



Scaling innovation to shape the future of recycling





The need for innovative recycling methods

As environmental challenges mount, it is becoming increasingly apparent that more needs to be done if we are to address the growing crisis of waste management. To effectively tackle packaging waste, new approaches such as deposit return schemes (DRS) and digital deposit return schemes (DDRS) will play a crucial role.



Understanding DRS and DDRS

From 2027, legislation for deposit return schemes is set to be implemented in the UK. Under this system, customers will pay a deposit — likely around 20p — on top of the price of their drinks bottles, which they can redeem upon proper recycling.

While DRS has been proven to increase recycling rates and has been successful in much of mainland Europe, it is heavily reliant on traditional reverse vending machines (RVMs). These machines, developed in the 1980s, are carbon-intensive, spatially demanding and can be financially burdensome for retailers. They also create inconvenience for consumers accustomed to recycling directly from their homes through local authorities.



Impact on local services

In the UK, the existing system has allowed local councils and waste providers to derive revenue from high-value materials like PET and aluminium. However, with the introduction of RVMs as part of DRS, these councils risk operating at a loss, fundamentally altering a system that has been in place for over thirty years.

Retailers such as Ocado Retail would also face significant operational challenges, as drivers would need to handle returns, disrupting their processes and supply chain.



The solution: Digital deposit return schemes

Digital deposit return schemes (DDRS) offer a promising alternative. While DDRS allows for the use of RVMs, it also empowers consumers to redeem their deposits from the comfort of their homes.

By utilising unique, serialised QR codes, customers can scan their products to receive their deposits back securely. This innovative solution ensures that each QR code can only be scanned once per item, preventing fraud and streamlining the redemption process.



Embracing the future

Implementing DDRS on a nationwide scale could represent a transformative shift in how we handle packaging waste. Combining the benefits of traditional systems with modern technology, it would provide consumers with convenience and simplicity while reducing the burdens on retailers and local councils.

Such models will be crucial in today's environmental landscape. By building on successful examples from Europe and establishing robust regulatory support, we can engage consumers to create a culture of accountability, enhance recycling rates, reduce waste, and create a more sustainable future.

Tackling packaging waste

Packaging waste is a critical environmental issue that requires urgent action.

In the UK alone, households discard approximately 100 billion pieces of plastic packaging annually, averaging 66 items per household per week. Despite efforts, the recycling rate for plastic packaging remains low, with only **44 per cent** of household waste being recycled in 2022.

It is clear that we need a concerted effort from consumers, businesses, and governments to address this and the call to action is clear. We must enhance recycling initiatives, reduce plastic production, and innovate sustainable solutions to reduce the impact of packaging waste on the environment.

Public awareness is rising, and with it, pressure for industry to adapt. New legislation, such as extended producer responsibility (EPR) and deposit return schemes (DRS), are reshaping the landscape. These regulations hold manufacturers and retailers accountable for their packaging, pushing them to take responsibility for waste management. It's not just about compliance; it's about rethinking how we approach packaging from the ground up.

For retailers and brands, this shift represents both a challenge and an opportunity. As they navigate the implications of DRS, the need for cost-effective, scalable solutions is more critical than ever. Businesses must find efficient systems that mesh seamlessly with their current processes, ensuring that recyclable materials are handled properly, and waste is minimised.

On the consumer side, demand for convenient and transparent recycling options is soaring. Today's shoppers are tech savvy and eco-conscious, looking for easy ways to participate in sustainability. They want clear information about how their waste is managed and prefer recycling methods that fit into their daily lives. This presents a golden opportunity for businesses to engage customers and promote accountability in recycling.

While the road ahead is not without obstacles, the drive toward sustainable consumption continues to gain momentum. By prioritising responsible practices and engaging consumers in the recycling journey, businesses can enhance their brand reputation and make a real impact on the environment.

In the UK, nearly **70 per cent** of consumers believe that brands should take greater responsibility for packaging waste and **58 per cent** are willing to pay more for environmentally friendly packaging, reflecting a strong desire for corporate accountability.

