Report

Directive on digital transformation: manufacturing

2nd Edition

THE Manufacturer
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Atos

Introduction

Following the success of the first "Transforming Manufacturing, Embracing Digital" roundtable event in 2015 and the positive response from the sector to the first edition of the "Directive on Digital Transformation: Manufacturing" Report (which can be downloaded from uk.atos.net/manufacturing) Atos and The Manufacturer hosted a second roundtable event in the Atos Business Technology and Innovation Centre (BTIC) in London in October 2016.

Mark Ingleby (SVP, Atos) and Jonny Williamson (Editor, TheManufacturer.com) were joined by a cross section of high profile figures from Manufacturing Organisations, Industry bodies and Technology partners to discuss and debate the very latest issues keeping the decision makers for UK Manufacturing awake at night.

Using the four key directives identified in the first edition of the "Directive on Digital Transformation: Manufacturing" Report the attendees focused on personal experiences and real-world examples as they discussed the impact on the sector of Industry 4.0, New Digital Technologies, People & Culture, and Data & Security.

This second edition of the "Directive for Digital Transformation: Manufacturing" report presents an overview and consolidation of the discussions that took place at the 2016 event and highlights the significant conversations, insights and thoughts to provide you with further key directives for consideration as you pursue your own journey through digital transformation.

Industry 4.0

The topic of Industry 4.0 has been something the whole manufacturing world has been discussing for some time now and it doesn't appear to be going away any time soon, but does everyone really understand what Industry 4.0 means?

Could you describe what Industry 4.0 means in a single sentence?

What does Industry 4.0 look like, feel like, sound like? What impact is it having across the sector and across organisation supply chains, and what – if anything – are UK Manufacturers doing right now to deal with the multiple, often unknown challenges the Industry 4.0 imperative can present?

We asked the attendees:
What does industry 4.0 mean to you and how are you addressing it?

"It's just too vague a term to be of any real use to anyone"

Head of Checkout Systems
Airbus

"I see it as a multiphase, multilevel problem that's about reducing time to market so you can increase flexibility and efficiency"

Manufacturing Lead
EMEA Zebra Technologies

"No client has come to me and said *'Can I talk about industry 4.0?'*"

Business Development Director
Atos

"It's something that IS happening and you can either take advantage of it or not."

Head of Capability
Babcock

It was clear from the discussions that each attendee had a different attitude towards, and opinion of, Industry 4.0 and what it actually entails. Some attendees said it boils down to making better use of information and technology, to both increase top line growth and decrease costs whereas others dismissed it as a fad stating that Industry 4.0 only appears where industry is growing, and isn't considered in SME's as it has such a high cost of implementation.

One thing that was agreed on however was the need to identify a standardised, across-the-board definition that everyone could work from, although it was highlighted that doing so isn't all that simple.

A lack of definition

To try and reach this standardised definition the attendees discussed what the component parts of Industry 4.0 might be, with various potential elements being put forward.

One of the key points made was the impact of Industry 4.0 throughout the manufacturing value chain and the change it represents in customer requirements. Mass consumerisation means consumers now want products immediately, and cheaper than yesterday. This has forced an operational change on manufacturers to reduce the time to market while keeping costs down. This has always been the case, but is now being done through transforming business to embrace digital business models and ways of working.

So Industry 4.0 could just be seen as harnessing digital technologies but as one attendee pointed out "the problem is how to make better use of these digital technologies to improve processes". It was felt that simply implementing digital ways of working wasn't the answer.

In the real world

As one attendee confessed, the current use of tech on shop floors in the real world is poor, and companies could achieve a lot more growth with the proper investment, know-how and strategy to back this up. This backing would help to better connect manufacturing operations across the value chain, making them more agile and competitive in serving the end customer, but again the attendees felt that a lot of the time this fell down in the real world due to the lack of experience in the market of formulating a successful digital transformation strategy.

"But is Industry 4.0 a red herring?" one attendee asked. They pointed out that it is only recently that digital technologies have matured enough to be truly adaptable and valuable, so are we only now entering the age of Industry 4.0 even though the discussion has been ongoing for a number of years? It's a point that caused further debate and seemed to ring true for the vast majority of the attendees.

