Build a Better Manufacturer

Digital Manufacturing Forum 2021

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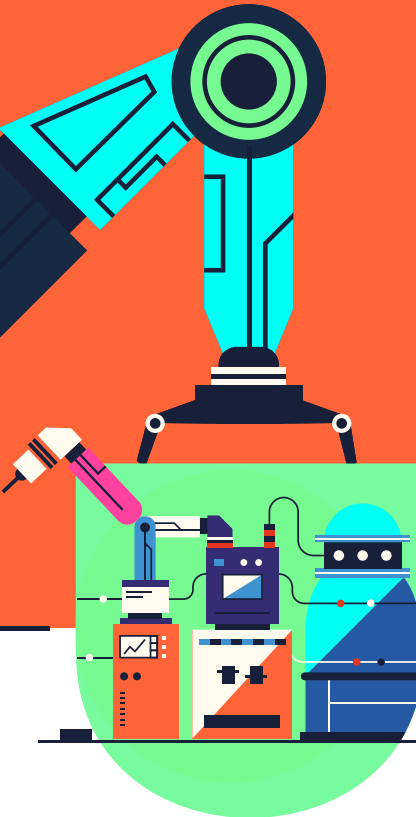
Terms like Industry 4, big data, IoT and servitisation can send you into a cold sweat; if it's not the jungle of buzzwords making your head spin, truly embracing digital can sound expensive and time consuming.

Technology and a digital mindset can unlock vast opportunity in your business, whether that's improving the efficiency of your production, streamlining back office processes or improving customer service and engagement.

We recognise that it can seem overwhelming. After all knowing where to start within the constraints of budget, capacity and skills all while bringing people on a journey of improvement can be difficult.
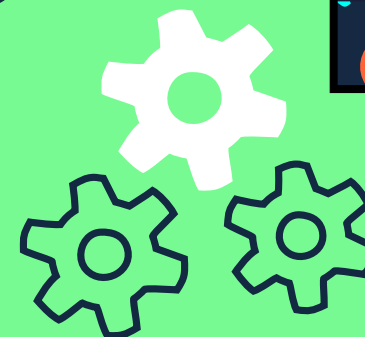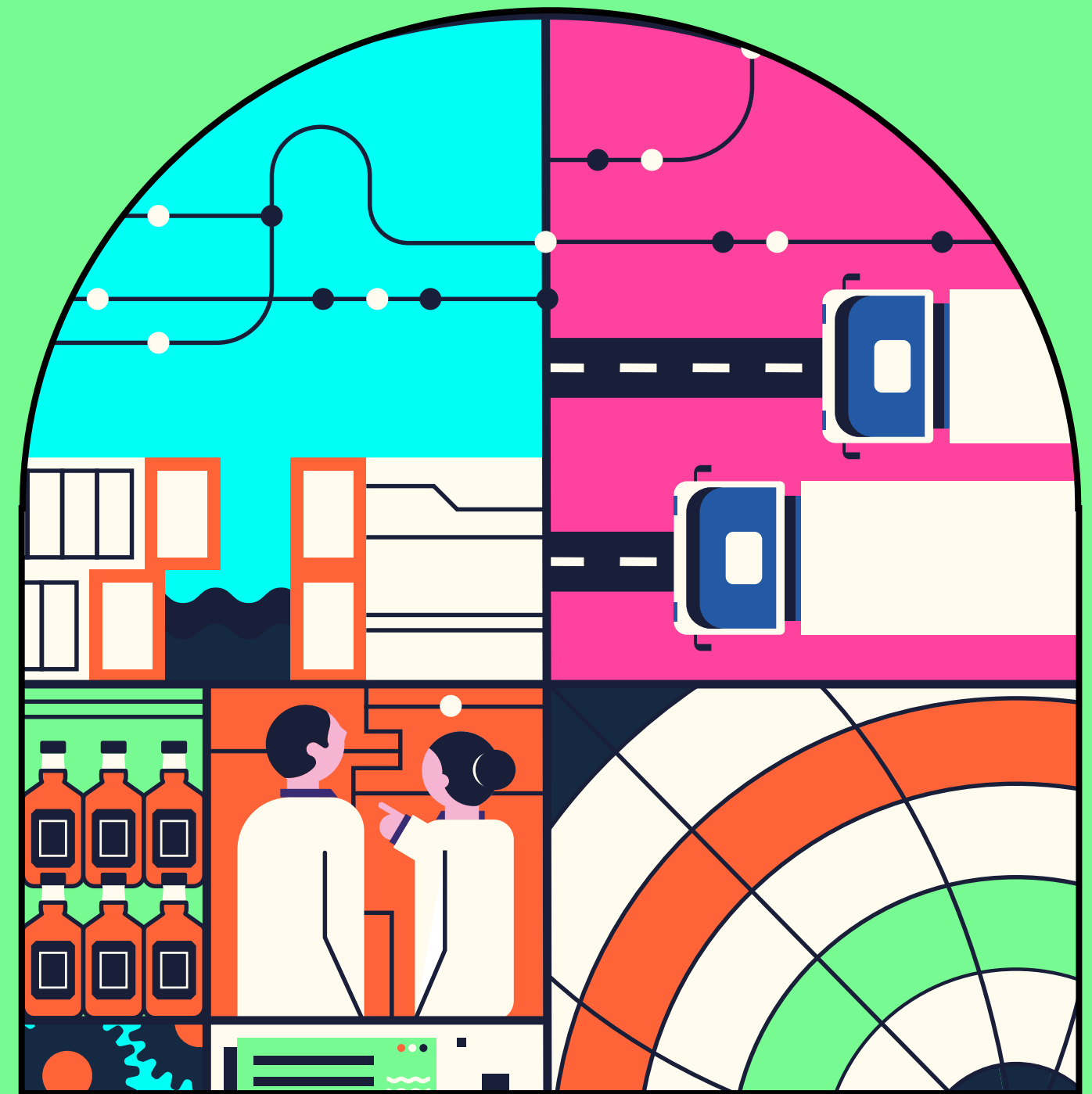
We've been working in manufacturing and technology for almost 30 years; we've lived and breathed the tremendous pace of technological change. Core to our values has always been a focus on pragmatic solutions that add real business value.

The Digital Manufacturing Forum was born out of a passion to share and collaborate with the wider manufacturing network; to find solutions to current challenges, look at problems from different perspectives, share best practice and lessons learned and to help build mutually beneficial relationships for manufacturers on their digital journeys.

Andrew Gill
Digital Adviser,
Waterstons

James Simpson
Manufacturing
Practitioner,
James Simpson
Associates

Members from both operations and IT roles, built new industry connections and explored and shared best practice. We're all looking forward to a host of factory tours later in the year!

So what key learnings emerged?

Build bridges

There's often a divide between the technology and manufacturing functions. Digital manufacturing requires a new approach – bringing digital skills into the manufacturing process and manufacturing into the digital process. Both sides often talk in different languages so it's not always easy!

IT teams need to support the manufacturing process first and manufacturing leaders need to be clear about their priorities.

Start small

And don't be afraid to ask for help. Ask yourself, what feels manual, slow and repetitive? How might other industries or businesses have solved this or similar problems before? Do you have the digital skills you need within your business? Don't be afraid to share progress made – it might inspire further improvements across the business.