Embracing innovative, efficient recycling solutions isn't just about meeting new regulations; it's about leading the charge toward a more sustainable future. Together, we can tackle the packaging waste crisis, reduce our environmental footprint, and create a world where recycling is second nature.



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58%

are willing to pay more for environmentally friendly packaging, reflecting a strong desire for corporate accountability

Powering progress towards a more circular economy

At GS1 UK, we are committed to driving innovation through standards that enhance efficiency and transparency across supply chains. In this context, our standards— especially QR codes powered by GS1— will be pivotal in shaping the future of recycling.

In a world where consumers are increasingly eco-conscious, the demand for clear and accessible recycling information is rising. QR codes offer an effective solution, allowing consumers to scan packaging to access detailed information about recycling options, material composition, and the lifecycle of products. By harnessing the power of GS1 standards, businesses can provide this vital information seamlessly, empowering consumers to make informed decisions about waste disposal.

The integration of QR codes on packaging not only enhances consumer engagement, it also streamlines recycling processes. These next generation barcodes can link directly to digital platforms that offer up-to-date information on local recycling facilities, guidelines, and best practices. This transparency fosters a culture of accountability, enabling consumers to actively take part and encouraging brands to uphold their commitments to responsible packaging.

The standardisation of data also ensures that information is consistent and easily accessible. This is essential for creating effective recycling systems that work across various jurisdictions and waste management programs. By establishing a common

language for packaging and recycling, GS1 standards enable greater collaboration among manufacturers, retailers, recyclers, and consumers alike, powering progress towards a more circular economy.

As we look to the future, it is clear that effective recycling is not merely a regulatory requirement, it is a vital component of our shared responsibility to protect the planet. By adopting GS1 standards and QR codes, businesses can lead the charge in transforming recycling into an efficient, user-friendly process that aligns with consumer needs.

At GS1 UK, we are committed to supporting businesses on this journey, providing the tools and frameworks required to drive meaningful change.



Anne Godfrey
CEO
GS1 UK

A new era of recycling

Polytag stands at the forefront of sustainable packaging innovation, actively partnering with GS1 UK to pioneer impactful change in the packaging sector. We believe that standardisation and interoperability are crucial to building a true circular economy.

Industries must 'speak the same language' to enable seamless data and information sharing, allowing packaging to flow efficiently from production through to recycling.

To meet this challenge, Polytag are developing scalable solutions that address the needs of both consumers and industries. Our efforts in Digital Deposit Return Schemes (DDRS) exemplify this commitment and the work we have done has provided valuable insights, proving that a DDRS model is both feasible and highly impactful.

Key findings from our pilots highlight three major advantages:

Ease of adoption: it is imperative that QR printing kits can be easily retrofitted onto existing production lines, ensuring no disruption to line speeds.

Consumer engagement: growing familiarity with QR codes allows for seamless consumer participation, with high engagement and impressive click-through rates to information-rich landing pages.

Value for money: if digital solutions are to have a meaningful impact on recycling rates, they must be accessible and affordable for businesses of all sizes.

Innovation is essential if we are to reshape recycling and create a truly circular economy. Polytag's proven, scalable solution is already gaining significant traction with major partners and together we are driving a future where recycling and sustainability become part of everyday consumer behaviour.

We believe our latest initiative with Ocado Retail represents more than just a new service—it's a step-change in how we approach packaging, recycling, and environmental stewardship.



Alice Rackley
CEO
Polytag Limited



Ocado Retail's commitment to sustainability

As the world's largest dedicated online supermarket, Ocado Retail is committed to providing unbeatable choice, unrivalled service and reassuringly good value while remaining focused on its sustainability commitments.

Sustainability is a top priority for the organisation, from their range of products, to how they make decisions and how they operate, and the integration of innovative recycling solutions across product lines is a key aim for the business.

Responsible packaging is a key pillar of Ocado Retail's "Planet Together" strategy and the retailer is actively working to minimise the use of single-use plastics and promote recyclable materials. This includes leveraging technological advancements to improve the customer experience and promote environmentally responsible practices.

By committing to these principles, Ocado Retail aims to demonstrate that sustainability and technology can go hand in hand, making a significant positive impact on the environment while also enhancing customer engagement and delivering an exceptional shopping experience.