A matter of scope

As the discussion moved forward the scope of Industry 4.0 was also debated, with one attendee pointing out that even in very large companies he'd seen - with ample resources and a broad portfolio – they were only able to implement roughly one third of what industry 4.0 supposedly entails. This creates an enormous challenge for both large and small companies as they are trying to implement this now but, if those that are best equipped are still falling two thirds short, what chance do others with fewer resources and capability have?

This sentiment was echoed by many other attendees and it was clear that although the conversation has been going on for some time not enough people are talking about industry 4.0 with the necessary level of detail to make it applicable and useful for organisations across the board right now. This point raised the question around whether the ideals outlined by Industry 4.0 are realistic or even possible?

A question of attitude?

If we accept that Industry 4.0 is possible though, getting to a point where it is widely accepted and strived for may be further away than we think, as attendees pointed out there is still resistance to new digital ways of working – especially in manufacturing which has a significantly older workforce than most other industries.

There is a big challenge around people's attitudes towards new technologies, and a reliance on paper that holds on to the notion of "it's better because that's the way we've always done it". This attitude is also exacerbated by the lack of suitable new hires coming into organisations and a dearth of STEM graduates – a point that was mentioned several times in all the discussions at the event. This "brain drain" may put paid to some manufacturers implementing Industry 4.0 type solutions before they've even started. spite of this cultural and generational challenge, something the attendees did agree on is that there are massive opportunities to be had in adopting digital ways of working (calling the Industry 4.0 solutions or not) which you can either take advantage of or not. As one attendee said "companies have to jump into this with both feet. You don't go from a square wheel to a round wheel in incremental steps" and the best way to do this is to foster alliances between and across industries, universities, and governments to push Industry 4.0.

In Conclusion

From the discussions at the event it would appear that Industry 4.0 is viewed as too broad a term and lacking in clear definition to mean anything concrete for many manufacturers. However, many of the attendees do see the value in adopting digital ways of working and implementing digital solutions which will start them on the way to Industry 4.0 – whatever that may be.

What needs to happen though is for manufacturers as a whole to agree exactly what Industry 4.0 looks like, what it entails and what it should do to then work together, with the support of tech partners, industry bodies and universities to ensure that this vision for the future of manufacturing can be delivered.

New digital technologies

What does the future hold for Manufacturers in a digital age? No one can ever be 100% sure but those who are at the forefront of the market, driving organisations of all shapes and sizes, are best placed to provide guidance and predictions as to what the rest of us can expect.

And what kind of impact are things like data analytics, automation, AI, virtual reality, augmented reality, robotics, and additive manufacturing amongst others going to have on the sector, manufacturers and how they conduct their operations?

We asked the attendees:
What impact do you think new digital technologies will have on manufacturing operations in the next 3-5 years?

"The way businesses transform is based on desirability and a need to get to the heart of a problem."

Head of Partnership Development
Coventry University

"Digitising works better when starting from a blank sheet of paper, the people who realise this will have the best results."

Strategy Manager
Siemens

"The factory of the future is constantly changing. What we may talk about today may be obsolete shortly."

Director
Zebra Technologies

New digital technologies are now created so rapidly it can be hard to fully explore them and understand how to use each of them to maximum benefit. The attendees suggested there is a definite need to take the time to look at all of these technologies in different and innovative ways to harness their full potential. The understanding of where to implement new technologies (rather than the actual implementation) is where most companies will struggle, so making sure you do the research and testing up front to build the business case is crucial.

This increased speed of development can be both an opportunity and a challenge. As one attendee pointed out, legacy markets like aerospace are somewhat protected by long product life cycles and can continue as they are for the time being, but in markets where this is not the case, such as automotive or food and drink, the landscape is constantly shifting and there could be large changes just around the corner.

The Personalisation Push

As mentioned in the discussions around Industry 4.0, consumer wants and needs have changed and will keep changing, and this is driving the adoption of new digital technologies by manufacturers. The typical consumer now expects a much more individual experience and more personalised products, and Manufacturers now need to look at how they serve this "individualised demand".

As the typical consumer has much higher expectations, this shift towards individualisation means firms have to work harder to provide a wider and also more targeted product range to satisfy their customers. This is where digital technologies will come to the fore to help manufacturers better understand the needs of the customers (with data analytics and social sentiment analysis for example) and then deliver the personalised product required (using a fully integrated MES implementation for example).