Consider the skills and tools you already have

Many of our members were able to use existing applications. For some that meant making greater use of existing tools such as the Office 365 suite. For others sensors or a small amount of additional software could be purchased to link or extend existing tools to create powerful solutions.

A new system won't solve all of your problems

…even if it is in the cloud! It's easy to fall into the trap of thinking 'our new system will fix this problem'. Quite often there's complex behaviour and process change which needs addressing too. Even if there is a new ERP or MRP system on the horizon, don't stop making small improvements and trying new ideas in the meantime. It's all excellent groundwork for skills development and any future systems improvements.
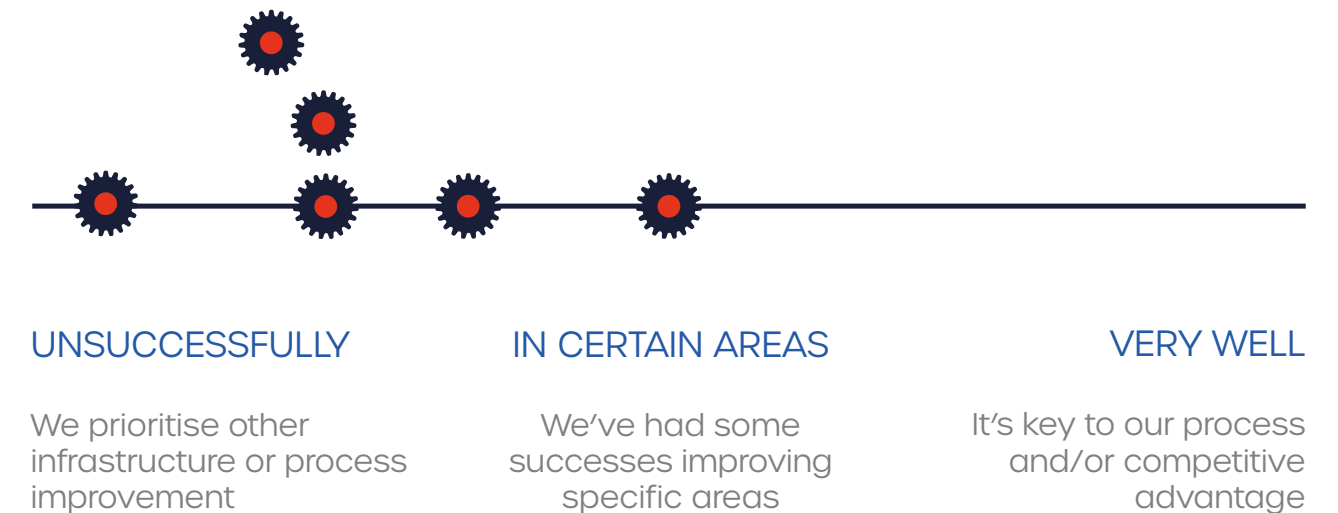
How digitally adept did our members feel they were? And how did they rate their organisation's productive use of digital technology?
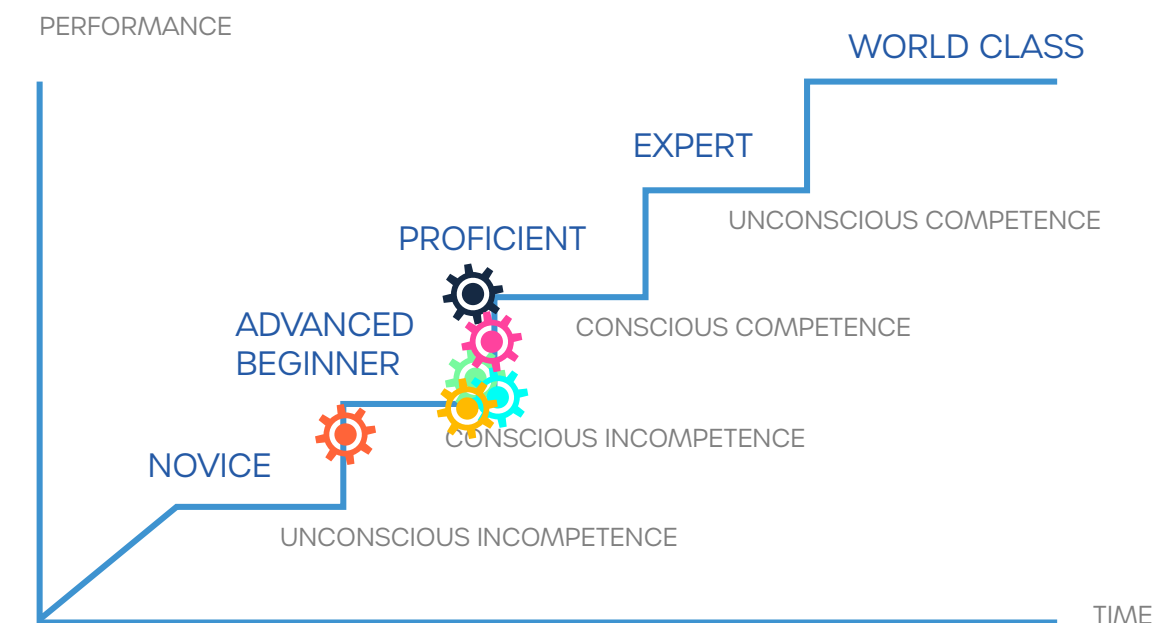
Findings

- There's a common misconception that other organisations are streets ahead in terms of digital adoption.

- Members rated themselves in the advanced beginner category but went on to share some fantastic stories of successful digital manufacturing improvement – too humble perhaps!

- Naturally some organisations and individuals will be further on the digital journey than others; we found the strength of the forum is in the different perspectives and shared ideas and experiences brought to the table by members.

