



## WHITE PAPER

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# Next Generation Digital Link Barcodes: Powering Production Efficiency

Four ways to optimize production  
efficiency with GS1 Digital Link

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# Introduction

Consumer packaged goods manufacturers (CPGs) have experienced significant challenges from supply shortages and escalating costs to rapidly shifting consumer preferences and dips in spending. According to McKinsey and Company, in 2023, Americans spent 10% more on groceries but bought 4% fewer items. Since then, the global marketplace has only become more complicated to navigate.

McKinsey's, [Rescuing the decade: A dual agenda for the consumer goods industry](#) reveals four megatrends slated to grow over the next decade. These are *consumer fragmentation*, *macroeconomic slowdown*, the *mass-merchant squeeze* and *escalating or volatile costs*. The first three trends combined have unraveled traditional strategies for growth and brand building through mass merchants. The final trend requires companies to reconsider their typical cost management approaches.

The CPG market is highly competitive, requiring companies to identify every available opportunity to gain efficiency, cut costs, and drive brand loyalty and increased conversion. Now, more than ever, digital transformation is necessary for companies that aim to lead in their categories with agile operations and healthy profit margins.

One tool to aid this transition is an updated version of the 2D barcode – [the Digital Link barcode](#) – which represents a disruptive digital tool for consumer goods manufacturers to engage consumers, improve operational efficiency, and differentiate their products.

## The megatrends that disrupted the last decade are strengthening.

Impact level of megatrends on consumer-packaged-goods industry, scale of 1 to 5

### Megatrend

Macroeconomic slowdown

- Population growth stagnating
- Wealth expansion slowing
- China's growth slowing

Consumer fragmentation

- Consumer attention shifting even more to digital
- Growing interest in "better for you" / "better for the planet"
- Prescription weight loss drugs coming

Mass-merchant squeeze

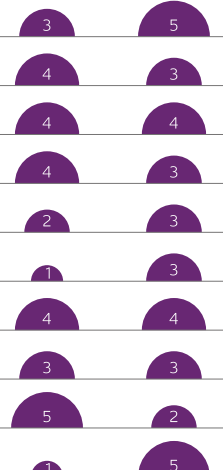
- Supermarkets losing share and, in Europe, struggling with profitability
- European private labels growing

Escalating, volatile costs

- Inflationary period (lessening, but not reversing)
- Heightened rate of crop failure



Past 10 years      Next 10 years



McKinsey & Company



## 2D Barcodes

2D barcodes are graphical images able to store large amounts of data for access by manufacturers, retailers, and consumers. While today's standard UPC (1D) barcodes only convey a limited amount of data like item identification and pricing, Digital Link barcodes can carry additional information including product origin, sell-by dates, and links to web pages and digital applications. Though the technology has existed for decades, the 2D barcode, such as QR codes, recently rose in popularity as an easy access point for brand or product information on the go.

Now, change is on the horizon with 2D Digital Link barcodes on product packaging to become digital transformation agents between brands, retailers, and consumers. GS1, the global organization for data standards, is behind GS1 Digital Link, the standardized model for encoding information within a 2D barcode. Recently, GS1 activated Sunrise 2027 to encourage the widespread adoption of specific GS1 standards for Digital Link to better share data. The initiative encourages widespread use of Digital Link on product packaging by 2027, from manufacturers to the end consumer.

As the world changes, manufacturers are racing to keep up with consumer demand for more product information and supply chain transparency. For decades, companies have utilized the standard 1D barcode for inventory tracking and point of sale (POS) purposes, but struggle to keep up with increasingly complex business needs that require more readily available product data. Digital Link barcodes create a digital product twin



to help manufacturers provide regulatory and product information such as origin, nutritional information, late-stage production data, serial number, best-before date, and expiration date. The capabilities of 2D barcodes offer key opportunities for manufacturers to streamline operations, enable increased conversion, glean insights from data, and increase overall profits.

## CROSS-BUSINESS COLLABORATION

- ✓ Ensure supply traceability and visibility. Allow product authentication and fight counterfeiting.
- ✓ Build consumer trust and food safety transparency.
- ✓ Prevent sale of expired or recalled product at Point-of-Sales.
- ✓ Achieve regulatory compliance.
- ✓ Real-time, 2-way, inventory management.

With this industry shift also comes exciting opportunities for manufacturers to fully optimize production and packaging. From connecting the business ecosystem to customizing operations, there are four strategic ways manufacturers can boost efficiency through 2D barcode implementation.

