



# INDUSTRY 4.0

Opening a door to new opportunities for the food and beverage industry



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## EXECUTIVE SUMMARY

Robots. Artificial Intelligence. Complex algorithms that take decisions for you before you even knew they needed to be taken. Machines that 'talk' to each other and take action about the goods they are producing. Vehicles that drive themselves, and alert you to the fact that they are about to break down before they actually do so.

Welcome to the world of Industry 4.0, the term that's becoming used to frame together some of the current trends in industry around digitalisation, automation and data exchange in manufacturing technologies.

Industry 4.0 is about smart manufacturing: fully-integrated collaborative systems that respond in real time to meet changing demands and conditions in the factory. It is the next, decisive, leap in industrial history, where automation combines with IT networks and systems – enriched through live and constantly-available data and analytics – to drive operations more efficiently and effectively.

The concepts behind Industry 4.0 are so broad, and the scale of the opportunities sometimes so unknown, that many food manufacturers could understandably be forgiven for struggling to understand how the technologies affect them. Which are most relevant for their business - and which are still a 'work-in-progress.'

The good news is that the integration of the processes offered by the technologies behind Industry 4.0 can help food manufacturers meet many of the current demands being placed on them, be they about enhancing food safety, better managing their supply chains, ensuring the greatest profitability in a complex, competitive world, or being able to respond flexibly to changing consumer demands.



On one level, Industry 4.0 will be all about making people's jobs easier. However, it raises fundamental issues about what sort of jobs will be created in the years ahead, and what skills will be needed to fill them. How can we train or retrain employees to embrace the new work culture that this entails, and change mindsets to embrace a new era of increasing automation positively?

Industry 4.0 is also important because it will enable – and require – food and beverage manufacturers to take a new approach towards their businesses: one that involves greater imagination in terms of successfully envisaging the future, greater integration of processes, and a greater need for clarity around outcomes and how a firm is going to achieve them.

This white paper offers food manufacturers help in how to meet these demands.

It will help food manufacturers gain an understanding of the full opportunities available, and the sorts of investments or changes in existing processes they might need to make if they are to seize them. It also examines what 'best practice' looks like, and how businesses can decipher some of the more technical aspects of the concepts involved.

Most importantly, food manufacturers need to forge new partnerships across industries and seek new allies to navigate the new world.

Some of the changes can be daunting; some of the language and concepts baffling. But with the right partners to go on the journey with them, thanks to Industry 4.0 they will be far better placed to thrive in an increasingly competitive world.



Industry 4.0 |

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## INDUSTRY 4.0: WHAT IT IS AND WHY IT IS IMPORTANT

