customers—equivalent to the "one step forward, one step backward" model which means they must be able to identify the businesses to which their products have been supplied and to trace food chain inputs back to the immediate supplier.

What does the law say?

1. You must have traceability information for your suppliers and business customers (one step back and one step forward)
2. Retailers, including caterers, are not required to keep traceability information where they sell to the final consumer. However, where they supply food businesses, all traceability requirements must be adhered to.
3. You must have systems and procedures in place to allow for traceability information to be made available to enforcement authorities on demand.
4. You must label or identify food placed on the market to facilitate its traceability.
5. Products of animal origin and sprouted seeds are subject to specific traceability requirements.

It also suggests the following should be considered when deciding:

1. The system:
You must be able to trace food/ingredients purchased from suppliers and then supplied to business customers (excluding food supplied to final consumer).

2. Defining batches of food:
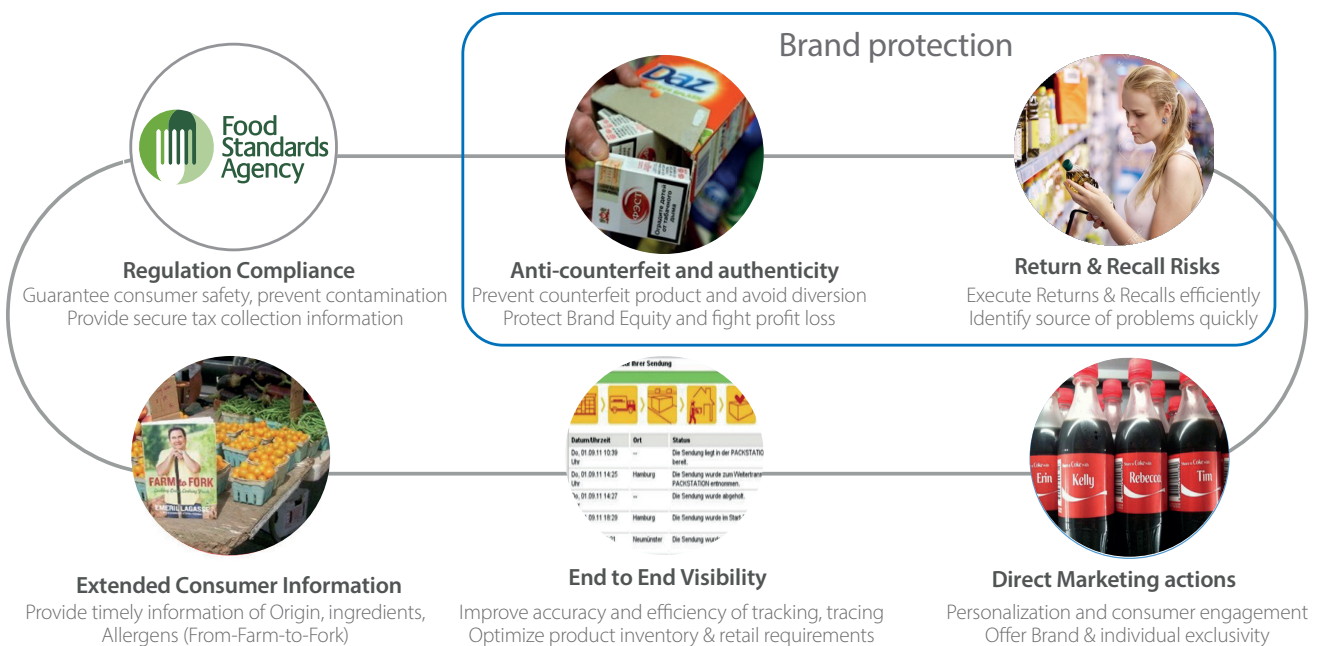This will help to ensure good traceability and can limit the amount of food to be withdrawn/recalled.

