

Manufacturing in a smarter, connected, digital world

A Meet the Boss ebook, in association with Fujitsu

IN THIS EBOOK...

1

CHAPTER 1:

Challenges on the journey to smart manufacturing

5

CHAPTER 2:

How to execute smarter manufacturing and scale it up

9

CHAPTER 3:

The future of smart manufacturing

13

CHAPTER 4:

What we learned

INTRODUCTION: A CHANGING WORLD

In common with most industries, manufacturing is increasingly seeing the advent of smarter, more connected, digital technologies as something of a game-changer. Whether it's greater use of data analytics, artificial intelligence, process automation, sensors and IoT, or any of the niche applications that are proving invaluable to today's manufacturing teams, digital tools are improving productivity across the board, reducing costs and downtime, and joining up the dots in the manufacturing process.

More importantly, they're also starting to enable those on the factory floor to add real value to the business in the form of better decision-making and insight.

But with legacy systems, disconnected data sets and entrenched organisational

thinking to contend with, transformation remains a tough proposition for many. Identifying strategies to optimise your manufacturing processes, people and technology – and thus increase efficiency and effectiveness – remains a key priority.

So what does it take to evolve into an agile, flexible and value-adding factory of the future? How does manufacturing harness digital tools and data to become more productive, more predictive and more customer-focused? And where do the pitfalls lie? Learning from those who've already taken those first steps is an important starting point. Which is where this ebook comes in.

Meet the Boss and Fujitsu recently hosted a series of roundtables with senior executives from some of Europe's leading

manufacturers to ask them about how they are approaching transformation at their respective organisations. Each roundtable represented a 90-minute deep dive into the challenges they face and the opportunities they see, led by the executives themselves and independently moderated by Meet the Boss.

This ebook gathers the highlights, challenges and learning from those discussions: three hours of conversation with 10 senior executives on the impact of, and drivers for, manufacturing transformation. What does business really think? It's all here.

**BEN THOMPSON, SENIOR EDITOR,
MEET THE BOSS**

Challenges on the journey to smart manufacturing

Transforming to become a smarter, more connected manufacturer is critical in an increasingly competitive environment. But, as ever, doing so is easier said than done.

Manufacturing is being transformed. And if you think you've seen it before – sensors, automation and even the internet of things are nothing new, after all – we'd argue different. The volumes of data and our ability to turn it into actionable insights is revolutionising operational decision-making across the board. Digitisation and the rising importance of customer experience are changing expectations as well as the way manufacturers approach the entire supply chain. The pace of transformation and depth of disruption is like nothing we've ever seen before.

“The most pressing challenge I see is how to bridge the gap between the rate of change inside the organisation versus the rate of change outside,” confirms Raahil Burhaani, CIO at global energy firm Essar Oil. “It's very hard to drive the train, because it's moving at a much slower pace than the technology advancements that are happening.”

For many, that challenge manifests itself in how to deal with the complex and unwieldy legacy tools and technologies that already exist within the organisation. “The manufacturing



equipment we have is, in some cases, starting to get quite old,” explains Ola Feddersen, Corporate Vice President for Device Manufacturing Development at pharma firm Novo Nordisk. “Some of the devices we have on the market have been on the market for 30 years, and the equipment used to make those devices has been around just as long. Suddenly turning it all digital is not easy. Sometimes, it would be nice to start from a clean sheet.”

Indeed, the tension between operations and IT is particularly strained when it comes to making progress with digital transformation initiatives. “The frustration is building on the manufacturing side because we want to deploy new solutions and take the benefits,” says Howard Baker, Head of Engineering Services & Technologies at Nestlé. “The concerns and the risk is sitting with IT. And we haven’t yet found an adequate solution in that space. It’s the biggest barrier holding us back at the moment.”

Reconciling those differences is key to smarter manufacturing success;

nonetheless, many of those concerns are well-founded. As manufacturing systems, production lines and factories become ever more connected, cyber security becomes a clear and present danger.

