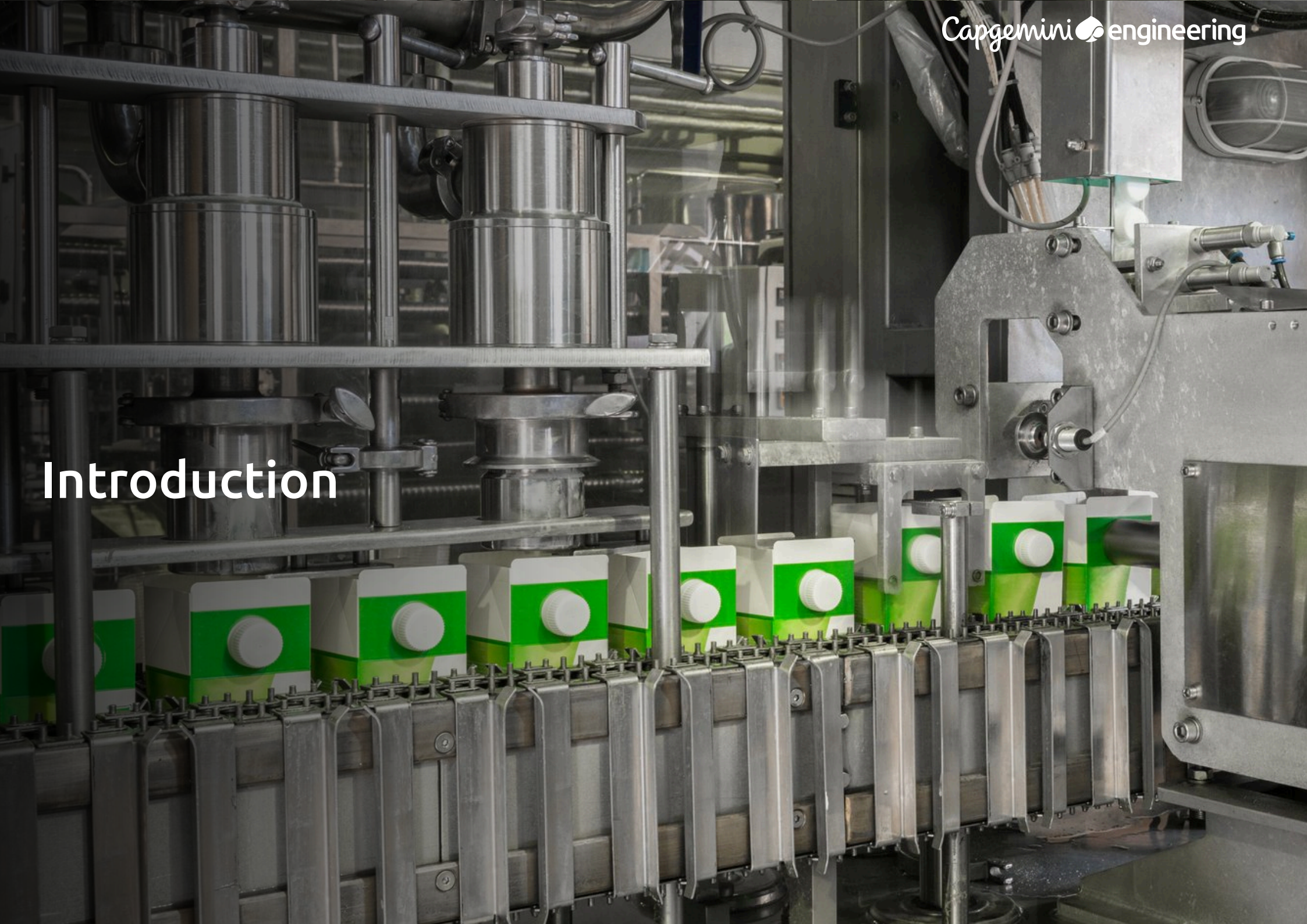


Food
packaging



Introduction



Food processing - defined by Encyclopedia Britannica as *“any of a variety of operations by which raw foodstuffs are made suitable for consumption, cooking, or storage”* - can be thought to date back to when humans began using fire for cooking 250,000 years ago.

Modern food processing came in the early 1800s, when the military necessity of providing long lived food for deployed soldiers led to Peter Durand, an English merchant, being granted the first patent for a process of food preservation via canning.