As an organisation, to what extent has digital technology been put to productive use?
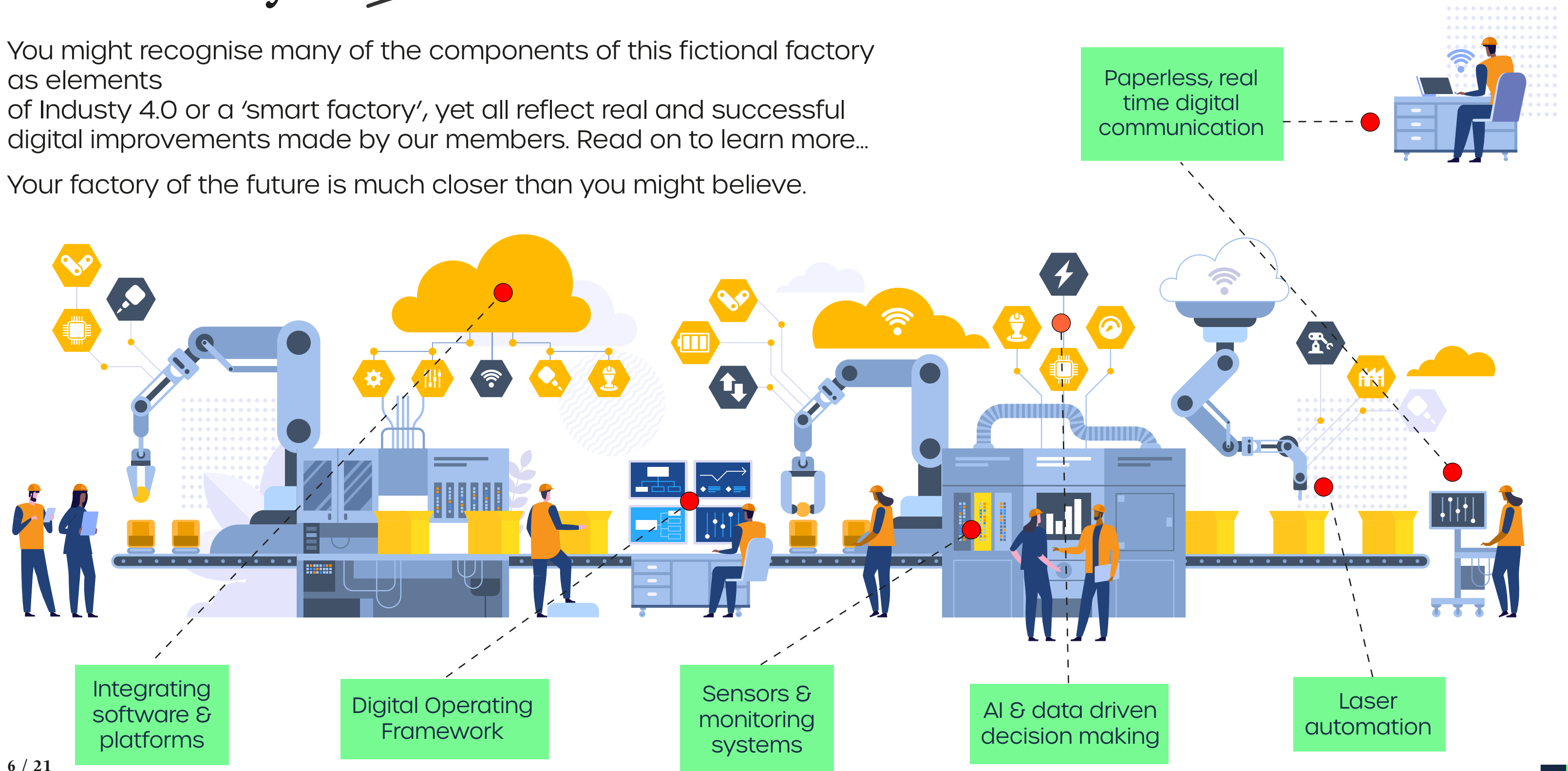
UNSUCCESSFULLY	IN CERTAIN AREAS	VERY WELL
We prioritise other infrastructure or process improvement	We've had some successes improving specific areas	It's key to our process and/or competitive advantage

How would you rate your own digital manufacturing skills?

PERFORMANCE

WORLD CLASS

EXPERT

UNCONSCIOUS COMPETENCE

PROFICIENT

CONSCIOUS COMPETENCE

ADVANCED BEGINNER

CONSCIOUS INCOMPETENCE

NOVICE

UNCONSCIOUS INCOMPETENCE

TIME

The factory of the ~~future~~ *now*

You might recognise many of the components of this fictional factory as elements
of Industy 4.0 or a 'smart factory', yet all reflect real and successful
digital improvements made by our members. Read on to learn more...

Your factory of the future is much closer than you might believe.

Paperless, real time digital communication

Integrating software & platforms

Digital Operating Framework

Sensors & monitoring systems

AI & data driven decision making

Laser automation
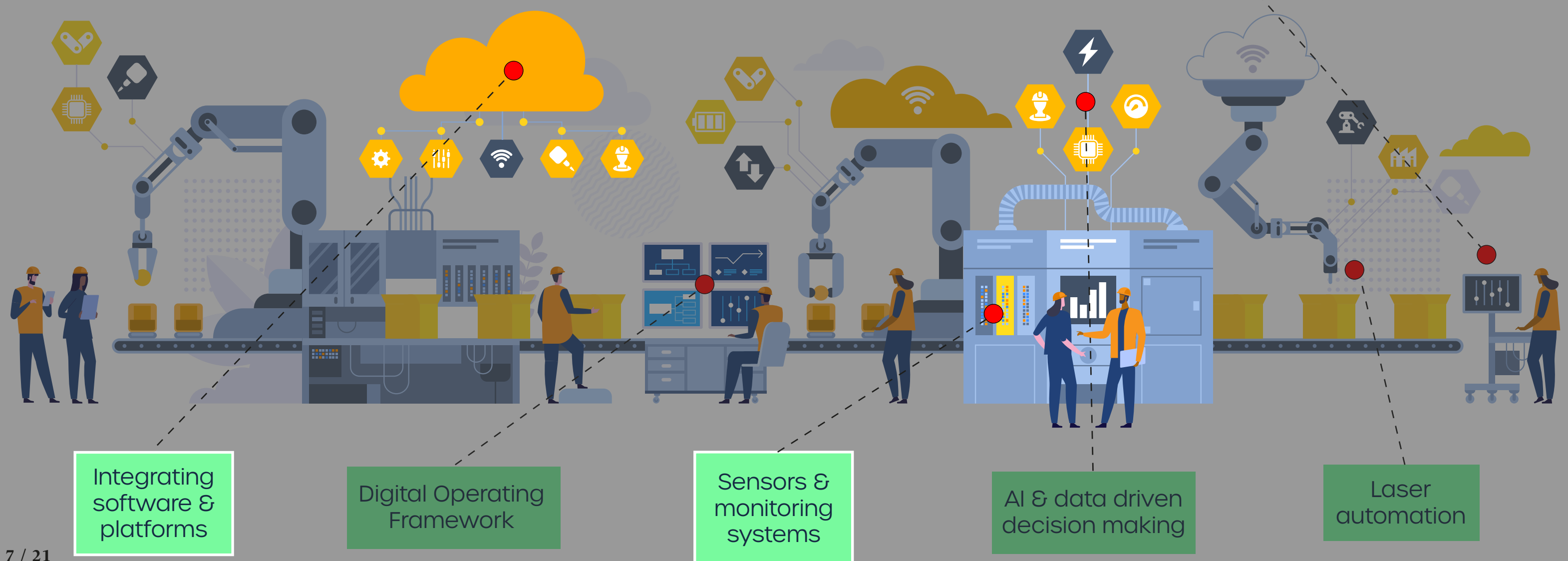
Using sensors & software to improve testing

A paper based, manual testing system was replaced with a real time, digital system using data collected via simple data snapshot software and sensors straight from the test cell to the test bay.

Benefits

- Delivered real time automated data logging with minimal capital investment.
- 10% reduction in downtime by ensuring all of the necessary data is right first time, avoiding the need for costly re-tests.
- Improved employee safety through reduced time working near to noise, vibration and combustion source.

- Digital test certificates can be shared internally and externally, quickly and efficiently giving customers more confidence in the test and ultimately end product.
- Improved audit performance in test performance.
- Minimal training, completed in-house, resulting in quick roll out of new system.

Potential Future Improvements

- Remote control of test harness to fully remove need for close working in hazardous area.
- Automated test harness to further standardise testing conditions.