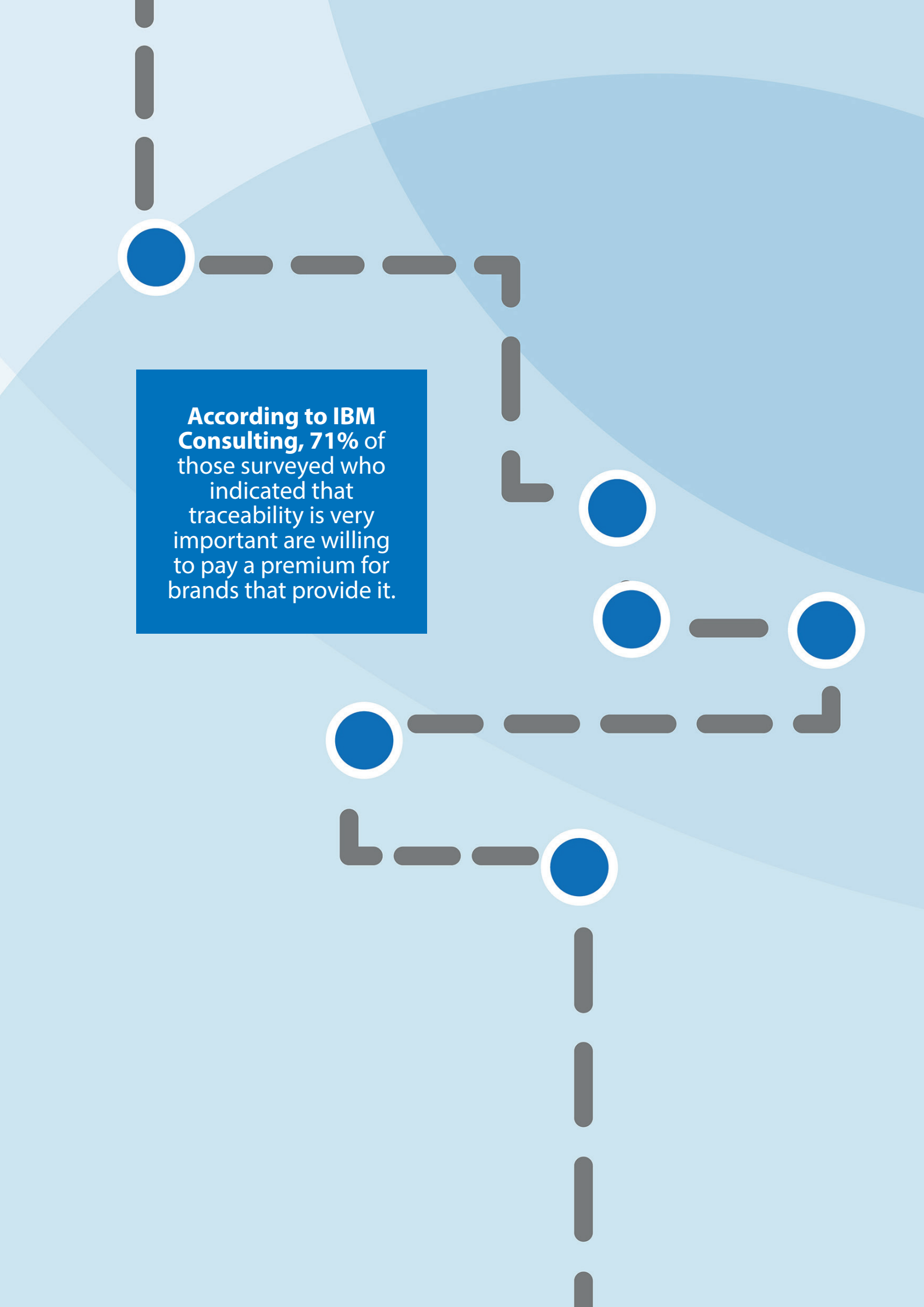**3.** Traceability information:
- Business name
- Business address
- Description of foods purchased and sold
- Quantities
- Transaction dates

4. Record keeping:
You must ensure your traceability information can be made available on demand.

In the food and beverage packaging industry, both traceability arrangements are equally important. Regulatory bodies are usually more concerned with external traceability, but solid internal traceability is what makes it possible to demonstrate the link between the immediate raw materials supplier ("one step backward") and the purchasing party ("one step forward").