A pioneering print method

In a significant move toward enhancing sustainable packaging, Polytag, Ocado Retail, and GS1 UK launched a groundbreaking pilot project in 2022 to assess how serialised QR codes powered by the GS1 Digital Link standard could power a DDRS.

For the first time ever, on-pack DDRS technology was implemented on over 1.6 million of Ocado Retail's fully recyclable milk cartons to evaluate printing requirements and assess how consumers would engage with and adapt to such as scheme. When scanned

by a smartphone, these codes provided Ocado Retail customers with vital recycling information, helping them understand how to properly dispose of their packaging.

The trial utilised Polytag's advanced technology to print the QR codes during production, ensuring that each product provided the necessary information for effective recycling.

Rewards for recycling: a groundbreaking first

In July 2023, the scheme entered a new phase, where customers were rewarded 20p for recycling their bottle. Conducted across various regions in England and Wales, the pilot mirrored a full-scale Digital Deposit Return Scheme (DDRS), providing valuable insights into consumer behaviour and operational efficiencies.

Upon scanning, Ocado Retail customers could also redeem deposits directly from their smartphones, creating a seamless and engaging experience.

This achieved impressive results:

- 20,000 cash rewards of 20p were issued within just 55 days.
- Over 3,000 consumers participated, actively engaging in kerbside recycling using their smartphones.
- The initiative saw an average of 350 deposit claims per day, demonstrating strong consumer interest and participation.

Building on success

By simplifying the returns process and providing instant rewards, the trial showcased the potential for broader DDRS adoption in the UK.

It also demonstrated the effectiveness of integrating digital solutions into recycling practices, the capabilities of QR codes powered by GS1, and how this technology could be effectively scaled at speed.

This work has since expanded to include a wider variety of packaging types and materials to broaden its impact and integration of Polytag's systems with Ocado Retail's platforms was improved to facilitate better data collection and analysis.

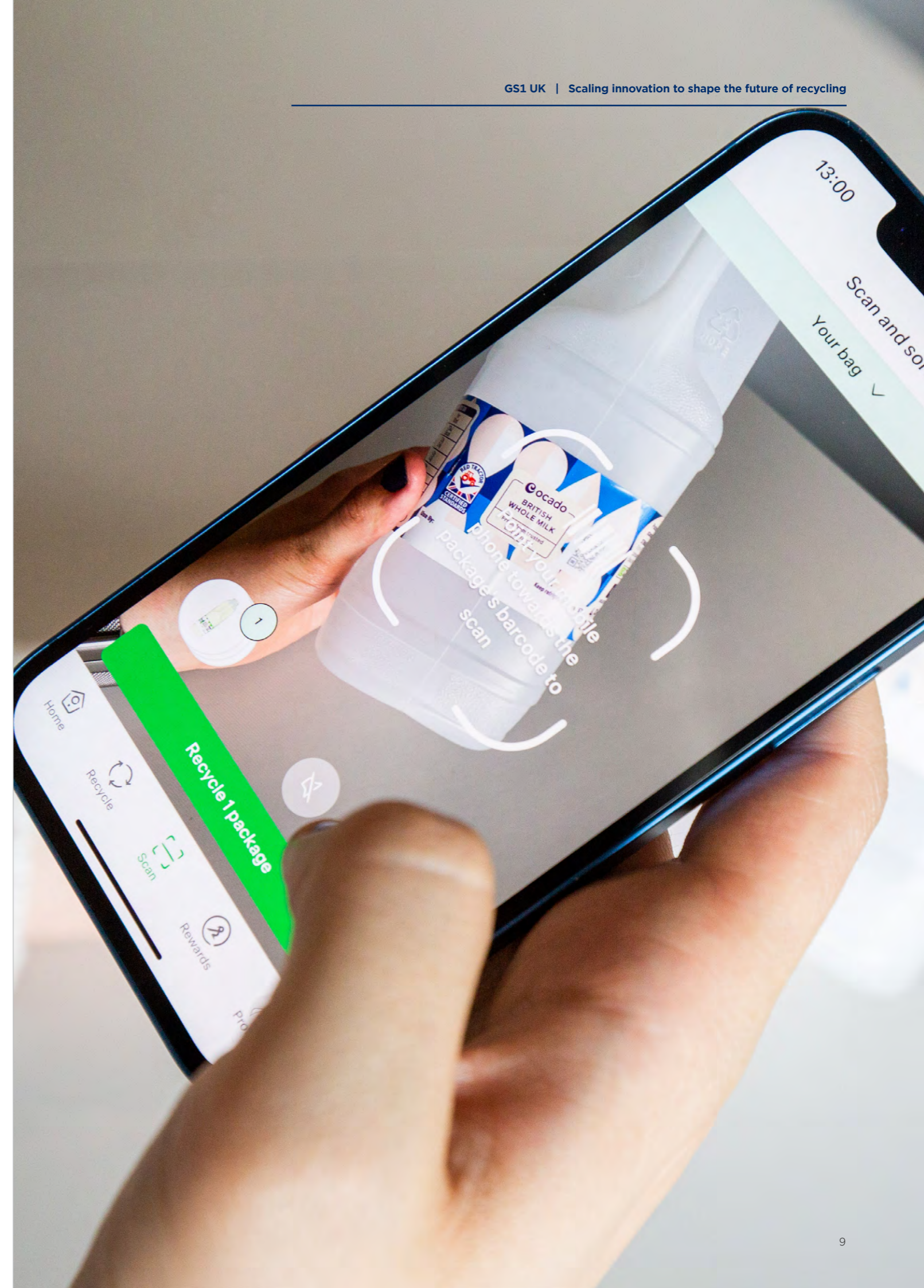
Polytag and Ocado Retail have since been engaging suppliers to drive wider adoption and capture valuable feedback for ongoing improvements. This has been supported by various marketing initiatives to raise consumer awareness and encourage greater participation.