Getting specific

The attendees went on to discuss specific technologies they'd had experience of and where they'd seen it add benefit for manufacturers:

- One attendee spoke of the benefit derived from harnessing high performance computing and data analytics to understand the value in data flow and suggested that to get the most from this you have to start at the customer and work backwards.
- Another attendee followed up by giving an example of analytics being used to visualise what's in a truck and by doing it properly the truck can be optimised by 30%. They said that data is information that can now be used thanks to the increases in technology.
- The use of 3D printing at Renault was noted by one attendee, who said they are now able to produce products which are more reliable and more cost effective.
- One attendee picked out how the Internet of Things and augmented reality are being embraced at Bentley and how AR is now being used in their design process to great effect.
- However, one attendee warned of the hype surrounding additive layer manufacturing, and that even though it is definitely a very useful technology when used correctly, it can create unnecessary difficulties if not implemented practically.

The attendees agreed that we will see new technologies such as these used more and more in the future, as companies realise the range of situations in which it can be beneficial and the potential cost reductions if used at scale.

Cost and Implementation

On the subject of cost, another challenge the attendees highlighted with embracing new digital technologies is the investment required for implementation. For larger companies with resources to spare it is less of an issue, but for SME's who don't have the necessary financial clout the costs of implementation may prove prohibitive.

In any event though, when thinking about how to implement digital solutions, it was suggested by more than one attendee that it's best to start from a blank sheet of paper, and that the people who realise this will have the best results. It was also suggested that in order to truly transform your business a complete design and business plan overhaul is required.

Everything is changing

The attendees moved on to discussing how in recent years people's attitude towards owning their own products have changed and they are now more interested in the outcome rather than the 'thing'.

For manufacturers then, the value (and future business) lies not in the product itself, but in the use of the product. This is leading to the rise of servitization as a business model for manufacturers.

The attendees suggested that the whole sector is moving towards a more service-led approach, such as a 'power by the hour' concept, and the digital tech that manufacturers use needs to reflect and support this shift. The attendees predicted that there will soon be a very large change in the way business is conducted as manufacturing companies no longer supply a product per se.

In this new "servitized" and homogenised world it then comes down to brand and Customer Experience being the key battleground for differentiation and a means to get customers to spend their money.

In discussing what a 'factory of the future' might look like to support this new business model one attendee said that the factory of the future is actually constantly changing and what is talked about today may be obsolete very shortly, so what's really needed is cultural change, partnered with technical agility to make the most of digital technologies as they arise in order to meet the shifting demands of an ever changing market.

In Conclusion

There are swathes of new technologies manufacturers are already using to great effect, or currently exploring with a view to imminent use but as with any new technology implementation the business case needs to be built first, and this needs to reflect the shift in business models currently being experienced by manufacturers.

In 3 – 5 years' time the attendees expect digital technologies to be supporting manufacturers as they provide products-as-a-service rather than just a product, and as this shift to servitization continues manufacturers need to ensure they can keep pace with technological developments and serve the "individualised demand" customers now require.

People and culture

Staff and relationships will always be at the heart of any business, but as the world becomes ever more technologically developed and the pace of change continues to accelerate the impact these new developments can have on people can often be forgotten about.

When the organisational focus shifts entirely to new tech and digitisation, how do you bring your people along for the ride? And how do you foster and build an organisational culture that lets you do so?

We asked the attendees:
How can you best align and allocate resources to deliver your (digital) strategy?

"Change in company culture does not happen from the bottom-up, it can only be effectively changed from the top-down."

Strategy Manager
Siemens

"The people who are often forgotten are the ones who don't work in fully technical roles."

Head of Digital Transformation
Atos

"Creating a futuristic, engaged and modern culture is a slow process. In terms of increasing staff turnover, is this necessarily a good thing?"

CTO
Meggitt

"We think we need more leaders, more people in managerial positions, but this is not the case, we need more young people, more engineers, and more enthusiastic people pushing things in a digital direction."