Integrating software & platforms

Digital Operating Framework

Sensors & monitoring systems

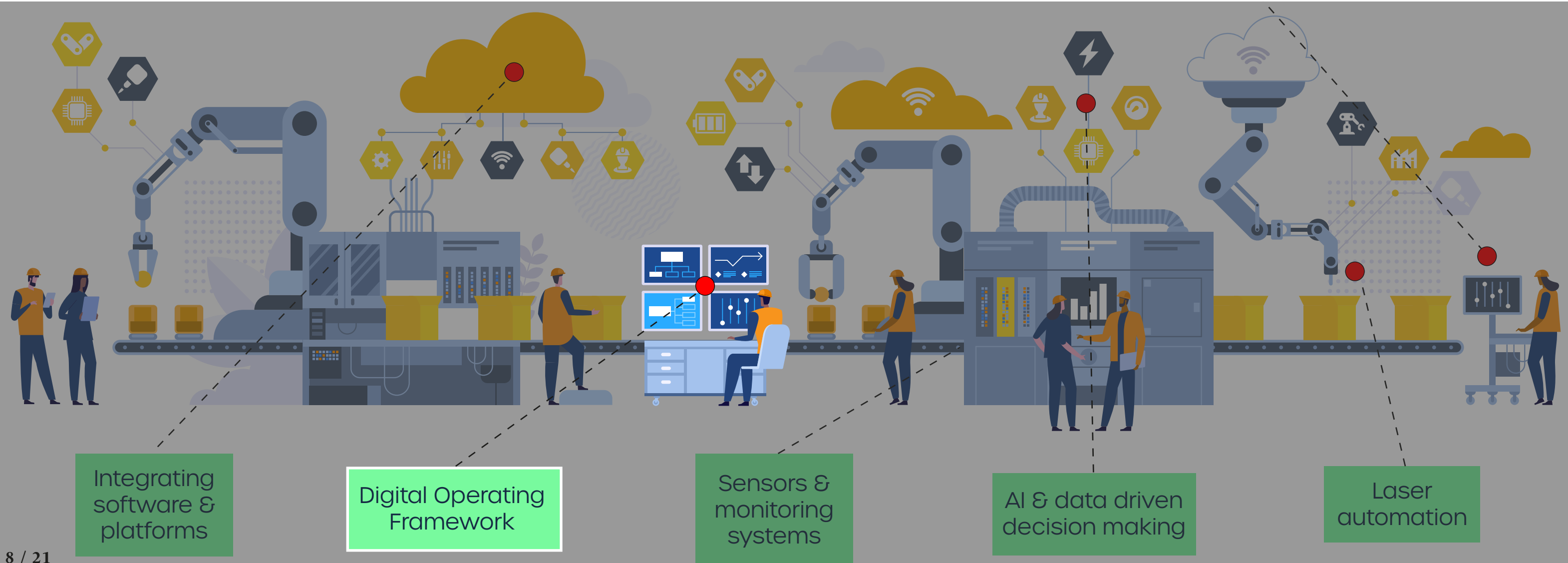AI & data driven decision making

Laser automation

Adopting a digital operating framework

An ineffective paper based operating framework was replaced with a powerful digital version using a creative combination of Office 365 tools including Microsoft Planner, Teams, SharePoint and PowerBI.

Benefits

- Low cost solution using software already available in an innovative way.

- End-to-end process now digitised and available across all functions in the business - from sales through to post operations support.

- Improved visibility of work in progress.

- Easier onboarding for new staff.

- Digital framework supports improved understanding and adoption of standard processes and knowledge, within the team, the wider site and in our global business.

Integrating software & platforms

Digital Operating Framework

Sensors & monitoring systems
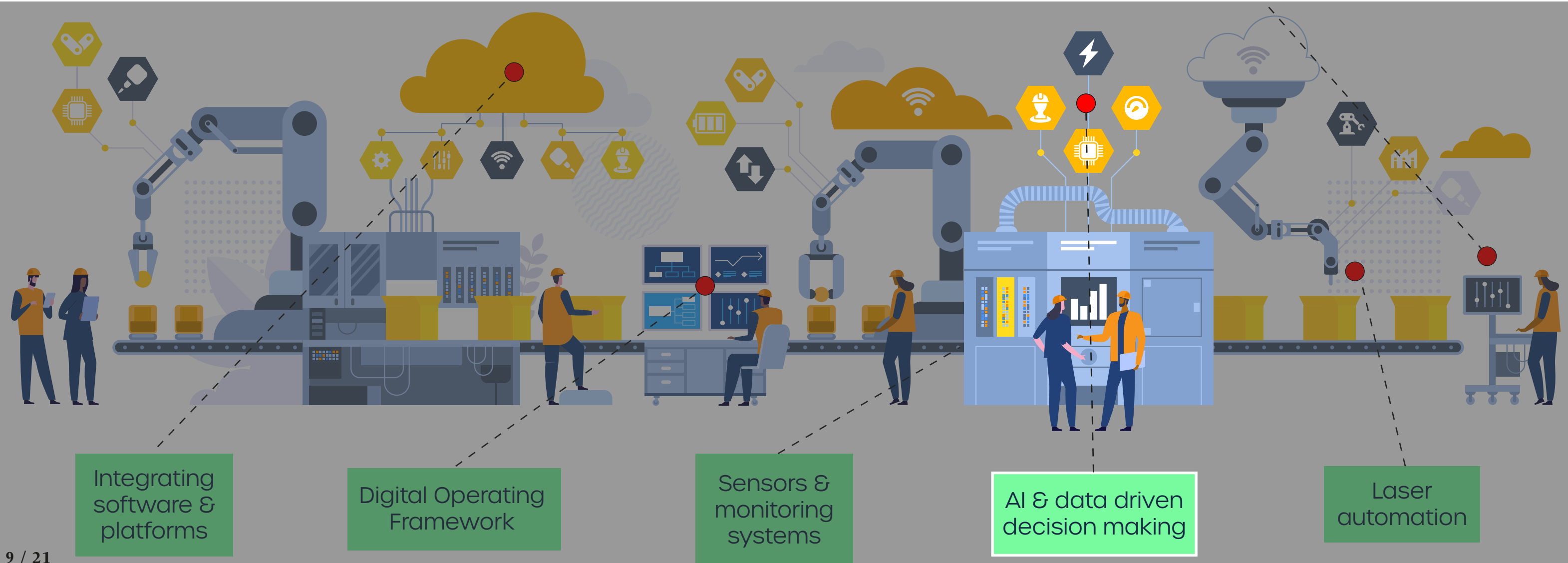
AI & data driven decision making

Laser automation

Using artificial intelligence to improve yields

Using data science to uncover impacts on production yield in a food manufacturing environment. Twelve weeks worth of production data was analysed by an expert third party, and a rather interesting correlation was uncovered!

Benefits

- Direct correlation between production yield and weather conditions was discovered in the data.

- Forecast data for humidity, air pressure and temperature was then used to adjust centrelines in production planning to optimise yields.

- Materials planning could take place around season variations and annual weather patterns.

- Informed global strategy for siting future factories in favourable locations.