More than 200 years later, our modern food industry is poised to make another major technological leap. This leap will not come from fire or tin, but by the adoption of cutting-edge digital approaches that are already emerging in other sectors – approaches which are being used to increase efficiency, scalability, and innovation, whilst cutting costs and emissions.

Taking in four contributions from Capgemini’s leading experts in food and beverage technology and processes, this report will explore how companies can use these powerful digital approaches to solve longstanding problems and transform how they do business for the better.

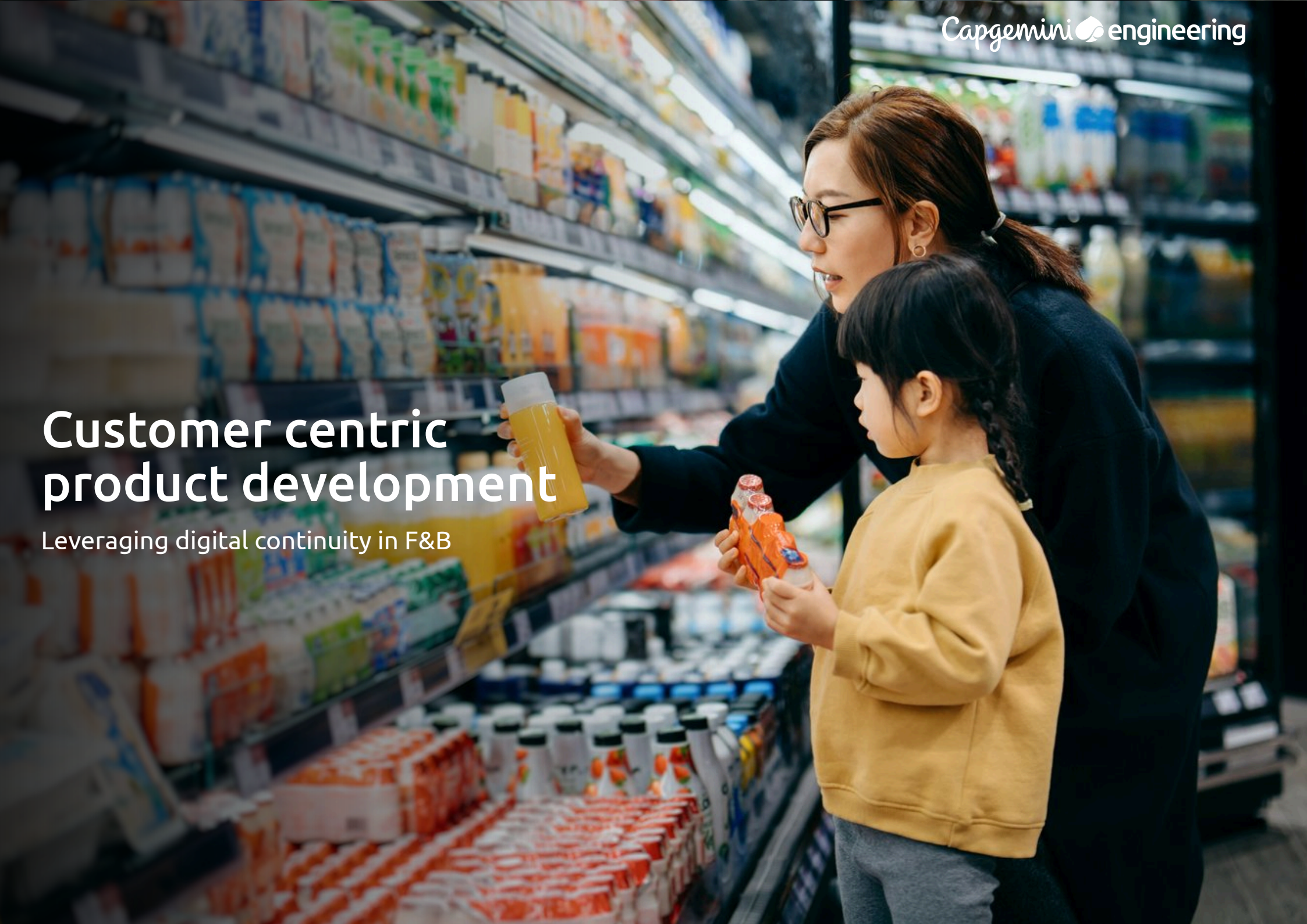
This includes:

- **Customer centric product development:** Leveraging digital continuity in F&B
- **A revolution in food packaging:** How (and why) product lifecycle management will transform the industry
- **Ensuring quality and compliance:** A digital approach to food safety standards
- **Sustainability in food production:** A digital approach to environmental impact

We hope that you enjoy and learn a lot from this point of view and invite you to connect with us on [LinkedIn](#).