“While we have spent billions of dollars on creating firewalls and making the IT side of technology robust, we have thus far largely ignored the OT side,” suggests Ravi Krishnamoorthi, Senior Industry Partner and Head of Manufacturing at tech giant Fujitsu. “How are your programmable logic controllers interacting with your manufacturing execution system? What are your machine-to-machine communication vulnerabilities? People are only just now starting to wake up to some of those security challenges.”

Feddersen agrees. “The production set up we have is very IT-dependent and cyber security is a key factor for us because it can cut production very easily. That’s a huge concern,” he says. “Every time you log in just a small collaborative robot or smart device somewhere, you suddenly have a programmable unit that is linked

onto the internal network. And you have created a backdoor for potential disruption.”

Indeed, even those firms that are already experimenting with smart factory initiatives see security as a challenge. “Most of our trials have been done in standalone ways outside of our networks, without the security risks and concerns,” says Nestlé’s Baker. “But as soon as we want to plug them into our networks, as soon as we want to scale them up and roll them out across the business, then the first brick wall that we hit are the cyber security risks associated with that.”

Those risks become even more acute when you consider the wider ecosystem that is increasingly critical to manufacturing success in a connected global economy. Bringing partners with you on the transformation journey is imperative. “You can become the best, most digitalised company in the world, but what if your supply chain won’t follow?” asks Giuseppe Sarago, GM for Smart Manufacturing and Innovation at Wärtsilä, a global leader in power solutions for the

marine and energy markets. “You then become an island and can’t do anything. If a company really wants to succeed in digital transformation, it needs to involve and enable the whole value chain in its transformation.”

And that doesn’t just mean suppliers: customers need to be involved too. “This is the biggest challenge today: to create competence and to move both suppliers and your customers into this transformation,” he adds.

“If a company really wants to succeed in digital transformation, it needs to involve the whole value chain in its transformation”

GIUSEPPE SARAGO

GM for Smart Manufacturing & Innovation, Wärtsilä

“The biggest challenge in making things more digital is engaging the organisation”

OLA FEDDERSEN

Corporate VP for Device Manufacturing Development, Novo Nordisk

However, transformation needs to begin somewhere – and for most organisations, that means the greatest obstacle to becoming a smarter, more connected business is getting their own house in order. “Our many sites are at various levels of maturity,” explains Naveed Khawaja, Director of Agile and Lean Transformation at AstraZeneca. “Some are very advanced with a lot of automation and robotics, AI, all of that. And then there are others that are almost at the starting point. They’re manual.”

It’s a scenario that will no doubt be familiar to others in the manufacturing space.

“We know we cannot yet bring in 100% consistency across all our sites, so we’ve agreed to a variable level of maturity,” he continues. “That’s a pragmatic approach, but it means the sites that are very enthusiastic about change will always be two steps ahead of everyone else within the company. And motivating those other sites to reduce that gap, that’s my biggest challenge. We haven’t figured that out yet.”

Indeed, capturing the imagination of the entire organisation as to the importance of transformation remains a significant hurdle. “The biggest challenge in making

things more digital is engaging the organisation,” confirms Feddersen. “Ours is a very traditional business, it’s heavily regulated. And as soon as you start changing even just small things, there are a lot of opinions on what you can and cannot do. It’s difficult taking advantage of digital opportunities because we are faced with the way we normally do things.”

How to execute smarter manufacturing and scale it up

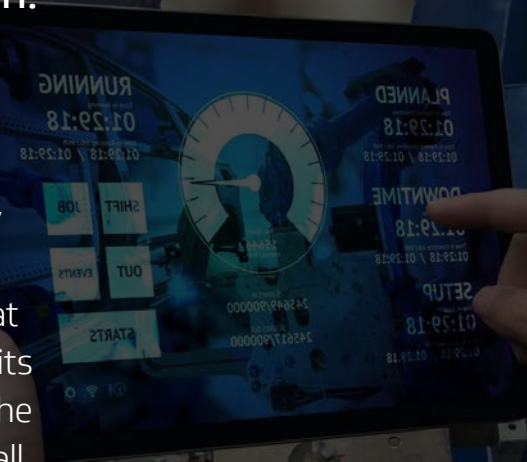
Clearly, there are multiple challenges on the road to transformation. Legacy technology, security and culture all loom large. So how are firms tackling these concerns?