### 1. Expand Cross-Business Collaboration

One of the most important aspects to understand about the integration of 2D barcodes is the critical need for cross-business collaboration. Manufacturers will only see success through communication with all areas of their businesses, as well as their retail partners, to maximize the potential benefits of 2D barcodes. By communicating regularly and working together to understand the needs of the entire supply chain, manufacturers will identify opportunities for operational efficiencies.

Here, it's crucial to highlight the roles of CPG inventory planning and management for consumer supply and demand. Manufacturers need more streamlined ways to anticipate demand and track and manage stock to reduce waste, increase conversion, and ensure seamless operations, profitability – and sustainability.

Given the importance of collaboration, cross-functional conversations should be the starting point of a 2D barcode initiative to ensure all parties align on are on the same page and understand the objectives, opportunities, and action items at hand. Manufacturers will play a critical role in establishing 2D barcode best practices for boosting production efficiency.

**Key Takeaway:** Approach this 2D barcode transition as a joint effort. Initiate discussions internally and with supply chain and solutions partners on what data will be tracked, what your retail partners' requirements look like, and what the steps look like for a transition to 2D barcodes.

## DATA MANAGEMENT OPTIMIZATION

- ✓ Data structure standards.
- ✓ Standardized data types.
- ✓ Data transfer solution for small to big producers.
- ✓ Safe and trustable data solutions.

### 2. Data Management Optimization

Data availability and quality are critical to enhancing the efficiency of manufacturing operations, and most companies are struggling to keep up. With data sourced from numerous locations, a lack of standardized practices, and limited options with standard 1D barcodes, it is abundantly clear why manufacturers struggle to distill their data into actionable insights.

The introduction of 2D barcodes provides manufacturers with a solution for existing data challenges, but manufacturers and suppliers will need to clean and structure their data in a consistent manner in order to utilize 2D barcodes to their full potential – a system will only work as well as its supporting information. Through storing information like material origin, expiration date, inspection results, and component details, manufacturers can share more data with consumers, responding to trends and preferences for data transparency. Further, by integrating 2D barcode efforts with master data from enterprise resource planning (ERP) software, manufacturers can take their data management to the next level and utilize information to its fullest extent.

**Key Takeaway:** The success of 2D barcode integration will hinge on the accuracy and consistency of your data. Ensure you have the proper resources allocated to collecting, cleaning, and managing incoming and outgoing data.

## STREAMLINE TRACK AND TRACE

- ✓ 2D codes can hold more data and are more resistant to damage.
- ✓ QR codes are accessible for more consumers by simple scan with a smartphone.
- ✓ Powered by internet, the code allows richer, real time information.
- ✓ Recall handling can be moved earlier into the consumer process by purchase being blocked already at retail store.

### 3. Streamline Track and Trace

With ongoing global supply chain disruptions becoming the norm, track and trace technologies are critical tools for building a more resilient supply chain – for compliance, meeting product transparency needs and protecting brands by minimizing waste and scope of potential product recalls. According to [Research and Markets](#), in 2024, the global market for track and trace solutions was valued at USD 6.2 Billion. By 2030, it is projected to reach USD 12.2 Billion.

Further to this, McKinsey's [Supply chains: Still vulnerable](#) illustrates how crucial it is for manufacturers to create a sturdy supply chain. Through its McKinsey Global Supply Chain Leader Survey, the data shows how supply chain issues are now normal, “with nine in ten respondents saying they have encountered supply chain challenges in 2024.” This is why investing in the right tools to support a more robust supply chain is essential.

For successful brands, data management doesn't stop at the end of the packaging line. It continues through distribution channels to the point of sale, where track and trace measures act as a vehicle for supply chain security and product safety. Thanks to the increased amount of product data embedded in the digital Link barcode, when scanned, 2D barcodes can automatically share more data with other systems like traceability.

Improved traceability is another major benefit of honing data efforts. By linking each component within a final finished product, manufacturers can have a holistic view of a product's entire history and be able to comply with traceability or digital passport regulations and pinpoint potential issues before they arise or take swift action once a problem is identified, from the manufacturing facility to the product in a consumer's hands. For example, if a snack food manufacturer notices certain product boxes are not passing end-of-line quality tests, they can scan the 2D barcodes to determine exactly what batches the boxes came from, when they were packed, and how many other boxes were impacted, zeroing in on certain products affected versus needing to review an entire production run.

With a simple scan, workers can efficiently understand key product details, allowing time saved to be allocated elsewhere. Additionally, if the snack food ends up being recalled, 2D barcodes can enable retailers to be notified before or during stocking, blocking the recalled product's ability to be sold, and a consumer's ability to scan a 2D barcode to learn of any recall notices for a product they have already purchased.