Integrating software & platforms

Digital Operating Framework

Sensors & monitoring systems

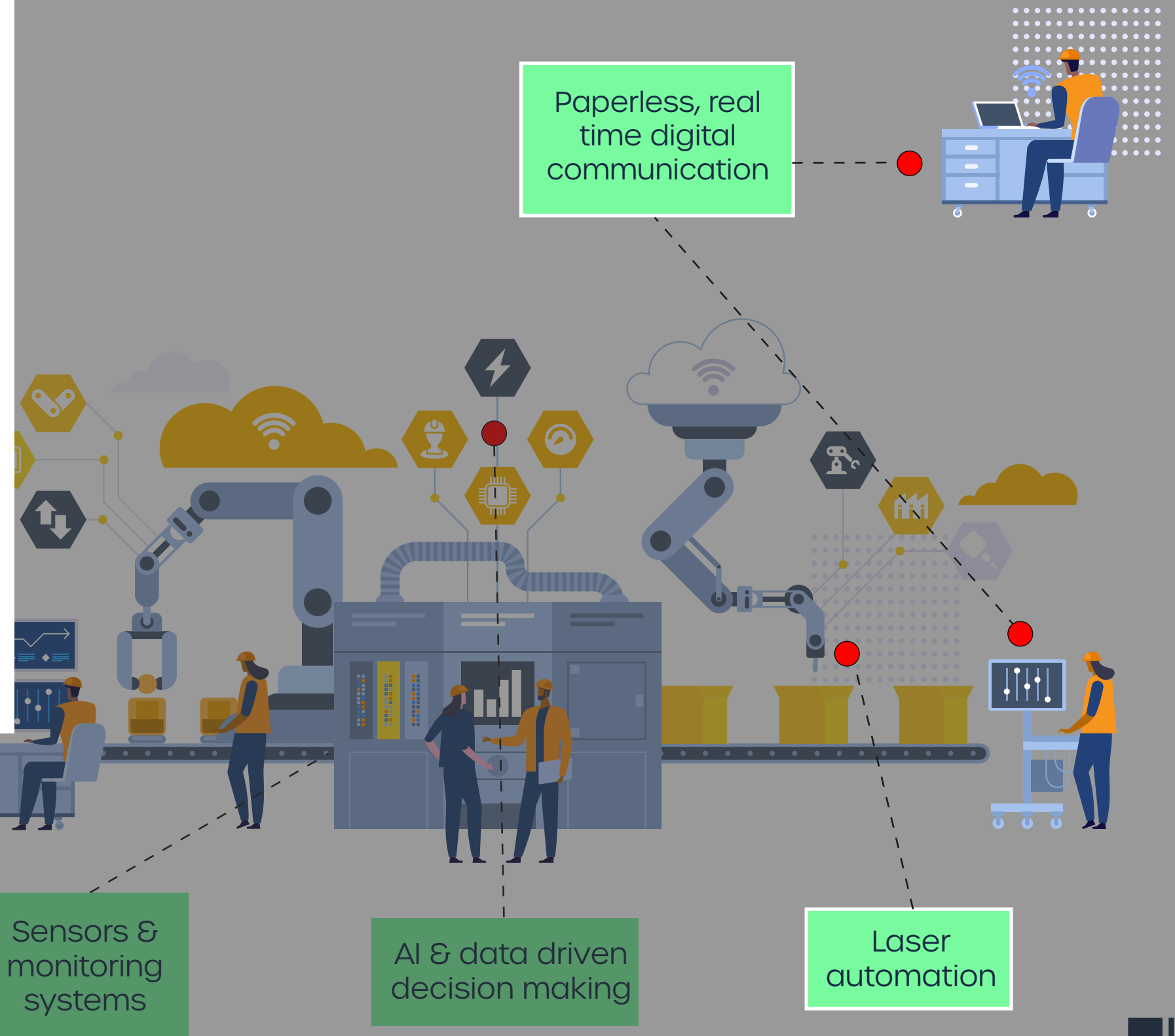AI & data driven decision making

Laser automation

Paperless Factory

Paper based job sheets, drawings and transport paperwork was replaced with a simple and creative digital solution using flat screen TVs on wheels with overlaid touch screen glass. Overhead lasers projected part arrangement, supporting accurate setting out of large components enabling batch sizes of one and reducing skills required for accurate assembly. This replaced a highly skilled and paper based operation.

Benefits

- Existing and simple off the shelf software brought the solution together.
- Enabled real time two way communication between the shop floor and office.
- Reduced risk of lost paperwork.
- Increased accuracy through laser projection.
- Less skilled labour required.
- Shorter on boarding for new staff.
- Improved visibility of work in progress.

Paperless, real time digital communication

Integrating software & platforms

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AI & data driven decision making

Laser automation

In a world of complex transformations and multi-million pound budgets, we focused on pragmatic digital solutions to today's manufacturing challenges.
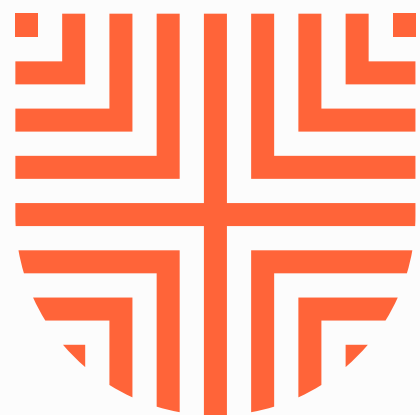
Challenges

Members brought current challenges to the table and we facilitated sessions using a variety of problem solving tools such as the 8 steps and 6 hats. The group discussed, shared ideas and experiences, and helped validate ways forward and potential solutions.

Each challenge owner left with clear actions to progress to the next steps.

Reducing part picking & shipment errors

Replacement warranty parts may be low cost, but when you factor in the service and labour costs and impact to customers around the globe, accuracy of picking and shipping is paramount in avoiding unnecessary expense and delays. With spare parts and warranty not your main business, how can you efficiently reduce these errors?

Ideas explored

- Improved ownership and skills in part picking.
- Improved stock management.
- Use of RFID/barcodes and scanners.
- Digital warehouse technologies with vending/self service capabilities.
- Hospital packs for engineers.

Improving skills & access to digital tools while balancing data & support challenges

With easier access than ever before, employees can find themselves new tools to achieve their goals at the click of a button. But just as giving everybody a set of tools doesn't make them a master, this comes with complex challenges, not least around IT, skills and support. How do manufacturers achieve the right balance?

Ideas explored

- Build communities of practice.
- IT roadmapping.
- Understand the art of the possible.
- Transparent documentation.
- Include IT in value stream mapping.
- Undertake fishbone analysis.
- Communicate what the business is trying to achieve from an IT perspective.

Ensuring all correct parts are fitted

With highly customisable products, thousands of discrete parts and tight timescales how might digital tools validate that the correct parts have been fitted?

Ideas explored

- Measure line supervisors by quality not time/quantity.
- Reduce customisation.
- Improve communication of scope change on delivery impact.
- Pre-assembly of parts.
- More standardised parts.
- Kitting trolleys and improved kit lists.
- More QA audits.

# Tackling systems and tech challenges – where to start

When IT is unstable, dependent on key personnel or single points of failure, and with obsolete systems and unknown risks. Where do you start?