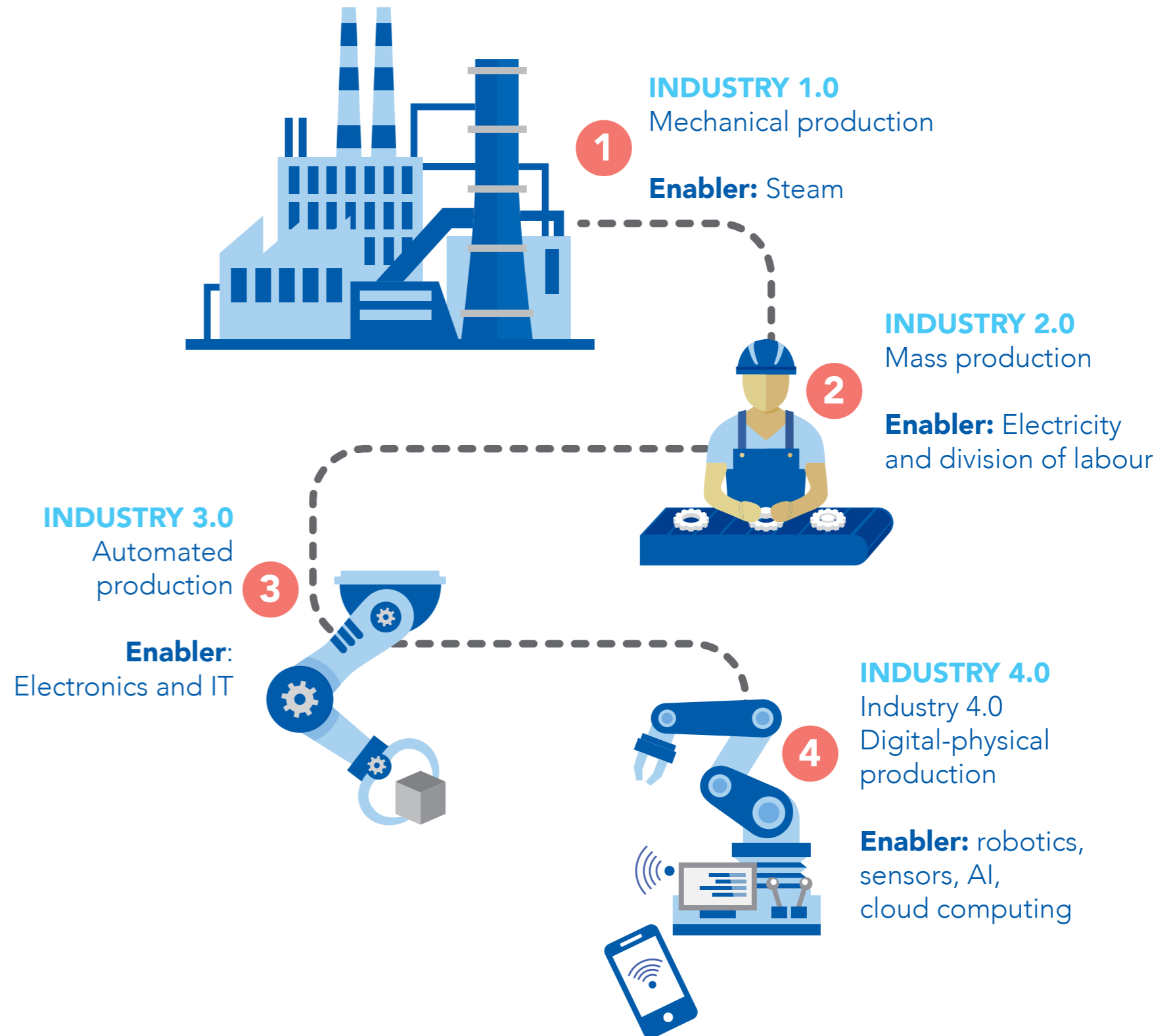
At its heart Industry 4.0 is a relatively simple concept. It involves pulling together recent opportunities presented by digitalisation, the Cloud and the Internet of Things, leading to smarter solutions for factories and processes.

It's called Industry 4.0 because it represents the fourth great leap in technology since the dawn of the industrial age. Each has brought its own set of challenges and forced industry to adapt the way it operates. But the opportunities created by those businesses flexible and far-sighted enough to seize them have been enormous.

**The first stage**, which we could perhaps call Industry 1.0, was the classic age of the Industrial Revolution, as steam power mechanised the work that was previously the result of human endeavour in the workplace.

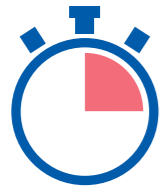
**The second stage**, Industry 2.0, was sparked by the use of electricity and led to the assembly line and many of the modern techniques of mass production.

**Industry 3.0** came about with the unleashing of computer power on the process of production, with machines and robots replacing workers on assembly lines.



**Industry 4.0** – which brings together computers driven by machine-learning algorithms in an entirely new and connected way – is therefore just the latest in a series of

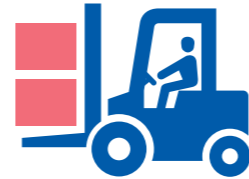
points-in-time which have allowed for a transformation of the manufacturing process. Each of these leaps has, in its turn, allowed businesses to:



**Increase productivity**  
allowing businesses to operate more efficiently and produce more.



**Reduce costs**  
thanks to a continuous process of automation.



**Deliver**  
increased profitability more swiftly.



**More quickly respond**  
to the changing demands of their customers.



**Embrace new ways of working**  
and partner with their employees to create new jobs through the upskilling of their workforce.

By embracing the opportunities offered by Industry 4.0, a company can increase its productivity, producing more from less – the very outcomes that defined the three leaps forward that preceded it.

So how can the food and beverage industry benefit from these changes?