This strategic expansion is still very much underway, positioning Polytag and Ocado Retail as leaders in sustainable packaging solutions and powering progress towards a more circular economy.

<p>£ 20,000 cash rewards in 55 days</p>	<p>3000+ participating consumers</p>	<p>£ ~350 deposit claims per day</p>
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“Our collaboration with Polytag illustrates how innovative thinking and partnerships can lead to actionable solutions in the ongoing challenge of packaging waste. As we move forward, the insights gained from this pilot will be instrumental in shaping the future of recycling, driving us closer to a circular economy where sustainability is integral to consumer choices.”

Anne Godfrey, CEO of GS1 UK



“Our aim through the expansion of Polytag QR codes, now being used across 60 products, is to We hope this will enhance transparency and strengthen our commitment to sustainability.”

Laura Fernandez, senior packaging and sustainability manager at Ocado Retail



Polytag’s solution: how it works

High speed printing

The 2022 pilot was the first-time serialised QR codes had been printed using existing plate printing techniques, a method that is very high-speed and highly optimised.

To ensure these codes could be implemented in line with Ocado Retail’s labelling requirements, Polytag collaborated with Interket, Europe’s most established self-adhesive label manufacturer, and Xact, the UK’s leading provider of coding, packaging and marking systems.

Dynamic landing pages

Ocado Retail has used Polytag’s dynamic landing pages to create content that is accessible via the QR codes. Each scan reveals tailored content specific to the individual product, managed through the Polytag dashboard. For example, scanning a two Pint Whole Milk bottle would display a different landing page than a two Pint Semi-Skimmed Milk bottle.

This hyper-relevant content drives high levels of consumer engagement and, during the Rewards for Recycling trial, encouraged users to download Sweden-based recycling app Bower.

After registering with Bower, customers were led through a user journey that includes locating nearby recycling bins, instructions for completing the recycling process, and receiving a 20p reward in their digital wallet which can be withdrawn to their bank account.

The initiative also included digital badges for recycling efforts, encouraging ongoing participation.

Enhanced engagement

With an average dwell time of over 32 seconds, these landing pages achieved remarkably high levels of engagement. This is **seven times longer than the industry average**, indicating strong consumer interest.

The seamless API connection between Polytag and Bower ensured secure, one-time redemptions, enabling real-time verification of unique serialised codes across six fresh milk products and ensuring high performance with **100 per cent** uptime.