**Key Takeaway: Consider implementing 2D barcodes across product components. Tracking by component and end product will allow for saved time, heightened traceability, and decreased errors and product waste.**

### 4. Consumer Demand and Supply

Consumer engagement is constantly fluctuating. From social media trends to seasonal preferences, companies are consistently challenged with planning for appropriate levels of inventory. On top of consumer preferences, aspects like data inaccuracies, poor forecasting, and unforeseen supply chain challenges act against manufacturers, mounting pressure to meet consumer expectations and financial goals.



# “Customer Obsession” — a Growth Strategy

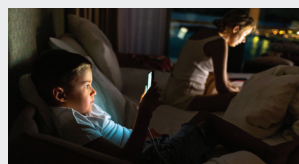
A study entitled [Accenture Life Trends 2025](#) shines a spotlight on why brands should create specific channels for more direct consumer engagement. It highlights the importance of the consumer experience and why “customer obsession is the best growth strategy.”

The study covers five dominating trends that organizations can tap into to stay relevant:



## Cost of Hesitations

This covers how the lines are now blurred between authentic and deceptive content today, it's hard for consumers to tell what is real – which leads to cautious digital interactions.



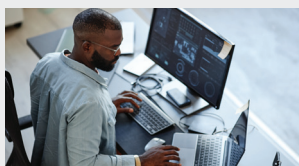
## The Parent Trap

The evolving digital transformation reveals how people want options for guiding younger generations – to help them forge healthy future bonds with technology.



## Impatience Economy

Highlights the ways consumers are finding quick solutions through online content to achieve their life goals.



## The Dignity of Work

This illustrates how this is being challenged. As people are introduced to new technologies at work, it's about whether they will welcome them or not.



## Social Rewilding

As a result of the all-consuming digital world, people are harking back to simplicity, and more meaningful connections.

With digital experiences and trust online being core focus points, the main trends are centered around this. These changes to consumer behaviors mean that brands must be more transparent than ever and communicate clearly with today's modern consumers to resonate with them and build loyal communities.

## DIGITAL EXPERIENCES

- ✓ Turn packaging into campaigns
- ✓ Brand information and stories
- ✓ Recycling information
- ✓ Farm-to-fork stories
- ✓ Direct 2-way brand engagement

The [Accenture Life Trends](#) survey 2024 reveals that 62% of respondents say trust is an important factor to them when choosing to engage with a brand. Brands need to connect and engage with their customers more authentically to earn their trust. Upscaled barcodes can offer them this deeper engagement. GS1 Digital Link, or digitally connected barcodes, provide increased capacity for production and product data. They allow consumers to scan products with their mobile phones and be directed to digital landing pages – this means they can engage with the brand at another level.

While consumer preferences always shift, 2D barcodes can help manufacturers better identify, anticipate, and weather otherwise unpredictable storms. By staying close to information from retailers and social media listening during heightened or decreased demand, manufacturers can drill down into specifics and make any necessary adjustments to production schedules, either temporarily or permanently. Additionally, manufacturers can prioritize collecting consumer insights from interaction via webpages to inform trends and preferences that guide purchasing habits.

**Key Takeaway:** Take control of your production schedules by monitoring trends more readily available through 2D barcodes. Instead of reviewing a month or quarter of production, stay in tune with consumer trends and pivots as needed to gain a competitive advantage based on current challenges or opportunities.





# How to Start

The GS1 Sunrise 2027 is sure to change how our world operates on a daily basis and delivers many opportunities for manufacturers to adjust operating procedures to increase efficiency and meet ever-changing consumer habits. Competition will only continue to increase for manufacturers as the world becomes more dynamic and complex, and with technologies like 2D barcodes, companies can unlock opportunities and prevail in an ever-changing world.

## Markem-Imaje: Connected Solutions

<https://www.markem-imaje.com/solutions/connected-and-compliant-2d-barcodes>

## About Markem-Imaje

Markem-Imaje, a wholly owned subsidiary of Dover Corporation, connects products and protects brands through intelligent identification, traceability and consumer engagement solutions. We offer the industry's most comprehensive range of marking and coding systems seamlessly integrated with trusted software, services and consumables. Over 50,000 customers worldwide partner with us to help them unlock the power of information in codes. With decades of proven expertise provided through the most extensive global network, we empower our customers to optimise supply chain efficiencies, achieve sustainability and compliance objectives, keep products safe and engage their consumers. This is intelligence, beyond the mark.

Visit [www.markem-imaje.com](http://www.markem-imaje.com) for further information.



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#### REFERENCES

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3. McKinsey and Company: [Rescuing the decade: A dual agenda for the consumer goods industry](#)
4. McKinsey and Company: [Supply chains: Still vulnerable](#)
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