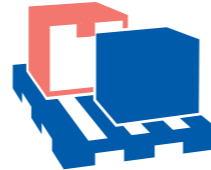
## INDUSTRY 4.0 – BRINGING TOGETHER THE FOUR LEVELS OF A COMPANY'S OPERATIONS

Industry 4.0 allows businesses to optimise the four levels of their operations by giving greater oversight of the whole process, ensuring greater traceability and performance monitoring, and allowing more intelligent decision making.

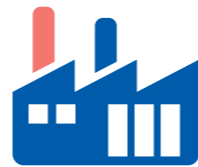
Those four levels are:



1. **'THINGS'**: Individual parts of individual pieces of equipment such as sensors collecting data which allows businesses to monitor how a particular part is performing.



2. **'EQUIPMENT'**: Where a company monitors and controls the performance of a whole machine or line of machines.



3. **'MANUFACTURING OPERATIONS MANAGEMENT'**: Where a business connects and monitors the performance of the whole factory.



4. **'BUSINESS SYSTEMS'**: Where a company monitors the planning and performance of the whole enterprise, or of multiple factories within its business. For example, looking at how sales are related to what is being produced on the shop floor, ensuring the company is producing the right goods in the timeliest fashion.

What Industry 4.0 does is bring all these elements together, allowing a company to monitor and make decisions on the huge volume of data that is being produced at the four levels, to better find out how the whole operation is performing so that smarter solutions can be found to issues as they arise. Industry 4.0 allows a business to pull information across the whole system and allow a greater level of analysis than has ever been achievable before. The greater connectivity and data analysis offered by Industry 4.0 allows traceability and transparency across the whole of a company's ecosystem, leading to the lowest possible costs and the highest possible output.





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# HOW INDUSTRY 4.0 CAN BENEFIT THE FOOD AND BEVERAGE INDUSTRY



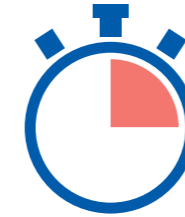
From a food manufacturer's perspective, the opportunities presented by these changes are enormous. Through adapting their own technology, or, where there are gaps, making new investments, Industry 4.0 allows for next-generation manufacturing systems that make smart decisions that can be monitored remotely, using the Cloud to access, store, and interrogate data, making the most of real-time analytics to help guide decision making, rather than simply relying on historical data.

These in turn can help drive greater momentum behind the current trends in the food and beverage industry such as an increasing focus on food safety and quality, and the need to improve productivity.

Broadly, therefore, Industry 4.0 allows a business to make an impact in the following areas:



Increased vigilance over food safety, for example by ensuring greater traceability.



Improved productivity, by better understanding where a business's bottlenecks are, and how they can be overcome.



Improved quality assurance using greater automation.



Managing complex global supply chains through IT and robotics.



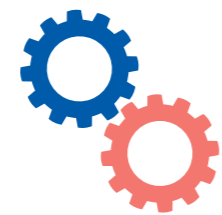
Using real-time data to respond swiftly to changing consumer needs.



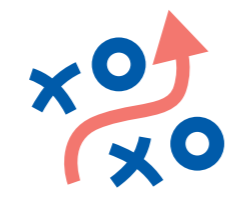
Many of the trends within Industry 4.0 allow a food manufacturer to better meet these needs. It enables them to:



Collect more data, in real time, to inform decision making, and analyse it more swiftly.



Use the data once it's been analysed in conjunction with their own industry expertise to develop insights and visualise processes about how better to manage their systems.



Make better, more informed, decisions based on those insights about their business strategy.

For example, smart machines that can communicate with each other means full traceability and transparency is possible across the entire food manufacturing value chain.

That in turn reinforces food safety and helps a business meet regulatory needs in the most efficient manner. Equally, machines that can self-diagnose a problem before it becomes evident can reduce downtime and can be supported remotely, increasing production capability and helping meet consumer expectation through speedier time-to-shelf. Self-driving vehicles reduce manpower costs, can speed up deliveries and make the manufacturing process more efficient.

The possibilities offered by Industry 4.0 are therefore enormous. But making sense of them can appear mindboggling.

How is a food manufacturer to decide which is relevant to them?



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## HOW INDUSTRY 4.0 CAN HELP IN PRACTICE

Industry 4.0 empowers a food and beverage business to take a huge leap forward in terms of productivity improvements, as well as increasing food protection and quality. But business needs to start to act now. The pressure to be more efficient and to stay ahead of rivals means it is important to begin to think about what steps can be taken, and when.