Tagging for traceability

Polytag also introduced UV Watermarks, which are applied to packaging to trace them back to recycling centres. Using low-cost Plastic Detection Units located at Material Recovery Facilities, Polytag measures the number of bottles on plastic conveyors. This capability will provide Ocado Retail with insights into the recycling performance of their milk products, aiding in Extended Producer Responsibility (EPR) and carbon footprint calculations.

By eliminating assumptions about recycling rates, Polytag’s solutions allow brands to make data-driven decisions about their environmental impact. This initiative not only sets a precedent for sustainable practices in the retail sector but also empowers consumers and businesses alike to contribute to a circular economy.

 **32** seconds dwell time

 **7x** longer than the industry average

 **100%** uptime



The power of GS1 standards

GS1 standards and QR codes powered by GS1 present a transformative opportunity to enhance recycling efforts in the UK. By establishing a universal framework for product identification, they improve traceability and data accuracy across the recycling supply chain.

One of the primary advantages of GS1 standards is the creation of unique identifiers for packaging materials. When integrated into QR codes, these identifiers empower consumers to access vital information regarding the recyclability of products.

By scanning the QR code, consumers can instantly learn how to dispose of packaging correctly - whether it can be recycled kerbside must be taken to a specialised facility. This immediate access to clear guidance helps reduce contamination in recycling streams and encourages responsible consumer behaviour.

Additionally, GS1 standards facilitate better communication between manufacturers, retailers, and

waste management authorities. Real-time data on the types and quantities of materials being recycled allows stakeholders to make informed decisions about collection methods and processing capabilities. This data-driven approach not only improves recycling rates but also optimises resource allocation.

Manufacturers can work together to standardise packaging and labelling, ensuring that consumers receive consistent guidance. This unified approach will drive greater awareness and participation among consumers and collaboration between stakeholders, benefiting both the environment and society as a whole.

“By integrating our Digital Link QR codes, powered by GS1, we’re not only enabling the reuse process, but we’re also providing new ways to quantify the success of sustainability programmes through accurate tracing of packaging through the supply chain.”

Alice Rackley, CEO of Polytag

Challenges and learnings

This expanded pilot proved to be even more successful than the first.

Over the course of 56 days, consumers redeemed over 20,000 rewards, demonstrating significant engagement.

Throughout the trial, both Bower and Ocado Retail conducted surveys to gather feedback and assess customers preferences. **71 per cent** of those surveyed expressed a preference for using a QR code to claim their deposit back, highlighting the potential for digital solutions for encouraging recycling.

The trial also showcased remarkable user engagement, with an **85 per cent** conversion rate. More than eight out of ten participants registered on the Bower app during the trial, far exceeding typical registration rates for similar coupon and reward apps, which typically average at around **60 per cent**.

93 per cent of Bower users responded positively to the scheme and **87 per cent** of those who scanned their empty packaging also recycled it, demonstrating a clear appetite for recycling and the effective integration of digital solutions.

The pilot presented a number of practical challenges that required careful consideration and planning. For example, it was crucial to ensure that the addition of these codes did not interfere with the manufacturing process or lead to increased costs for retailers. To address these concerns, Polytag and Ocado Retail

focused on a seamless integration strategy, which included working closely with production teams to minimise disruptions.

Codes were printed onto the web of labels, digitally finishing eight labels concurrently. The labels were plate printed and then finished digitally with thermal inkjet heads at standard industry speeds. Polytag's printing partner Xact, worked to ensure there was little to no disruption or downtime to the printing line and the kit used to print the QR codes was retrofitted to the finishing station and could easily be switched on and off.

Creating a user-friendly experience to drive the desired levels of consumer participation also required careful planning. This involved thorough testing and feedback loops to refine the app and the overall process, ensuring that it was accessible to a wide audience.

All QR codes needed to be readable, which required thorough monitoring and quality control while development work was necessary on both Polytag's and Bower's ends to ensure that the API connection functioned smoothly. Throughout this process, close collaboration was crucial to maintaining the integrity of the data and enhancing the user experience.