Ideas explored

- Start with people. Who uses what? Understand the entire end to end value stream.
- Understand the interfaces and pain points, and what can be addressed first.
- Put backups in place.
- Contain legacy technology within modern platforms and hardware to reduce risk and improve options for recovering legacy systems (perhaps in isolated network segments).
- Create a plan to tackle and overcome resistance to change.
- Rehearse a crises situation in a controlled environment. Ask yourself... "What if this system was gone? What if we had a fire? What if all our data was held to ransom?" Doing this ahead of time can help flush out pain points, areas to focus on and engage people in creative ideas on how recovery plans can be improved.
- Reach out to your network to fill any knowledge gaps when it comes to legacy systems or technology. You might be surprised who has already solved a similar problem in a creative way!

Jargon Buster
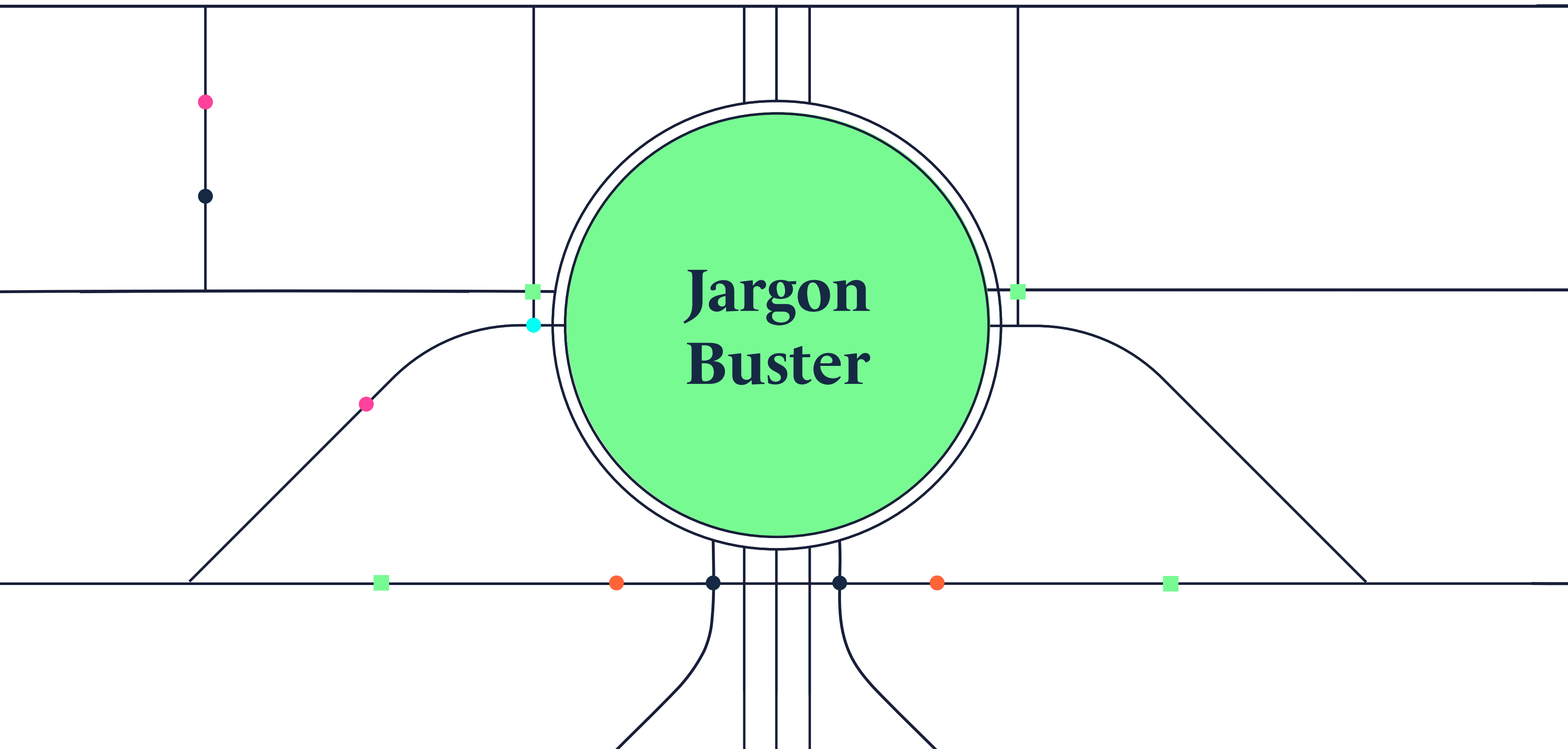
Blockchain is a method for storing data. It's a database... although a complex one.

The key benefits of a blockchain database are that the data is transparent, and it can be trusted. Blockchain is useful where many parties are involved, where no one party can be trusted, and where data can be completely transparent. Potential use cases are land registries, counterfeit detection, quality assurance and supply chain monitoring.

Unlike a more common database, a blockchain database is decentralised and distributed amongst its members. This means that everyone taking part in the blockchain has a complete copy of the data, and the data within the blockchain is completely visible - no data can be hidden within it. This transparency of data is the first key attribute of a blockchain database.

Blockchain

A very simplistic example of a blockchain. Note: blocks can store multiple bits of data, and the chain is linear.

The second is that the data is 'immutable'. Once the data has been written, in theory, it can't easily be changed. There's a few steps involved in making it extremely difficult to go back and alter data in a blockchain.

Blockchains can be public or private. In a public blockchain, the data is entirely accessible by anyone who wants to join it. Because blockchains are run via software, and there are complex computing processes needed to ensure data can't be easily changed, a vast amount of electricity is needed to power them. The crypto-currency Bitcoin is stored on a public blockchain and uses so much electricity if it were a country it would be in the top 30 energy users worldwide!*.

Given that there's likely to be more trust amongst members of a private blockchain, the security configuration complexity can be reduced, meaning so too is the power needed to run them.

This does of course mean that they are less immutable than public blockchains. On the plus side in a private blockchain members have complete control over who views the data.

The technology behind blockchain is very clever... however when you delve deeper, storing data this way can be quite impractical and often has way more blockers than it's worth. Do you want your entire supply chain to be able to see all of your data? Possibly not. It's highly likely that there's a much more suitable way to store your data.

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Data so big or complex, in both storage and access, that it's hard to process in traditional ways.

The idea behind big data is that it encompasses the bigger picture of all data collected from various sources inside and outside an organisation.

At what point does data become 'big'?

• Where there's too much of it to put in one place.

• Where it's not all neatly held and labelled in a structured way.

• Where you're taking data from internal and external sources (such as overlaying weather).

• Where the flow of data is unpredictable or unexpected e.g events resulting in peaks in demand or unplanned external factors such as surges in activity on social media.

• Where it's flowing so quickly, you can't comprehend it meaningfully

And to do all of this and generate actionable insight and outcomes then you're likely to need specialist skills and tools to identify patterns and trends, create visuals and test hypotheses.