IT Manager
Crediton

People and culture play a vital part in the success or failure of an organisation. As technology moves forward and the way business is conducted changes rapidly, there is an increasing need for new ideas and different perspectives. However, attendees suggested that it is very slow and often difficult to cultivate a futuristic, engaged and modern culture and there is also no set of instructions for doing so.

Each organisation needs to work out what will work best for them but the attendees questioned what the best approach might be to make a large transformation to culture within an organisation? The attendees were unsure whether it was better to make lots of incremental steps or one big leap as there were conflicting views based on personal experiences.

The Challenges

The attendees then went on to discuss the many challenges associated with properly aligning people and culture, starting with identifying what skills are now required for jobs. As the capabilities of digital technology continue to advance and market demands continue to shift, the jobs held by generations past no longer exist.

One attendee said that engineering roles and requirements are changing, and due to this, there is no 'skill set' anymore. Instead companies simply require more young people, more people interested in technology, and more enthusiastic people pushing things in a digital direction. One attendee said that finding technical experts is not the challenge; the challenge is finding people who can add to your company's culture in a positive way to keep moving towards a digital future.

Another large challenge facing companies all over the UK is that the output of staff is becoming greater than input, and retiring staff outnumber new hires. Currently there is too much reliance on older engineers who will be retired in 10 years' time. Attendees identified that Nordic countries have a solution to this. They use the experience of seasoned pros to teach young students, and by doing this they have shifted the bias away from the tail-end of engineering employment.

Where are they?

The attendees did note something of great concern; that finding and recruiting the correct talent in the UK can be very difficult due to differences in skills between regions and the fact that some specialists tend to migrate abroad to follow specific career paths.

Attendees stressed that organisations need to find a way to fill the gap or they jeopardise their future success. In an ideal world staff would be retrained to move to where they are needed but for many organisations this can be a difficult and costly process. However the attendees suggested that reward is there for doing so; by having a scalable and agile workforce that can significantly increase efficiency within an organisation.

Help is needed in a much wider sense though and the attendees suggested that everyone needs to do more to understand how best to encourage school children (and particularly girls) to pursue STEM subjects. As one attendee said "In the UK, engineering isn't perceived as a 'sexy' thing to do. This is different in foreign countries that seem to be doing the best job and we need to look at how we do that here."

A futuristic culture

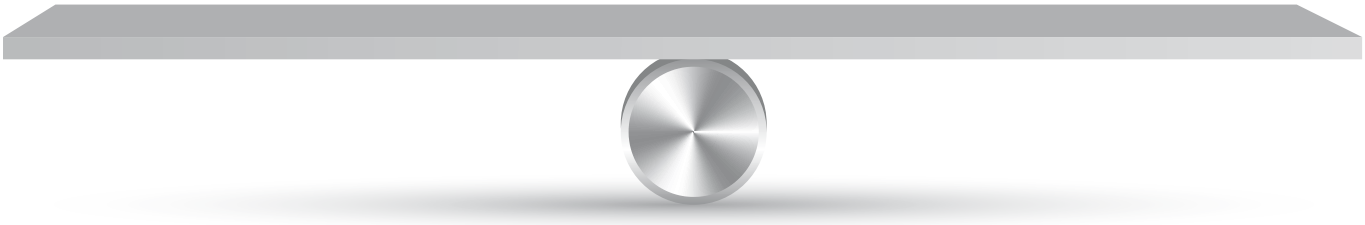
The attendees had lots of ideas when talking about ways to achieve a more futuristic culture, but started by identifying that a one size fits all approach doesn't work – both at an organisational level and at an individual level. You cannot put different businesses, departments and people through the same process and expect the same result. As such any "cultural training" needs to be tailored and varied.

Attendees were also vocal on the point that companies now require a much greater element of flexibility to encourage innovation and cultural shift, but that change in culture does not come from the bottom it HAS to come from the top-down. The attendees were firm on the point that there has to be an example set when it comes to cultural changes, as people require leadership to move in the right direction.

Overlooked?

The issue of people and culture is often overlooked when companies aim for a digital future, and the attendees picked up on this. One said that Industry 4.0 includes the amalgamation of technology, and people and culture and it is absolutely vital that they get an equal amount of attention, as the people and culture element commonly seems to get ignored.