This need not be a 'one-off' leap to some bright, new future. Rather, it is about beginning a step-by-step journey, deciding on which processes are right for each business, and ensuring opportunities are taken to the full. And it is not a journey to be undertaken alone: it's about finding the right partners to guide you at each stage.

In order to make the most of these opportunities, industry can respond by taking some of the following steps with their equipment and processes.

Idea > Development > Rollout



## ✓ CONNECTING AND INTEGRATING EQUIPMENT

Machinery that is connected to others to provide useful data to manufacturers sits at the heart of Industry 4.0. Equipment at customer plants can be connected, and processes integrated, together enabling machines at different production stages such as processing, filling and distribution to communicate with each other and synchronise themselves. The extra information generated and knowledge shared can lead to greater efficiency savings, and greater productivity.



## ✓ USE THE INFORMATION TO MAXIMISE SUPPLY CHAIN EFFICIENCY...

This greater visibility and integration embedded in Industry 4.0 allows companies to keep better track of all their orders across the supply chain. It can tell companies instantly how much inventory they have and how it can be deployed. Logistics timeframes can be shortened, and products can reach the market more swiftly. That can help ensure that products evolve ahead of the competition, producing both top and bottom-line growth. The information obtained through having complete sight from end-to-end of the production process can enable a business to have far greater control, and provide quicker, actionable information into how a product is performing.

## ✓ ...AND TO ENSURE FULL TRACEABILITY

That increased visibility can have an important role in helping solve production issues, pinpointing problem areas at an early stage to enable manufacturers to make smart decisions. This traceability is already embedded in most businesses' processes, particularly larger ones. However, Industry 4.0 allows greater access to vastly more information, helping all companies – large, medium and small – understand more about their entire plant.



## CARRYING OUT PREDICTIVE MAINTENANCE

Equipment can not only talk to other pieces of equipment – it can, to all intents and purposes, talk to ‘itself’ too. An operator can pull data from a machine and put it into the Cloud, allowing for far greater analysis than was ever possible before. The data can then be used to create algorithms to make predictions and decisions, helping a company make the most of its equipment by reducing downtime to a minimum. Such Predictive Maintenance is one of the key benefits of Industry 4.0: if you know a machine is about to malfunction, you can build in downtime by moving production to other machines which may have more capacity, and you can allow spare parts to be dispatched well in advance, saving money and cutting down on the time a machine is idle.



## BETTER INSIGHTS FROM DATA

By aggregating billions of pieces of data, it is possible to gain far greater insight into how a machine is performing. But with so much data to absorb, a company needs to ensure it has the systems and processes in place to make sense of the information it is receiving. The role of data analysis – and a workforce able to act on it – therefore becomes far more significant in the world of Industry 4.0.



## EMBRACING MACHINE-LEARNING ALGORITHMS

What makes machine learning useful is that the algorithm can “learn” and adapt its outputs based on new information. When implemented correctly, machine learning can help manufacturers solve complex problems and predict them before they occur in ways that will help improve the efficiency of the operation. Algorithms can help food and beverage manufacturers gain greater insights from the data. The sheer volume of information produced means such tools are needed to produce quick, almost instantaneous analysis beyond the capability of a human alone. Using the information gathered, algorithms can number-crunch both past and current activity, and predict optimum plant operation for the future by ‘learning’ from what is going on in the present. This will help business understand how to make the most of their production capabilities, which lines to use, and how production can be tailored in real-time to meet customers’ demands.

### Example:

<b>The Challenge</b>	An Asian food and beverage producer was concerned about the levels of machine downtime due to mechanical issues, resulting in too much variability in its maintenance needs, and high levels of waste. The producer’s own customers were concerned about its performance, so fixing the problem became the producer’s number one priority
<b>The Solution</b>	The firm embraced a service solution consisting of preventive maintenance, parts management and on-site production support. Potential problems were identified before they occurred, and unplanned downtime was reduced
<b>The Results</b>	Variability was reduced by 60%, levels of waste were lowered, costs were made more predictable, and Line Machine Mechanical Efficiency – which looks at how close to its target a line performs – improved from 90.7% to 95.7%



## USING THE LATEST AUGMENTED REALITY

Engineers can be empowered with wearable technology so any issues can be resolved by experts – even if they are sitting thousands of miles away. For example, by donning a HoloLens, a service engineer can see into a piece of machinery which may be on the other side of the world and explain to an on-site engineer what needs to be done. Augmented reality can therefore reduce the costs and increase the speed of any maintenance that may be required.