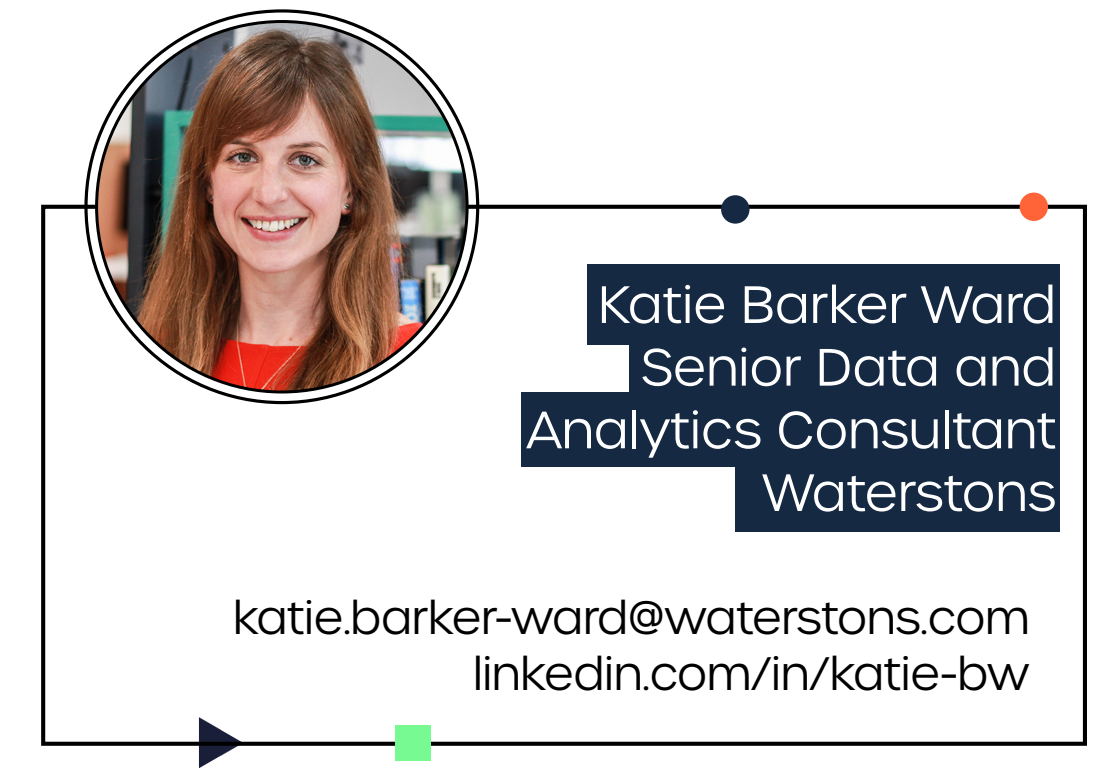… so no, your overflowing paper filing cabinet doesn't count!

In reality, many organisations need to start the data journey

One way is to start small, but think big. Sketch out what you'd like to do in the longer term but start by truly understanding the data you have. Do you use all of it? Consider working with a data partner (see success story here). You can get huge insight from your data now.

You probably don't realise how much data you already create and have access to. Your machine sensors, production processes, testing, sales, finance, supply chain, maintenance, quality... all generate data points that are often untapped. Thinking a little beyond internal systems there's also social media data, picking up customer issues or carrying out sentiment analysis. And depending on your products, weather data which can help predict flux in sales to improve planning.

Bringing all of this data together can enable you to make more informed decisions with more confidence than ever before.

In summary, big data can highlight opportunities for improving operational efficiency, enable predictive maintenance, improve the customer experience, drive product quality and innovation, forecast demand and optimise supply chains. However you can gain some of this insight from the data you already have.

Big Data

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Steam powered factories marked the first industrial revolution. Mass production marked the second...

... and computer driven systems the third.

At its core Industry 4 is about connectivity – combining physical production and operations with digital technology to create a holistic environment with access to real time insight across people, products, processes and partners.

Some of the technologies and methodologies can seem a bit alien but you might be surprised to learn that many of them are really not that new and are most definitely not out of reach for your organisation.

Before we take a quick look at these technologies let's explore the four simple areas Industry 4 can be broken down into:

Industry 4

automation, integration, information and innovation. All of which provide improvement opportunities and can be achieved with minimal capital investment and some clever thinking.

Automation

Automation can be about robotic arms and human-free production lines, but there's a lot more to it than that. From automating your production line to repetitive tasks like material resupply, order processing, invoicing and the like to automating procurement off the back of order-book based MRP. A huge number of manufacturers could benefit from simple automation tomorrow, creating efficiencies and saving time and cost.

Integration

Facilitating automation means integration. This could be simply ensuring your systems can talk to each other and share a single master data record. Or it could be integration between your systems, customers and suppliers; think live, pro-active re-ordering by your customers based on their sales or demand, or real-time views of raw material stock at your suppliers to ensure they can get you what you need when you need it.

Information

Manufacturing processes generate massive amounts of data; but few businesses really extract that value effectively.

Imagine a world where you can identify potential product quality issues before they happen by monitoring the precise parameters of your production line.

Then there's monitoring the performance of products in the field, and using that knowledge to build quality into the next generation – that's all we're talking about with 'the Internet of Things'.

Innovation

Innovation in manufacturing; it's what drives you, right? It could be generative design – leaving computers to do the hard work in enhancing product design (using data again!), reducing waste, or improving the production process. Or maybe using augmented reality

devices to show your customers what their products will really look like in 3D before you even fire up the production line or ship the finished goods. You've probably experimented with similar things already – 3D CAD anyone?

Embracing Industry 4

Manufacturers don't need to invest millions in fancy technology and transform overnight. SME's can make huge improvements by focusing on key issues that don't require significant investment, and by adapting existing systems rather than investing in new ones. Defining a strategy, ensuring senior buy-in, investing in skills and encouraging innovation will also be key to unlocking success.

Let's take a quick look at the technologies and methodologies of Industry 4.

Sensors and monitoring systems

Monitor and control real time parameters. Provide data for analysis and process insight. Reduce risk in hazardous areas and enable predictive maintenance.

Internet of things (IoT) devices

Light weight, low power mobile solutions. Generate the data necessary for better decision making.

Software and platform integration

Integration of sensor and business data, legacy systems or data warehouse to create
a single source of the truth. This enables accurate real time data and better reporting and analytics.

High performance networks, storage and cloud computing

High speed internet and scalable storage to enable a solid base for Industry 4 technology.

Data, AI and machine learning

Collecting and analysing historical or real time data to predict maintenance, automate decision making and respond to emerging trends.

Additive manufacturing and 3D printing

Producing an end result by adding material rather than taking it away. Enables rapid prototyping and innovation, reduced inventory, bespoke items and legacy spare parts.

Cyber security

An effective approach to mitigate cyber threats is critical as organisations become more connected.

Virtual, augmented & mixed reality

Visually immersive digital experiences in full (virtual) or part (augmented), or both (mixed). Enables prototyping, collaboration, training and more.

Simulation and digital twins

A virtual representation of a physical object or system. Enables real time simulation, planning, servitisation and issue detection.

Machine to machine communication and cyber physical systems

Physical and software components that are deeply intertwined. Enable real time, smart control and self configuration and optimisation.

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Software that collects and analyses millions of data points from across your network and alerts you to suspicious activity.

Targeted tools that protect your systems and data can sometimes miss out on the bigger picture, which is more important than ever to ensure your critical systems are protected from the evolving cyber threat.