Attendees also noted that companies are moving towards a much higher rate of employee churn than in previous years - one attendee mentioned that he worked at a company that would only employ people for a maximum of 4 years. This was viewed as a positive thing though as the attendees suggested that an increase in employee churn is needed in order to stop culture becoming stagnated, but it was also noted that organisations cannot go from one extreme to the other and equilibrium needs to be reached.



In Conclusion

Although it often tends to get overlooked, establishing the proper future-focused culture, and getting people brought into it, is vital for manufacturers of all shapes and sizes - especially in the UK where the "brain drain" of suitable hires is being felt and an aging workforce will shortly be heading for the exit. A focus needs to be placed on engaging with and recruiting younger "digital natives" who can bring a more youthful mind-set, approach and culture to an organisation.

It could potentially be seen as the most important element of any future strategy, as without the proper culture to support any developments made in other areas could fail. There is no silver bullet for building the right culture however and each manufacturer needs to look at what they currently have, understand where they want to be and then work on how to best get from A to B with senior management setting the example for the rest of the organisation.

Data and security

Data is now the lifeblood of business, but do manufacturers really understand how best to collect, analyse, interpret and utilise data to drive real benefit and value – for them, their customers and the other organisations along the supply chain?

What are manufacturers doing to secure and protect the data they use? What are the challenges being faced with compliance and trust, and what more could be done?

We asked the attendees:
How do you execute on a strategy where data is becoming an increasingly competitive factor?

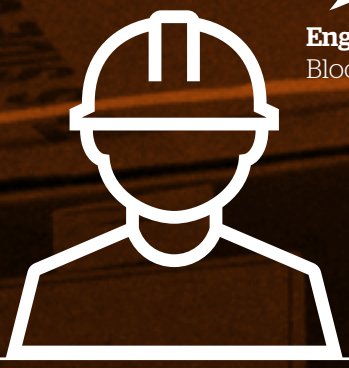
"There isn't a problem with the data, the problem arises when you have to convert it into actionable insights"

Head of SI
Atos

"To stop this being just hype, companies are going to have to trust, and potentially change their business model"

Head of Partnership Development
Coventry University

"The way people protect their data is woeful. Large companies can afford good data protection, but SME's can't."



Engineering Lead
Bloodhound SSC

"Digitise or die"

Strategy Director
Siemens

Companies are collecting more data than ever before, and there are many opportunities here, but only if the data is used in the correct way. One attendee said: there isn't a problem with the data, the problem arises when you have to convert it into actionable insights, there needs to be a closed loop approach, continuously giving feedback to the company. The attendees concurred that this is very difficult in practice though, and even large, increasingly digital organisations such as Banks aren't there yet.

Another attendee went on to say that if you want to benefit fully from raw data you have to have it in the cloud. This enables all parties who need the information gathered from the data to have access to it, however making this technology widespread can be challenging for businesses.

But, the attendees suggested that if are you are able to achieve the intelligent utilisation of the data you collect, you can employ many techniques to help your business such as predictive maintenance, where inaccurate parts are inspected and preventative measures are put in place to help prevent losses. This all relies on having a suitable analytics platform in place though.

The more you have ...

The other main point discussed by the attendees was security and the fact that the more data you have the more data you have to keep secure. With security breaches a 'legal minefield' leading to a vast array of negative outcomes for your company and its reputation, security failure cannot be an option. One attendee described some company's data protection as 'woeful'. Part of this could be due to the size of an organisation as large companies can generally afford good data protection, but SME's can't. Due to the complexity and regulation behind data management small companies can often be left behind and in need of expert advice that they may not be able to afford.

To deal with the issue of compliance one attendee suggested that the only way to learn to protect data is to learn how to hack it, and then reverse engineer this to build appropriate defences. The attendees agreed with this point but also discussed how the continually shifting regulatory landscape, coupled with the need to protect more and more legacy systems as time goes by, will mean this needs to be an iterative process (with continual hacking) and can't just be an occasional thing.