Customer centric product development

Leveraging digital continuity in F&B



In the fast-paced and highly competitive Food and Beverage (F&B) industry, staying ahead of the curve requires more than just innovative recipes and efficient production processes. Today, success hinges on understanding and satisfying the ever-evolving preferences of consumers.

This is where the concept of customer-centric product development comes into play, and one of the keys to achieving it is leveraging the power of digital continuity. In this blog post, we'll explore how digital continuity is transforming the F&B industry by enabling a customer-centric approach to product development.

Understanding customer-centric product development

Customer-centric product development is a strategic approach that places consumers at the core of the innovation process. Instead of relying solely on historical data and the product developers' gut feelings, businesses prioritize gathering real-time insights and feedback from customers to guide product development efforts.

This approach results in products that align more closely with market demands, leading to increased customer satisfaction and brand loyalty.

Historically, F&B product development has been characterized by a series of challenges:

- **Lack of real-time insight:** Traditional product development often relies on periodic surveys, market research, and manual data collection, leading to delays in obtaining insights into consumer preferences.
- **Rigid processes:** Long development cycles, coupled with rigid processes, make it difficult to adapt to rapidly changing consumer trends and preferences.
- **Inefficiency:** Paper-based documentation, disjointed communication, and siloed data slow down the development process and hinder innovation.
- **Limited traceability:** It can be challenging to track the evolution of a product idea and the rationale behind decisions, which can hinder informed decision-making.



The role of digital continuity

Digital continuity, in the context of the F&B industry, refers to the seamless flow of information and knowledge throughout the product development lifecycle. It encompasses the integration of data from various stages of product development – from concept and design to manufacturing and distribution. Leveraging digital continuity involves using digital tools and platforms to connect teams, systems, and processes to enable more efficient and customer-centric product development.

How digital continuity enhances customer-centric product development

- **Real-time data collection:** Digital platforms enable real-time data collection from various sources, including social media, customer feedback, and sales data, offering immediate insights into consumer preferences.
- **Data-driven decision making:** Digital continuity facilitates the collection and analysis of vast amounts of data. This data can be used to identify emerging trends, consumer behavior patterns, and market demands, helping businesses make more informed decisions about product development.
- **Enhanced product customization:** Digital continuity allows for more personalized product development. By analyzing data on a customer's individual preferences and purchase history, businesses can offer tailored products and experiences to their customers.

- **Digital prototyping:** The use of digital tools allows for rapid prototyping and experimentation, reducing time-to-market and the risk associated with new product launches.
- **Product lifecycle transparency:** Every decision made during the product development journey is recorded and easily traceable, ensuring transparency and accountability.
- **Cross-functional collaboration:** Digital continuity fosters collaboration between different departments, from R&D to marketing. This means that insights gained from customer feedback can be quickly communicated and acted upon, reducing the time it takes to bring consumer-desired products to market.





Case in point: Coca-Cola's Freestyle machines

Coca-Cola's Freestyle machines are a prime example of how digital continuity can drive customer-centric product development. These touch-screen dispensers offer over 100 different drink options, and they collect data on which flavors are most popular in real time. Coca-Cola uses this data to introduce new flavor combinations, creating a more personalized and engaging experience for its customers.

The future: remaining relevant as customer needs change

In the F&B industry, staying relevant and competitive means adapting to the changing demands of consumers. Customer-centric product development, powered by digital continuity, is the key to achieving this.

By harnessing real-time data, facilitating cross-functional collaboration, and responding swiftly to market shifts, businesses can create products that resonate with their audience. The result is not only satisfied customers, but also a more agile and innovative F&B landscape that can anticipate and meet the ever-evolving needs of the market.

The first post titled "[Innovation in Food Packaging](#)" summarizes How (and Why) Product Lifecycle Management will transform the Food Packaging Industry.

A revolution in food packaging

How (and why) product lifecycle management will transform the industry



Food packaging is an integral part of the modern food industry, ensuring the safety, freshness, and quality of products as they make their way from the manufacturer to the consumer's table.

Over the years, food packaging has evolved significantly, driven by changing consumer preferences, sustainability concerns, and advancements in technology. One of the key drivers of this evolution is the integration of digital technologies into product lifecycle management (PLM). In this blog post, we will explore how digital innovation is transforming food packaging – and why it matters.