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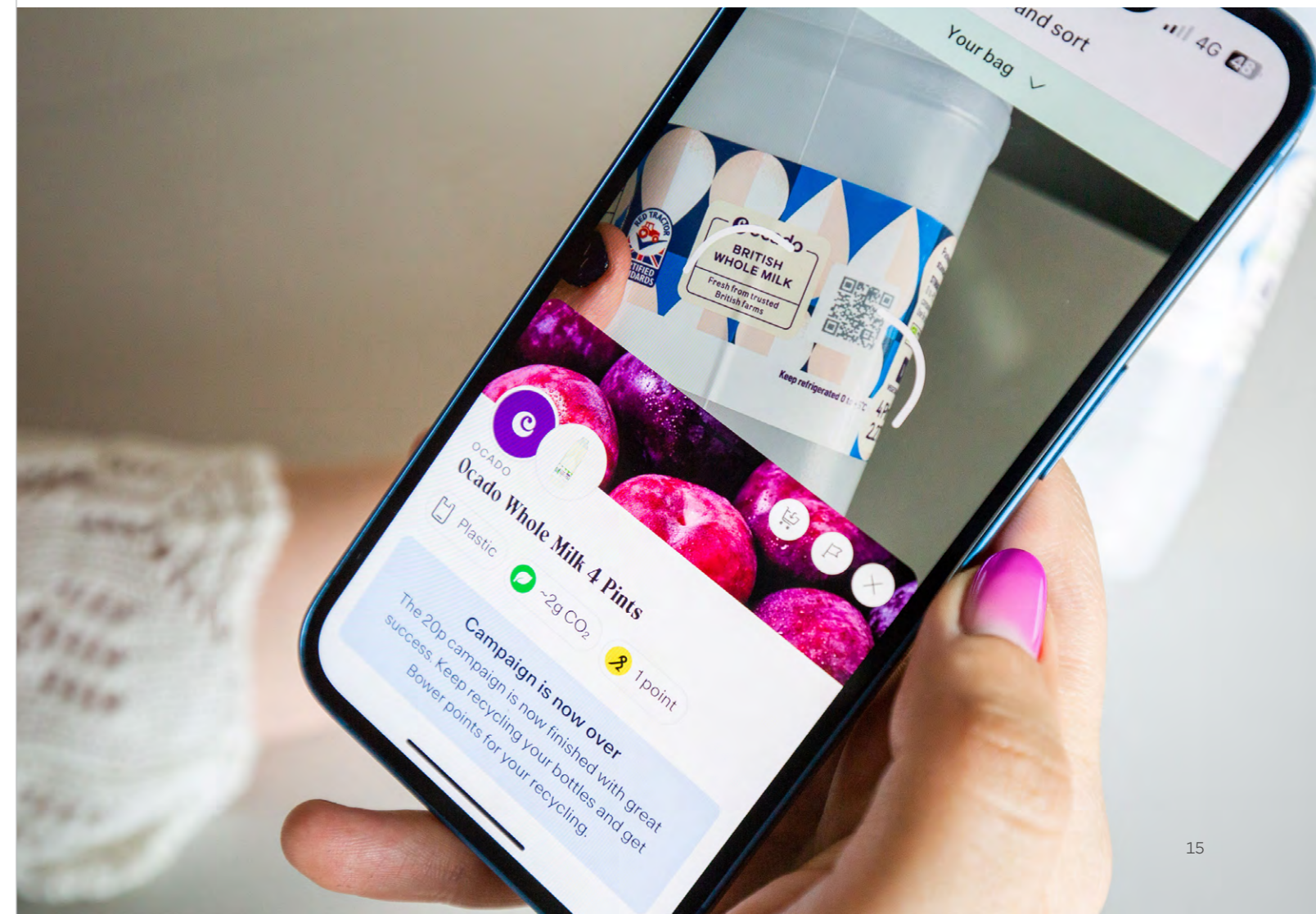
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What's next?

This expanded pilot was just the beginning of Polytag's journey with Ocado Retail. Over 60 products across Ocado Retail's food, drink, and household product ranges now feature Polytag's QR codes powered by GS1, empowering consumers to delve deeper into product information and sustainability practices with one simple scan.