IT versus OT

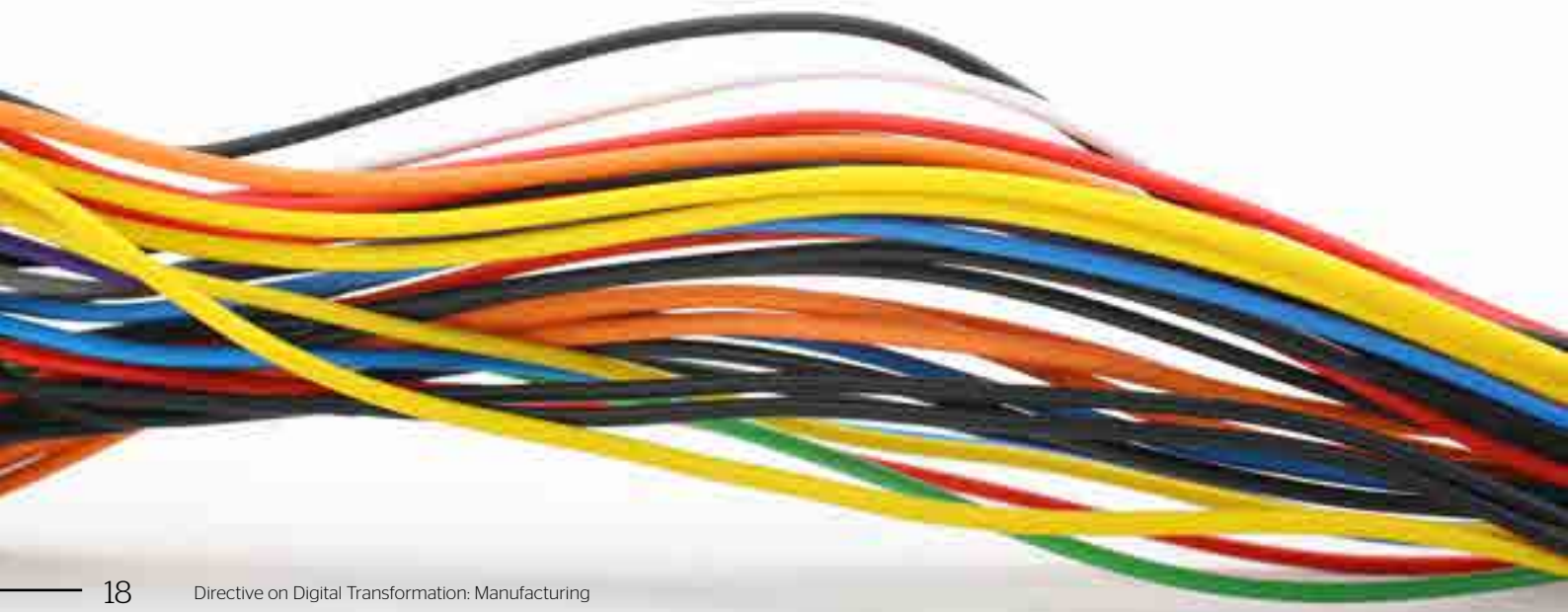
The attendees went on to discuss further issues relating to compliance inside factories and one attendee said that to be truly compliant the barriers between operations and IT need to be removed. There are unnecessary complications in sharing data when office staff are IT literate but the shop floor staff aren't.

The attendees discussed that they have seen an increase in data sharing on different devices, and that if mobiles can be properly used to share data then we might be able to overcome the barriers to capitalise on potential efficiencies. But, as with any tech implementation, there would be difficulties and potentially large costs associated that would need to have a supporting business case.

To share or not to share

Lastly, data sharing within the supply chain was a large point of contention for the attendees and they highlighted many issues around the security of information and knowing who you can trust with data. The attendees suggested that at this moment in time there are no assurances of mutual gain from data sharing, and if you share data and this is not reciprocated then a competitive edge is lost.

In an ideal world there would be complete supply chain visibility and all firms would benefit equally from this arrangement. Unfortunately the attendees felt that this doesn't, and probably won't, happen in the real world.



In Conclusion

Manufacturers clearly recognise the importance of data but many are struggling to derive real value from the data they have access to. In addition, the way in which data is managed and dealt with is non-standardised and varies significantly from one organisation to the next.

This is troubling for the sector as a whole as a chain is only as strong as its weakest link. If one part of a value or supply chain mismanages data and isn't compliant the knock on effects elsewhere could be significant.

New technologies are being explored to make better use of data and share it more easily however barriers need to be broken down within organisations and greater trust needs to be built between organisations to make this a truly beneficial activity for all.