The changing landscape of food packaging

The food industry has witnessed a profound transformation in recent years. Consumers are increasingly seeking products that align with their values, such as sustainability, health, and convenience. Food packaging plays a crucial role in meeting these evolving demands.

1. Sustainability: Environmental consciousness has become a top priority for consumers and food producers alike. Innovations in sustainable packaging materials, reduced packaging waste, and eco-friendly design have become vital for businesses. Digital PLM tools can help companies design, evaluate, and optimize sustainable packaging solutions, reducing their carbon footprint and enhancing their brand's eco-credentials.

2. Food safety: In the age of global supply chains, ensuring food safety is more complex than ever. Digital solutions like blockchain and IoT (Internet of Things) sensors enable real-time monitoring of products throughout their journey, from the farm to the table.

This transparency ensures that any potential issues can be addressed promptly, reducing the risk of foodborne illnesses.

3. Consumer engagement: Today's consumers are tech-savvy and expect more from their food packaging. Augmented reality (AR) and QR codes on packaging allow consumers to interact with brands in innovative ways. This not only provides a unique experience, but also offers an avenue for brands to share information about the product, its origin, and its impact on health and the environment.

4. Customization: With digital tools, businesses can customize packaging to meet individual customer demands. Personalized packaging not only enhances the consumer experience, but also helps brands stand out in a crowded marketplace.



The role of digital PLM in food packaging

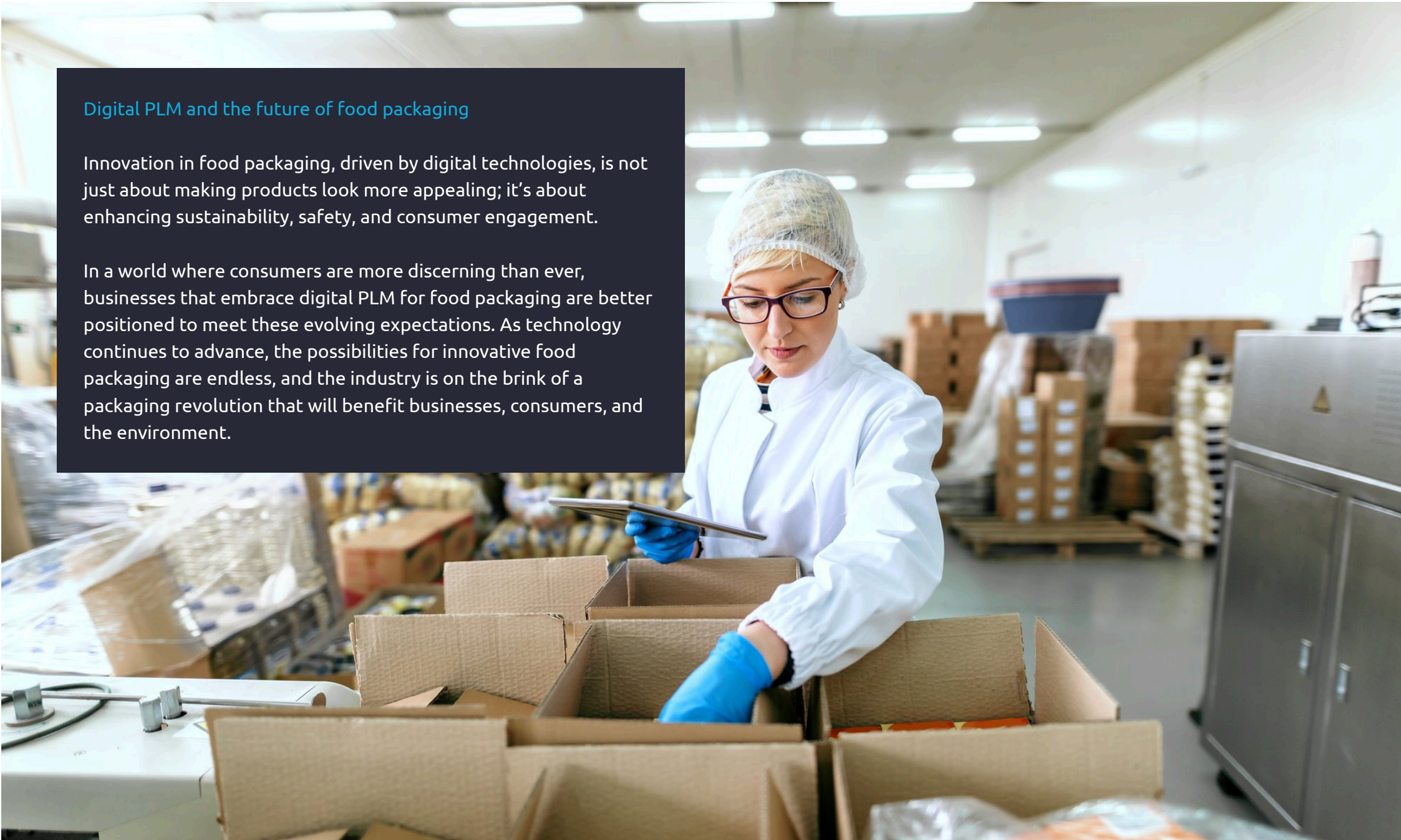
Product Lifecycle Management (PLM) is the process of managing the entire lifecycle of a product – from its initial concept through design, development, and manufacturing to service and disposal. When applied to food packaging, digital PLM can revolutionize the industry:

1. **Design and prototyping:** Digital tools allow for rapid prototyping and testing of packaging designs. This reduces time-to-market and helps companies innovate faster.
2. **Material selection:** The ability to analyze the environmental impact of different packaging materials is crucial in a sustainability-conscious world. Digital PLM tools can help in selecting the most eco-friendly materials for packaging.
3. **Quality control:** IoT sensors integrated into packaging can monitor factors like temperature, humidity, and physical stress, ensuring that products remain safe and of high quality.
4. **Supply chain visibility:** Blockchain technology ensures end-to-end traceability, reducing the risk of food fraud, and providing real-time insights into a product's journey.
5. **Consumer feedback integration:** Digital PLM systems can collect and analyze consumer feedback, providing insights for continuous improvement and product development.
6. **Regulatory compliance:** Keeping up with ever-changing food safety regulations can be challenging. Digital PLM tools can help businesses stay compliant by tracking and managing the relevant documentation and standards.

Digital PLM and the future of food packaging

Innovation in food packaging, driven by digital technologies, is not just about making products look more appealing; it's about enhancing sustainability, safety, and consumer engagement.

In a world where consumers are more discerning than ever, businesses that embrace digital PLM for food packaging are better positioned to meet these evolving expectations. As technology continues to advance, the possibilities for innovative food packaging are endless, and the industry is on the brink of a packaging revolution that will benefit businesses, consumers, and the environment.



Ensuring quality and compliance

A digital approach to food safety standards



According to [data released by the World Health Organization \(WHO\) in 2022](#): “...an estimated 600 million – almost 1 in 10 people in the world – fall ill after eating contaminated food and **420,000 die every year**, resulting in the loss of **33 million healthy life years** (DALYs) ...children under 5 years of age carry 40% of the foodborne disease burden, with **125,000 deaths every year.**”

Food safety has always been paramount, today is no different. Ergo, in the ever-evolving landscape of the food and beverage industry, ensuring the quality of products is of paramount importance.

The global nature of the food supply chain, increased consumer awareness, and changing regulatory requirements make it essential for businesses to adopt innovative approaches to food safety standards.

One such approach that is gaining momentum is the use of digital technology. In this blog post, we'll explore how a digital approach can revolutionize the way we manage and monitor food safety standards, ultimately benefiting both businesses and consumers.

The traditional challenges of food safety

Traditionally, food safety has been managed through a combination of manual record-keeping, periodic inspections, and reactive measures to address issues. While these methods have served the industry for many years, they come with several challenges:

- **Human error:** Manual processes are susceptible to human error, which can lead to data inaccuracies and compliance issues.
- **Inefficiency:** Paper-based record-keeping and manual inspections are time-consuming and labor-intensive, often leading to delayed responses to safety concerns.
- **Limited traceability:** Traditional methods make it difficult to trace the origins of food products, making it harder to identify and isolate contaminated batches.
- **Regulatory compliance:** Staying up to date with evolving food safety regulations can be a daunting task, especially when relying on manual processes.



The digital revolution in food safety

The adoption of digital technology has transformed how the food industry approaches safety standards. Here are some key aspects of this digital revolution:

- **Real-time monitoring:** Digital systems allow for real-time monitoring of critical control points in the production process. Sensors, connected devices, and data analytics enable the immediate detection of any deviations from safety standards.