As well as vital storage and recycling tips to minimise waste, Ocado Retail is now using QR codes to share their commitment to ethical sourcing through partnerships with the Rainforest Alliance and Fairtrade Foundation, while exploring the sustainable journeys behind their food and household products.

Building on this momentum, Ocado Retail is also trailing reusable and refillable packaging for its own-brand essentials, including pasta, rice, and washing liquid, utilising Polytag QR codes on labels. This further underscores Ocado Retail's dedication to promoting sustainable consumption and Polytag is now actively scaling these initiatives across additional SKUs.

The future of recycling

The high participation rates, strong consumer engagement and positive user feedback serve as proof of concept for implementing DDRS on a national scale.

The impressive number of items returned, and deposits redeemed within such a short timeframe also demonstrates the importance of designing recycling schemes that engage consumers, provide convenience, and encourage them to take greater accountability. This will be crucial for laying robust foundations for the future legislation and industry standards required to support the shift towards a more circular economy.

Looking ahead, the expansion of Polytag and Ocado Retail's innovative model to include a broader range of products and retailers is not only viable, but necessary. We must continue to drive innovation in digital

recycling, refining and scaling solutions to ensure they meets the evolving needs of consumers, industry and the environment.

Collaboration between government bodies and industry stakeholders will be essential in this next phase and powerful partnerships such as this serve as a shining example of best practices and standardisation.

By working together, we can create an environment where innovative recycling solutions can thrive, amplifying the impact of DDRS initiatives to ensure their integration into the fabric of everyday consumer behaviour.

The Polytag and Ocado Retail pilot is a catalyst for transformative change in the UK's approach to packaging waste and recycling.

The initial successes and lessons learned from this initiative show that digital solutions can shape the future of recycling, driving the UK towards a circular economy where resources are valued, waste is minimised and accountability is shared.

The journey has only just begun, but the path ahead is clear, and the potential is vast.

“Our world-first trial in 2023 was just the beginning of all of this. As the largest deployer of QR codes powered by GS1 in the UK grocery market, Ocado Retail has found our platform easy to integrate, enhancing their packaging design with endless digital possibilities.

“We're beyond proud to support Ocado Retail in delivering both convenience and an impactful sustainability message.”

Alice Rackley, CEO of Polytag



About Ocado Retail

Ocado.com (operated by Ocado Retail) is the world's largest dedicated online supermarket, and is a joint venture between Marks & Spencer Group and Ocado Group.

Reaching over 80% of the UK population, more than 1 million active customers benefit from an unbeatable range of around 50,000 products (including big-name brands, more than 7,000 items from the M&S food and drink range and Ocado's Own-Range), unbeatable service with next-to-no substitutions, and the freshest produce. Every order is carefully packed in one of seven distribution centres using world-leading software and technology. Shopping is then delivered directly to customers using a network of regional spokes and fleet of delivery vans.

Ocado developed the first grocery shopping app in 2010 and continues to innovate, offering customers the best possible experience. Ocado Retail is also responsible for Zoom by Ocado, its rapid grocery delivery service.



About Polytag

Polytag is a cutting-edge technology company transforming recycling by providing innovative solutions for brands, retailers, and recyclers. Its system enables the tagging and tracking of packaging, promoting transparency and efficiency across waste management sectors.

Using QR codes and UV watermarks, businesses can trace packaging throughout its lifecycle, while GS1-compliant barcodes allow tills to read packaging details. Polytag empowers citizens to interact with packaging via smartphones, earning rewards for recycling and driving behavioural change. Polytag bridges the gap between consumers, producers, and waste processors, fostering a circular economy and reducing environmental impact.

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About GS1 UK

Whether online, in store or in a hospital, the common language of GS1 global standards is helping our community of more than 60,000 organisations across the UK to uniquely identify, describe and track anything, creating greater trust in data for everyone.

From product barcodes to patient wristbands, GS1 standards have been transforming the way we work and live for 50 years. We are now embarking on the next 50 years of industry transformation delivered through QR codes powered by GS1.

GS1 UK is one of 118 neutral and independent GS1 organisations operating worldwide.

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