Key directives

Based on the discussions from the event the following have been identified as key areas manufacturers could look to focus their attention in order to drive their business forward and secure their future.

1 The brain drain

The lack of suitable new hires with qualifications in STEM subjects was the most consistently and fervently discussed issue for the attendees during the event.

The crux of the issues is not just that there aren't the new hires available now, it's that there doesn't seem to be the requisite amount of individuals coming out of Universities over the next few years either. This lack of fresh talent is also exacerbated by the people and expertise manufacturers already have getting ever closer to retirement age.

Obviously hires can be made from overseas and there are large numbers of highly qualified graduates available but in certain manufacturing industries, aerospace and defence for example, this isn't feasible for security reasons.

The view was that in 10 to 15 years' time the sector will be in a very sticky situation unless something drastically changes. But what can manufacturers do now to address this issue?

Establishing closer alliances with Universities and Governments is a good way to access the graduates that are coming through but manufacturers can't just rely on this and need to push their own activity too. There needs to be engagement with children long before they even start considering university and the fires need to be lit at a primary school age. This is where projects like Bloodhound SSC are vital in getting the next generation of the workforce interested and excited.

The use of industrial apprenticeships by organisations such as JCB was also highlighted as a fantastic initiative with "digital natives" being brought into organisations at school leaver age and given the opportunity to obtain a degree without the hefty cost of university. These apprentices not only get the knowledge and experience but also deliver projects of real benefit to JCB.

Whatever approach Manufacturers and the wider market decide to take to meet this challenge it is a challenge that needs to be dealt with right now. The future of UK manufacturing is at stake and waiting definitely isn't an option.

2 Personalised demand

One topic that was discussed several times, especially when considering new digital technologies and the use of data was the idea of "personalised demand" and how to better serve the shift in customer expectations towards more individualised products and/or services.

This shift in what consumers anticipate from organisations isn't just impacting the manufacturing sector however. It is being felt across all industries in both the public and private sectors as people now want and need to be treated as individuals, "not just a number". How businesses react to this will help determine future success with those best equipped and positioned to serve these 'segments of one' being the more likely to success and prosper.

But what can manufacturers do?

At the front end manufacturers should be looking at tools such as social sentiment analysis and effective data capture technique, to ensure that a full and thorough understanding of exactly what customers (and customer's customers) want can be obtained. Doing this will then allow manufacturers to focus on products, product features and/or services that effectively serve this new demand.

At the back end the use of new techniques and technology by manufacturers, such as MES (manufacturing execution system) and line-optimisation solutions can be used to provide more agile and more reactive manufacturing capability that can flex to meet new requirements as they shift and change.

However the key is ensuring the complete end-to-end integration of whatever is implemented so information flows seamlessly into, through and between the different departments of the organisation. A focus on properly implementing and harmonising these two elements will ensure manufacturers are then well positioned to sense and respond to market demands and better secure their futures.