Brand protection

Regulation Compliance
Guarantee consumer safety, prevent contamination
Provide secure tax collection information

Anti-counterfeit and authenticity
Prevent counterfeit product and avoid diversion
Protect Brand Equity and fight profit loss

Return & Recall Risks
Execute Returns & Recalls efficiently
Identify source of problems quickly

Extended Consumer Information
Provide timely information of Origin, ingredients,
Allergens (From-Farm-to-Fork)

End to End Visibility
Improve accuracy and efficiency of tracking, tracing
Optimize product inventory & retail requirements

Direct Marketing actions
Personalization and consumer engagement
Offer Brand & individual exclusivity

According to IBM Consulting, 71% of those surveyed who indicated that traceability is very important are willing to pay a premium for brands that provide it.

Combatting counterfeiting, promoting ethical sourcing and minimizing recalls

Counterfeiting has become a major problem in the food and beverage industry as the market becomes more globalised. With the increase in imports coming from developing countries, it's crucial to have a traceability system in place to confirm that products are authentic. In addition, consumers are demanding information on the sources of raw materials going into foods in order to ensure that the products are ethically sourced. This is most applicable to confection goods containing nuts or cocoa, as these raw materials are often sourced using child labour or another form of labour in violation of international law.

Problems with product authenticity don't always come from outside, however. Mistakes in manufacturing can result in packages that say they contain one thing but actually contain another. As anyone with a peanut allergy knows, this is a potentially life-threatening issue. Food and beverage packaging must be extremely specific about what's inside, and if there's an information mismatch, the affected product needs to be recalled immediately. In fact, errors on labels and packaging are the most common cause of food and beverage recalls.

One of the best ways to combat labelling mistakes is to implement an industry-standard label verification system. Print quality inspection systems are capable of performing a wide variety of verification-related tasks, including optical character recognition (OCR), optical character verification (OCV), master-to-label comparison and data and code matching. These features help companies ensure accuracy and data integrity, identify defects and avoid liability.

Since recalls can have a catastrophic impact on a company's reputation as well as its profits, minimising errors on labels and packaging is essential. Companies that include any sort of repackaging process as part of their operations should be doubly careful to ensure that product identifiers are thoroughly tracked and that labels are comprehensively verified. This cost comes on top of the expenses that are directly associated with taking all the impacted product off the market.

Using traceability to analyse and optimize productivity

In addition to helping companies avoid recalls and other disruptions to their profitability, traceability systems are also a great way to optimise processes and evaluate overall equipment effectiveness (OEE). By collecting and analysing operational data, manufacturers can figure out which machines are under-performing and pinpoint precisely where bottlenecks are occurring in production.

In order to gather this data, manufacturers need to set up numerous code reading stations at various points across the production line. Barcoding helps track vital productivity information such as throughput and quality based on package type, machine, shift and product. In many cases, this means that barcode readers need to be embedded within machinery. This poses a challenge, since most manufacturing equipment is designed to take up as little space as possible and therefore doesn't have much extra room for barcode readers. This creates the need for ultra-compact readers.

These ultra-compact industrial barcode readers and smart cameras are designed to be highly flexible and configurable within an exceptionally compact casing. This means that they can be easily embedded within machinery while still providing fast and accurate reading. Thanks to their liquid lens auto-focus technology, the readers eliminate constraints on camera positioning. The same camera can be used for machine vision inspection, enabling the expansion of automation as a facility's needs evolve without investment in new hardware.

Once traceability data is gathered via the barcode readers, it needs to be communicated to the rest of the system. This poses a new challenge – that of using this data without hampering control performance. When traditional controllers are tasked with processing large amounts of traceability data, they are liable to slow down the production cycle time.