Security Information and Event Management (SIEM) software collects all of these data points – from firewalls, antivirus, applications, devices and so on, categorising and analysing the data against typical activity and known threats or vulnerabilities alerting an organisation to any potential issues.

The capability of SIEM tools has grown over the last decade from mostly monitoring and reporting for compliance purposes to incorporating threat intelligence feeds and user behaviour data to give a much wider view of an organisation's cyber landscape.

Security tooling vendors such as Darktrace, AlienVault and Splunk have recently added a layer of artificial intelligence to advance the predictive threat element of their products.

When it comes to cyber attacks, sadly manufacturers are hit disproportionately – but the sector also invests the least in cyber security. As we become more connected and adopt more technology in our organisations, the surface area for cyber attacks only gets larger.

So, what can you do to protect your organisation?

Contrary to a lot of the scaremongering out there, protecting your business doesn't need to be an impossible or hugely expensive task. Often getting the basics right can head off the vast majority of drive-by cyber threats facing organisations today.

Software such as SIEM sits at the more advanced end of the security maturity curve, so if you're not quite there yet, consider the steps you need to take to get started on the journey.

A great blueprint for making sure your organisation has the cyber security basics right is GCHQ's National Cyber Security Centre 10 Steps to Cyber Security Framework. These recommendations consider people, process and technology mitigations that you can take, as well recovery plans to put in place should the worst happen.

Our advice? Get cyber security onto the boardroom agenda, use the 10 steps framework as a guide and dedicate time to getting the cyber basics right.

The 10 Steps to Cyber Security Framework can be found on the NCSC website here: www.ncsc.gov.uk/collection/10-steps

SIEM
Security Information & Event Management

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Ready to re-imagine your factory?

We love nothing more than to don our high-vis and safety shoes to see first hand what makes your organisation tick.

Get in touch to see how we can help you build a better manufacturer through technology.

- ⚠ Cyber security
- ◕ Data & analytics
- ⛁ Technology architecture & road mapping
- ⚙ ERP/MRP
- ◈ Selecting & integrating software
- ⚲ Iot & platform development
- 🖥 Cloud computing & connectivity networks
- 🔍 Data mapping
- 🔒 Business resilience
- 🔑 Innovation kaizen

Waterstons
we're with you
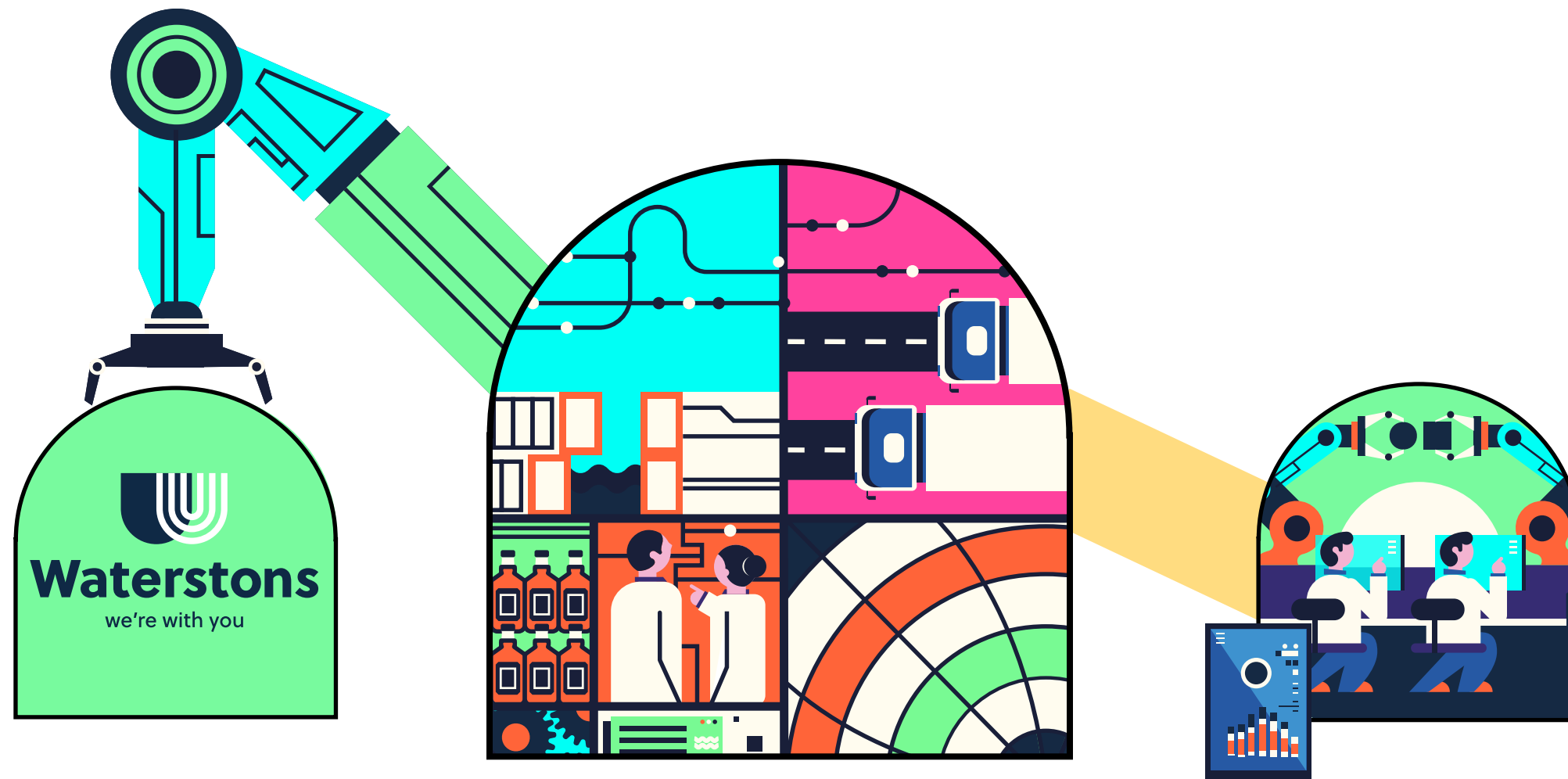
Contact us

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Since the last forum session in 2021 some of the key topics that are currently top of the agenda for companies we work with include:

Sustainability

How manufacturers are able to practically take steps towards meeting commitments they have set out or are likely to adhere to over the coming years. This also includes how progress can be monitored and reported, ideally in an automated way.

Supply chain disruption

Improving the integrity and resilience of supply chains within the manufacturing industry. Including identifying and reducing risks by improving visibility and management across the supply chain. This is a particular hot topic as we move into a post-pandemic and post-Brexit World.

Digitisation

Improving the maturity within the business to better align people, process and technology to ensure the strategic aims of the business are being supported. For example, the real-time collection and processing of accurate data so that decisions can be made based on real-time insights. This doesn't have to be significant changes but instead small improvements so manufacturers can quickly start realising the benefits and create a culture focused on improvement.

Manufacturing Forum 2022

We are planning to restart the forum in April 2022. This year we will be inviting guest speakers who are either experts on a particular topic or another manufacturer leading in a particular area to share their knowledge and engage in a group discussion.

You can find out more information and express an interest here:

https://www.waterstons.com/events/digital-manufacturing-forum