3 All theory, no practice

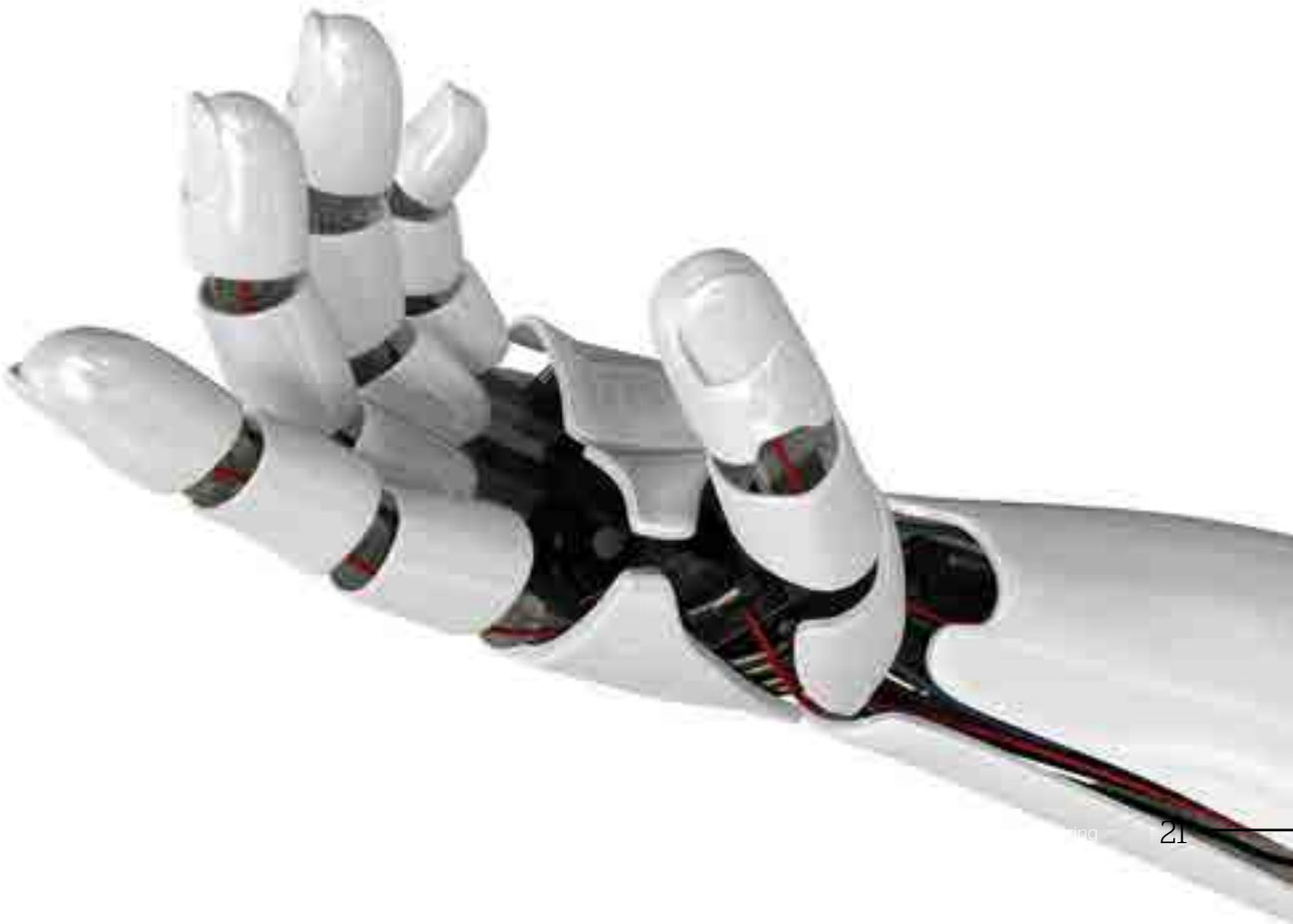
One major frustration manufacturers are feeling, which seemed to permeate all the discussions at the event, was around the proliferation of ideas and theory that lack any real world use cases or evidence of delivery. This is the case in many industries and walks of life but is especially felt in Manufacturing, a sector largely populated by engineers who like to be able to get to grips with physical things and "understand with their hands" rather than discuss purely theoretical ideas.

Industry 4.0 is most definitely the main culprit here. As a concept and indicator of where manufacturing can head it is vitally important but the effect it really has on the day-to-day running of plant and machinery right now is probably negligible. Does an operator on the line, attaching head lamps or bottling drinks care if she and the plant is industry 4.0 compliant (whatever that may mean)? Most probably not.

As you will have read one attendee even called Industry 4.0 a Red Herring and to a lot of manufacturers it is seen as such an unspecific ideal that it's just being ignored. But, to ignore industry 4.0 entirely could be very short-sighted. As another attendee said, you "digitise or die". But if the use cases and examples aren't out there what can Manufacturers do to make sure they get it right?

The answer is simple. Get out there and do it. Be brave. Be the use case. Be the test pilots. Be the pioneers who are embracing digital technologies and not just striving towards the promised land of Industry 4.0 but shaping what it looks like along the way.

This may sound daunting (and costly) but with the proper tech partners aligned, who have a first-class grounding in digital technologies and experience of the sector as a whole the path to the future can be smoothed and you can transform manufacturing by embracing digital.



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THE Manufacturer

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Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and is listed on the Euronext Paris market. Atos operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline.

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