Automation manufacturers have addressed this issue by developing controllers that can maintain high-speed control while handling all the information a traceability system provides. For example, controllers can be used for a packaging machine with the capability of handling 1,000 products per minute and can collect all traceability data in synchronisation with the production cycle while performing motion control. This means that traceability doesn't need to slow down other aspects of production while fulfilling the purpose of collecting important data. Barcode readers provide direct connectivity via Ethernet/IP to the controllers, making it simple to integrate traceability data into the automated system. When it comes to utilizing traceability information, the data collection is one challenge. It's another matter altogether to transfer that data to the business and enterprise systems that store and use the data. Controllers can make this easy thanks to the seamless incorporation of SQL and OPC-UA.

Embracing vision systems for complete product integrity

Machine vision technology has been taking on an increasingly important role in traceability because it's an extremely effective way to maintain complete product integrity. Vision inspection includes a wide variety of functionality such as detecting defective products in real time and performing both OCR and OCV to verify that the data on labels and packages adds up. By functioning as a complete solution for ensuring that non-conforming products don't go out into the market, vision systems are vital for brand protection.

The hurdle that manufacturers face in implementing a machine vision system is twofold. Such systems are often expensive to implement, and the complexity of the technology can overwhelm operators. Many applications require special programming. However, these challenges are offset by the fact that a single product recall or fine for tainted product – preventable by a vision system – could cost more than the vision system itself.

## Transitioning from manual record keeping to fully automated traceability

The avoidance of unwanted complexity isn't just a deterrent to using machine vision – it's often a reason why manufacturers forego upgrading their traceability systems in any way. Because implementing a new system seems inordinately complex, many manufacturers prefer to stick with cumbersome and error-prone record keeping methods that rely on manual processes. It's understandable that companies want traceability to be easy. However, failing to upgrade the system with automation actually leads to more work in the long run.

Manual record keeping is far more widespread in the food and beverage packaging industry than it should be, especially when one considers the huge costs associated with certain types of mistakes. Unfortunately, not all companies have the budget to invest in good traceability software. Budgetary constraints and the fact that traceability solutions need to be scalable are major barriers to automating the system.

OMRON strives to make traceability as easy as possible, just as it strives to make its machine vision technology intuitive enough for the average operator to use. Its MicroHAWK barcode readers keep things simple by working right out of the box – in fact, the browser-based WebLink interface allows manufacturers to start using the readers without needing to install any software whatsoever. OMRON also has extensive knowledge of how traceability works in a variety of industries, and its focus on providing comprehensive solutions with complete line integration lets companies rest assured that the upgraded system will "just work."

Although often perceived to be challenging and somewhat expensive at the outset, a robust traceability system is the single most important means of complying with industry regulations and reducing the incidence and cost of recalls. OMRON's traceability solutions address various pain points that manufacturers face in the food and beverage packaging industry so that real-time, automated traceability is within the reach of any company that needs to comply.