- **Data-driven insights:** Digital platforms can collect and analyze vast amounts of data, providing businesses with valuable insights into their operations. These insights can help identify trends, predict potential issues, and make informed decisions.
- **Enhanced traceability:** Blockchain and other technologies provide end-to-end traceability of food products. Consumers can access information about a product's journey from farm to table, enhancing transparency and trust.
- **Automation:** Automation reduces the risk of human error by streamlining processes. Quality control checks, temperature monitoring, and sanitation routines can be automated, ensuring consistency and compliance.
- **Regulatory compliance management:** Digital platforms can be equipped with compliance tracking and reporting features, making it easier for businesses to stay in line with the latest regulations. This proactive approach helps avoid costly penalties and recalls.



Benefits of a digital approach

The shift toward a digital approach to food safety standards offers several significant benefits:

- **Improved product quality:** Real-time monitoring and data analysis enable early identification of issues, allowing for immediate corrective actions. This, in turn, leads to improved product quality and reduced waste.
- **Enhanced consumer confidence:** With increased transparency and traceability, consumers can make more informed choices about the products they buy, ultimately building trust in brands and the industry.
- **Cost savings:** Automation and efficiency improvements can lead to long term cost savings. Fewer recalls, reduced product losses, and streamlined operations all contribute to a healthier bottom line.
- **Adaptability:** Digital solutions are scalable and adaptable to the food industry's evolving needs. They can accommodate changing regulations, emerging threats, and growing consumer demands.



Conclusion: towards safer, better food production

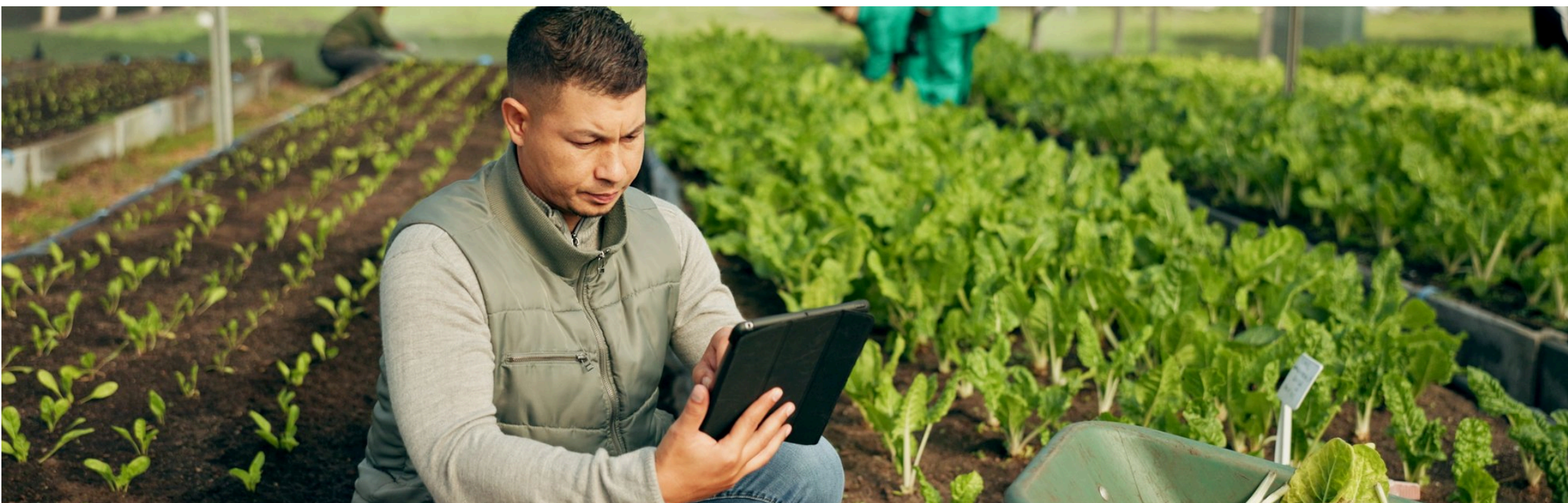
The digital revolution in food safety standards is not merely a trend; it's a necessity.

Businesses that embrace digital technology to enhance safety and quality standards will not only thrive in an increasingly competitive market but also contribute to the overall well-being of consumers. This transformation is not about replacing human expertise but augmenting it with tools that make food production safer, more efficient, and more transparent. By doing so, the industry can meet the challenges of today and tomorrow while maintaining consumer trust.