By and large, most manufacturers have similar targets: improving operational efficiency, quality and speed whilst reducing costs are still at the forefront of R&D investment for most organisations. Yet while goals often remain the same, the methodologies and approaches manufacturing firms are employing to help meet those goals are increasingly diverse.

Some are exploring how to squeeze more out of their existing manufacturing footprint. “We’re starting to introduce more robotics to replace the human workforce and have more digital solutions in production,

because a lot of our challenges on quality and safety come from human errors,” offers Vibeke Risvig, Head of Operations at Siemens Gamesa. “But we also see benefits in terms of improving the end-product. The sites are heavily data-driven. We’ve kept all sorts of data to manage and monitor the site performance. And now we are looking at how to use that to drive improvements across the board.”

Indeed, improving visibility across the entire operation is critical. Too many manufacturers today still operate in siloes; to truly leverage the power of big data, machine learning,



AI and analytics, breaking down those organisational barriers will be key.

One company that is tackling this head-on is Philips. “We wanted to provide end-to-end visibility to the factory community to drive productivity and operational efficiency,” explains the company’s Manufacturing IT and Industry 4.0 Solution Architect, Vivek Kariyavula. “For that, we came up with something called the Visual Factory, which can enable the entry of information within the production environment.”

Alongside a push to collect more data on devices and products from the field, Philips has been using the Visual Factory approach to break down the walls between systems, between IT and OT, and between the firm’s various data repositories. “The idea of the Visual Factory is really helping us to bring all that data together,” says Kariyavula.

Taking a more data-driven approach to manufacturing will be essential going forward, and such approaches are in turn enabling firms to become faster and more

agile. The pace of change has never been as fast as it is today – and, worryingly for those struggling to adapt, it will most likely never be this slow again. “In today’s environment, speed or access to a service or product is more important than quality,” argues Essar Oil’s Raahil Burhaani.

“Despite this, manufacturers are still focused on quality, and tend to be slow in terms of delivering to the market. There is a balance to be struck in terms of perfection versus delivery.”

“The idea of the Visual Factory is really helping us to bring all that data together”

VIVEK KARIYAVULA

Manufacturing IT & Industry 4.0 Solution Architect, Philips

“We can now move the manufacturing base to a new location using a truck in just a few hours or days”

SAMI SALO

Head of Manufacturing Capabilities, Nokia

Indeed, in many cases speed and agility are becoming key differentiators between success and failure. And agility isn't just a mindset change. Agile methodologies are also shifting the way firms physically set up their manufacturing operations. “We are utilising a concept called Factory in a Box, which is a container connected to the cloud that can do SMT, AOI, all the basic stuff the factory does,” explains Sami Salo, Head of Manufacturing Capabilities at Nokia.


Such an approach is helping Nokia address concerns around where manufacturing

operations are based – for instance, where price volatility, supply chain or local regulations might be an issue – and enabling production to take place closer to customer markets, thus reducing time-to-market.

“We can now move the manufacturing base to a new location using a truck in just a few hours or days,” says Salo. Potential use cases include building for country-of-origin requirements, improving the speed of prototyping and new product introduction, and hardening resilience from a business continuity and disaster recovery standpoint.

Yet while all these approaches are seeing success, none would be possible without looking at the wider transformation of the organisation. Despite all the technological progression, the common element in all successful smart manufacturing initiatives remains better engagement of your people.

For Wärtsilä's Giuseppe Sarago, that means taking an employee-first approach, where manufacturing excellence is about bringing your people with you on the journey. “I think we should raise the bar for all of our employees,” he says. “Digital transformation

A man with a beard, wearing a white hard hat and safety glasses, is focused on working on a complex industrial machine. The machine has various pipes, wires, and mechanical components. The background is slightly blurred, showing more of the industrial environment.

competence should be embedded in the backbone of what you are trying to do, from the blue collar to the top executives. It's not a technology challenge. You need to change the mindset and competence of the people."