## THINK ABOUT THE FUTURE

Industry 4.0 allows a food and beverage business to take a far more sophisticated approach to the way it runs its operations. Virtual Reality makes it possible to simulate an entire warehouse, see pallets moving around, and analyse a full-year's production, checking whether there is enough flexibility in the space that exists in case changes need to be made for the future.

What bottlenecks are there and how can they be removed? How many trucks will be needed? Is there enough storage? Will there be a need for a new factory in the future, or can the current one be re-designed?

Being able to walk virtually through their not-yet-built factory enables a manufacturer to ensure their strategy is capable of meeting all their upcoming needs.





## STRIKING THE RIGHT PARTNERSHIPS

No single firm, even the largest food manufacturer, has the scale and capability to manage all this data. So, they will need to strike partnerships with those who can help them make sense of the information. That could be with a robotics firm that understands how machines can be optimally configured, a Cloud business that specialises in information gathering and storage, a software company that can ensure the most efficient programming, or perhaps even an electric vehicle producer, to ensure equipment runs smoothly and most effectively.

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## FIVE KEYS TO SUCCESS

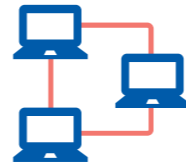
Industry 4.0 enables a whole new way of thinking for a company. It enables them to be agile, and to reap the rewards of partnering with other businesses: not every firm can be an expert in every area it needs to if it is to embrace the opportunities offered.

As they seek to adapt their processes and equipment for the “Smart Factory” needed to make the most of the opportunities presented by Industry 4.0, there are many potential processes they could adopt. To help them decide, they should perhaps consider thinking of this as a five-stage process, so they can concentrate on what really matters to them.

They can:



**PARTNER.** Join forces with others in the food and beverage industry who have a deep understanding of the technology and processes Industry 4.0 requires and of the imagination required to execute them.



**CONNECT.** Ensure their equipment is capable of being connected with each other, and with the workforce necessary to manage it efficiently.



**ENGAGE.** Team up with subject matter experts in each part of their processes, to ensure they are fit and ready to respond to the potential changes Industry 4.0 will bring.



**ANALYSE.** Make sure they have the capability to analyse the data that is generated to make swift, smart decisions.



**DECIDE.** Make informed decisions based on what they've learned about their business needs, and how their strategy needs to adapt.

Thinking of this as a five-stage process can help give businesses in the food and beverage industry the guidelines they need to follow and the processes they need to adopt if they are to thrive in a connected world. It can demonstrate to their own customers and consumers that they understand how the world is changing, and that they are rising to the challenge of the new world. It positions them as industry leaders, and as businesses which have a deep understanding of the trends driving the future economy.

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## EMBRACING FUTURE OPPORTUNITIES

For many food manufacturers, the future can be daunting. They are still coming to terms with the full range of possibilities presented simply by the first wave of digitalisation, such as the ability to engage on social media, use influencers, and use product packaging to provide more relevant, bespoke information to customers eager to find more about what they are buying.

Industry 4.0 goes far beyond this. It allows companies access to more data than ever before, and better ways of analysing it. It represents a step-change in the way companies go about their business.

For workers, it means embracing the new world and being trained in the new focus on connectivity and integration.

It also however means the potential for better jobs, more highly skilled employment, and less mundane work to carry out.

Done well, Industry 4.0 it allows food manufacturers to ensure their processes will better serve changing consumer trends. It will allow them to spot those trends earlier, and automatically update their capabilities to meet them. It will empower their workforce to gain new skills, and take greater responsibility. And it will allow them to manufacture their products more efficiently, quickly and profitably.

The future can look baffling.

But the opportunities far outweigh the risks of not embracing the technology. With a connected workforce, connected manufacturing processes, data analytics, and by seeking out partners to help chart the right course ahead, the food industry can look confidently ahead to the promises of the world of Industry 4.0. It also leaves them perfectly positioned when Industry 5.0 comes along – whenever that may be, whatever it may entail.