Sustainability in food production

A digital approach to environmental impact





According to [data released by the World Food Programme \(WFP\) in 2021](#): “Around one third of food produced for human consumption is either lost or wasted, amounting to a **financial loss of about US\$1 trillion annually**... food loss and waste are prevalent in a world where enough food is produced to feed the world’s 7 billion people, yet **811 million people still go to bed hungry each night.**”

The WFP also reports that food loss and waste account for over 3 billion tons of greenhouse gases per year. If this were a country, it would be the third largest producer of greenhouse gases in the world, after the US and China. And, as the world grapples with the urgent need to address

climate change and its associated challenges, sustainability has become a priority in virtually every industry – food production is no exception.

Food production is a major contributor to environmental degradation, and finding sustainable solutions to mitigate its impact has become paramount. In this post, we will explore how a digital approach is revolutionizing food production and enabling the industry to reduce its environmental footprint.



The environmental challenge

Food production is a multifaceted industry that includes agriculture, a complex supply chain, and significant resources to produce finished goods. It starts with food grown around the world. Prices are agreed, with crops and meats shipped (often over great distances) under carefully controlled conditions. Products are treated and produced in factories to precise recipes, then are packaged and shipped again to retailers and supermarkets to finally be sold to the customer.

This all comes at a considerable environmental cost. It contributes to water use, greenhouse gas emissions, and single-use plastics waste. As the population continues to grow, the demand for food increases, further straining our planet's resources.

Sustainability: the imperative

Sustainability in food production involves producing food in a way that meets our current needs, without compromising the ability of future generations to meet their own. There are many dimensions to consider when addressing environmental, social, and economic concerns. The incorporation of sustainable practices is critical, but is a significant challenge, given the complexity of the industry.

The digital transformation

The integration of digital technologies in food production is paving the way for innovative solutions to tackle sustainability challenges. Here's how a digital approach is changing the game.

1. IoT and smart manufacturing

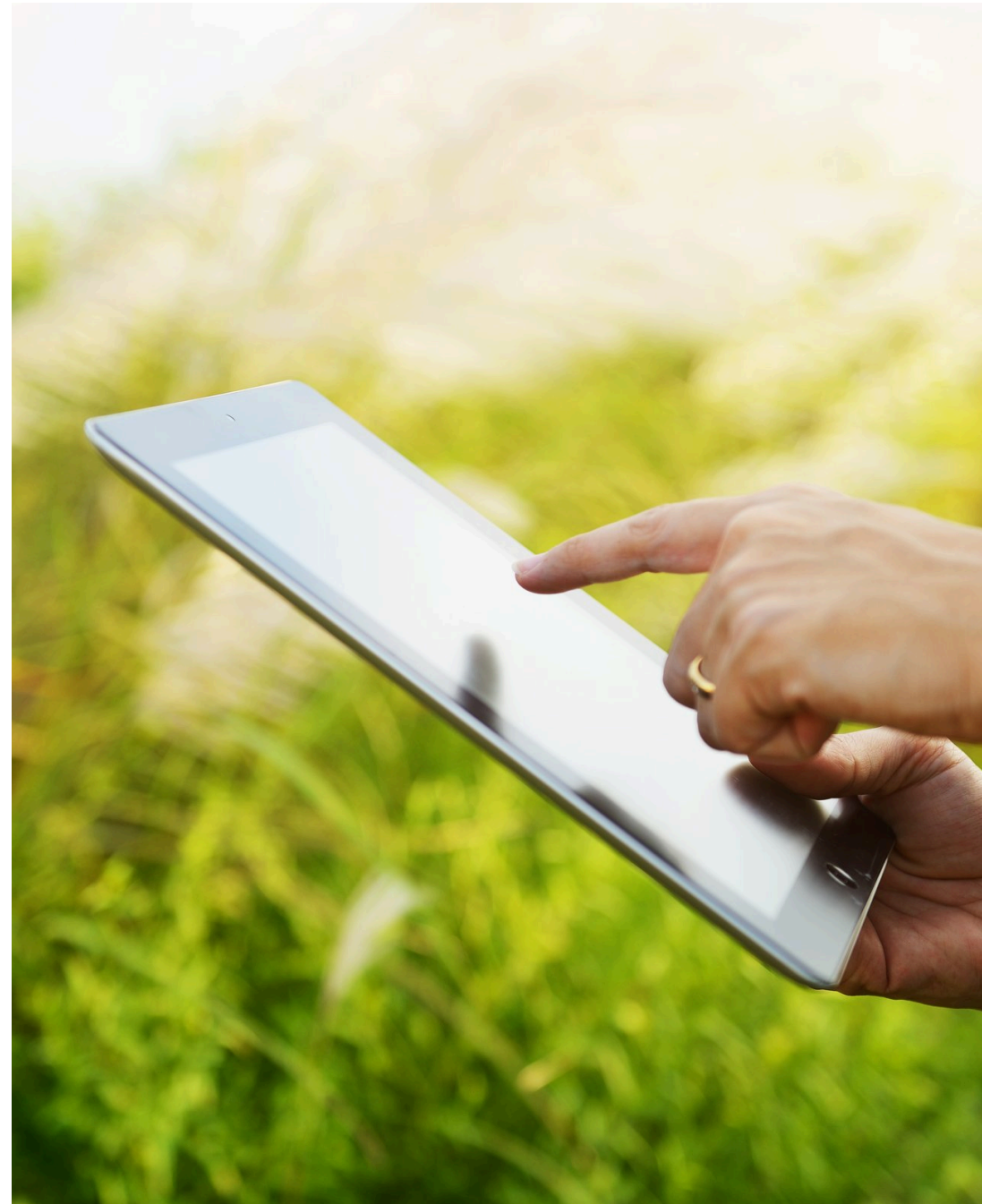
- Internet of Things (IoT) devices enable real-time data collection within the factory..
- Smart Manufacturing applications can track energy and water usage, tied back to recipe and process development. Optimizations can be made to reduce energy and water consumption.