Indeed, the truly progressive firms see new technology as a way of enhancing the skills and capabilities you already have, rather than simply replacing them. "We definitely see the potential for technology to help augment the people and skills that we have in our organisation by giving them access to information, by giving them opportunities to do more and to be more productive," suggests Nestlé's Howard Baker. "To do that, we need to capture the expertise and experience that exists already in our organisation."

And not just within your own organisation. "You need to have an ecosystem to deliver that promise of smarter manufacturing," says Burhaani. "One company cannot do everything alone. So building the ecosystem is key to increasing your ability to deliver to the market." Sarago agrees. "The ecosystem is more than just getting connected to suppliers or customers," he

explains. "Companies have been doing this for years. An ecosystem is something more. It is shared. It is collaborative. It's about open innovation. If you create common ground, then you can all grow together. And only then can you ensure a new level of business."

In response, manufacturers are being forced to open up and collaborate more with partners, clients – and on occasion, even with competitors. "We've been very much a closed book up until now, we've typically been afraid of revealing our secrets," admits Risvig. "And while there might be good reasons for that on the technology side, on the manufacturing side we would like more openness. Co-creation will be critical."

Why? Because consumers won't accept anything less. "Our biggest challenge in the future will be to stay relevant given the vast choice that the consumer has, from an increasingly diverse set of competitors," concludes Baker. "To stay relevant, we will have to innovate. And we will have to innovate faster than we've ever innovated before."

The future of smart manufacturing

Manufacturing is evolving fast. So what does the future hold? And how does the industry need to adapt in order to stay relevant?

Manufacturing is changing because it has to – and, critically, because it can. Technology is enabling much of this change. The industrial internet of things provides access to huge amounts of untapped data. Analytics provides new insights into it. Greater enterprise mobility offers the opportunity to share those insights with everyone from frontline workers and plant managers to senior executives. And the latest security tools allow everything to be connected safely and with less risk than ever before.

But it's not just about technology. "Technology is just an enabler. You need to have a vision," says Philips' Vivek Kariyavula. "One thing that I see here internally is that

transformations are not just limited to IT or the departments closely associated with IT. Business transformation beats digital transformation every time. And so the same amount of effort needs to be put in to other areas of the business, to really get them up to speed as well."

Fujitsu's Ravi Krishnamoorthi agrees, but goes further. For him, it's about thinking bigger. "It's not about manufacturing, it's not about producing something, it's not about how we deliver. It is about the customer journey. How can a customer get what he wants, when he wants, how he wants it? And where can he get the data he needs to make a buying decision? Being customer-centric

"Technology is just an enabler. You need to have a vision"

VIVEK KARIYAVULA

Manufacturing IT & Industry 4.0

Solution Architect, Philips

is going to be the most important element going forward.”

And this shift towards a greater focus on customer-centricity manifests itself in one of the biggest trends in the manufacturing space today: the rise of mass customisation. “We are starting to see more and more consumers wanting bespoke products,” he says, citing the example of Nike and Adidas where consumers can now order a shoe that is completely customised for them, using their own information – how their foot lands, whether they’re landing on their heel or their toes, whether they want gel or want a cushion.

“Being able to offer that level of customisation at speed is transforming the entire manufacturing process,” he explains. “Your supply chain needs to be tuned for it, your factory robots should be tuned for it. You need to have much more intelligent decision-making, and those decisions need to be made pretty quickly.”


And it is not just consumer packaged goods companies that are feeling the pressure of rising consumer expectations. For instance, medical professionals are increasingly seeking to recommend personalised drug formulations to patients based on individual

needs, and will require pharmaceutical firms to be able deliver on that promise – in other words, to be able to rapidly and cost-effectively reconfigure systems and production lines to cater to small batch and even one-off product runs.