A typical FMCG traceability implementation example
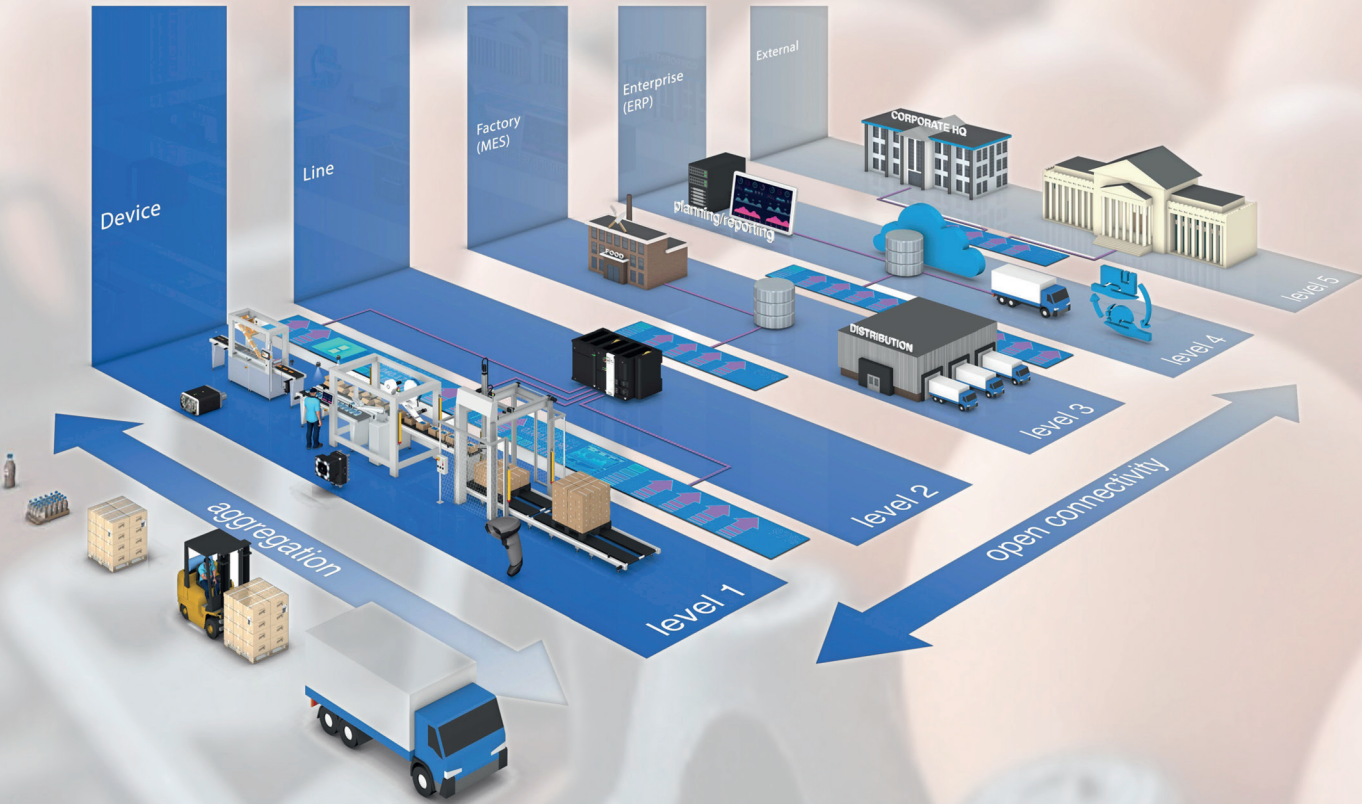
Summary

All levels of traceability are critical to the success of manufacturing. In fact, most industries will see and use all levels in their plants or facilities. One phase is not "better" than the other; the full complement is their strength. The evolution of traceability is the direct result of business needs and is crucial in the hyper-competitive world of global manufacturing.

While similar in many ways to Industry 4.0, Traceability 4.0, and all its phases, is different in several ways. Timing and availability is one key difference. When speaking of Industry 4.0, in some cases there are decades between advancements, and generally they are not being developed, or used, at the same time. Many steps of this progression were sequential.

The concepts and technologies of traceability began just 40 years ago and are actively building upon each other and are being used concurrently, for both bettering production and sparking new technology developments.

The other large difference we see is the focus of Industry 4.0 compared to that of Traceability 4.0. They both focus on improving and connecting digital and physical technologies to optimise manufacturing and improve yield. Traceability, however, brings an additive dimension – ensuring quality components and end products. It is this laser sharp focus on credibility and brand protection that true traceability can deliver.

Discover OMRON

OMRON is uniquely positioned to provide significant and innovative value to customers in this space. Our global portfolio of traceability products and solutions is integrated, intelligent, and interactive. Our core "MVRC" offerings (mark-verify- read-communicate) include barcode readers, ISO-compliant barcode verifiers, laser markers, and RFID. OMRON has a complete automation platform featuring programmable logic controllers, motion controllers, machine vision systems, safety technology, and robotics to facilitate a complete traceability solution for data management, inspection, and material handling. Our IoT enabled devices communicate data seamlessly with each other and across multiple data layers within an organization (MES or ERP). This data connectivity enables analysis for continual improvements to be realized. We were present at the beginning of traceability's evolution and we will continue to drive that evolution forward. OMRON has facilitated many Traceability 4.0 applications in the food and commodities industries with exceptionally positive results. Our knowledge and expertise will continue to drive further productivity for our customers and end users.

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