2. Data analytics

- Advanced analytics and machine learning algorithms can process vast amounts of data to predict yields and detect supply chain disruptions, based on disease outbreaks.

3. Supply chain optimization

- Tracking sustainability metrics from vendors and co-manufacturers enables better reporting and the ability to focus on impactful initiatives.





The benefits of a digital approach to sustainability

1. Resource efficiency

- Reduced resource consumption, such as water and energy, leads to lower environmental impact.

2. Reduced packaging waste

- Enhanced packaging design tools can lead to less material usage and/or more compostable material usage in product packaging.

3. Lower emissions

- Optimized supply chains and reduced energy usage in manufacturing decrease greenhouse gas emissions.

4. Sustainable sourcing

- Enhanced transparency in supply chains supports responsible sourcing practices.

Conclusion: nourishing the world, safeguarding the planet

Sustainability in food production is no longer an option; it's a necessity.

As the global population continues to grow and environmental pressures mount, we must find innovative solutions to ensure a sustainable future. The integration of digital technologies into food production is revolutionizing the industry, offering a promising path to reduce its environmental impact.

By embracing a digital approach, we can make significant strides toward a more sustainable and eco-friendly food production system. It's time to harness the power of technology to nourish the world, while safeguarding our planet for generations to come.

Want to learn how a digital approach can help us to reduce the environmental impact of food production and be more sustainable, or find out how to implement it in your business? Connect with Michael now.

Want to read more? In previous articles in this blog series, we cover how digital technology can transform food packaging , product development and quality & compliance.

- [Customer-Centric Product Development and Digital Continuity](#)
- [A revolution in food packaging](#)
- [Ensuring quality and compliance](#)



Conclusion



As we embark on this journey of digital transformation in food processing, it's crucial to understand the magnitude of the challenges we face and the potential impact of innovative solutions. According to a report by Capgemini, [Food Waste – the \\$400 billion opportunity](#), published in June 2022, the scale of food waste is staggering. It estimates that approximately **370 million metric tons of food** is lost in processing, storage, and distribution.

This staggering figure highlights the urgent need for innovative solutions to address inefficiencies within the food industry. This waste not only represents a significant economic loss, but also exacerbates environmental concerns, contributing to greenhouse gas emissions and biodiversity loss.

It's not just about technology

As such, it is imperative to recognize the potential of digital approaches to revolutionize not only how we produce and consume food, but also how we address longstanding challenges and inequality.

Indeed, the Capgemini report further reveals that reducing food waste by just 25% could feed approximately **870 million people globally**, underlining the significant social and humanitarian implications of addressing this issue. It also highlights the potential for digital technologies to **reduce food waste by 20% by 2030**. The contributions from Capgemini's experts underscore the pivotal role that digital technologies can play in driving efficiency, scalability, innovation, and sustainability across the food and beverage sector.

So, as we embark on this journey of digital transformation in food processing, let us harness the power of innovation to create a more resilient, sustainable, and inclusive food system for generations to come. The fusion of tradition with cutting-edge technology paves the way for a future where food processing is not only about nourishment - but also about empowerment, resilience, and sustainability.

We hope that you enjoyed and learnt from this point of view. We invite you to [connect](#) with us.

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