As Essar Oil’s Raahil Burhaani puts it: “The consumer is more important than the manufacturer, and consumer freedom is something that is only going to increase with more customisation. Everybody wants a custom product and that is going to change the manufacturing paradigm.”

McKinsey forecasts that the economic impact of IoT applications by 2025 could be as much as

\$11.1 TRILLION



“It’s not just data. It’s the way you manage the data, it’s the way you approach the strategy”

GIUSEPPE SARAGO

GM for Smart Manufacturing & Innovation, Wärtsilä

This shift is all part of what Krishnamoorthi refers to as the ‘servicisation’ of manufacturing. “It’s not just software or infrastructure or platforms: everything is becoming a service,” he suggests. Take the field of automation, where Fujitsu is running a pilot with robotics company KUKA to trial the use of a so-called ‘cobot’ – a robot that works alongside human operators in a shared workspace, and is designed to interact and collaborate with its human colleagues. Rather than purchase the robot outright, Fujitsu is instead trialling a robot-as-a-service model:

in other words, it only pays for the time it uses that machine.

What that means, explains Krishnamoorthi, is that the robot can be used by KUKA (and, by extension, its partners and customers) to do other manufacturing work in the Fujitsu facility when not in use. “The one caveat we have is that it cannot be used for competitive products, obviously,” he says. “But the day will come when companies such as KUKA will be able to build products on-demand using just a software file from clients who have no

manufacturing facilities of their own. In 20 years’ time, I don’t expect Fujitsu to have a manufacturing facility. Factories will be available as a service.”

So where does that leave manufacturing in an age of transformation? Where do the future opportunities lie? And what does the manufacturer of the future look like? “It’s up to the organisation to look at where they want to be in 10 or 15 years’ time, and service is where the future is,” suggests Burhaani. For Giuseppe Sarago over at

Wärtsilä, transforming in concert with the entire supply chain is essential: “You can’t really run business-as-a-service if the whole supply chain is not at the same level,” he says. “It’s not just data. It’s the way you manage the data, it’s the way you approach the strategy, it’s the way you develop your knowledge base.”

Faurecia’s Jürgen Breuer believes that future success means continuously being able to shape your organisation and your business model to stay effective. “It’s being lean, being green. But the key thing is to stay flexible and continuously adapt to needs,” he says. “That, for me, is what makes the successful manufacturer of the future.”

Over at Philips, meanwhile, Kariyavula sees a critical role for these types of agile development methodologies, but argues that they must serve a single purpose. “You must really work towards the goal of making factories better,” he says. “And better can be anything: it can be industry 4.0 compliant, it can be factory of the future compliant, but it should all drive towards the common goal of serving the customers better.”

Krishnamoorthi agrees, maintaining that the most essential takeaway is that manufacturing must fundamentally change to embrace a new, customer-centric mindset. “Connected, real-time, intelligent, consumer-centric, service-oriented: those are the five things that are going to define what the future of manufacturing will look

like,” he concludes. “Digital transformation today is less about automating factories or automating a particular process, and more about the end consumer asking for data anywhere in the world, using any device and at the click of a button, anytime. Which means that as manufacturers, we all need to be ready to serve that customer.”

By 2020, Industry 4.0 is expected to bring an average annual cost reduction of

3.6%

across process industries globally, according to PwC

What we learned

Fujitsu's Senior Industry Partner & Head of Manufacturing Ravi Krishnamoorthi provides his recommendations for how to get smarter about your manufacturing.

TRANSFORMATION DOESN'T HAVE TO MEAN BIG BANG:

Fujitsu believes there is no truly end-to-end smart factory today. But there are bits and pieces of smartness being introduced into old machines and ways of working that are delivering improved activity. "If you are going to convert into a fully smart factory, you're looking at a few billion dollars of investment," says Krishnamoorthi. "But there are small, incremental IoT-type things that can be done that are delivering huge results." Sensors and mobile solutions can have a big impact.

DEVELOP A PLAN FOR YOUR DATA:

Data is increasingly the lifeblood of any manufacturing process. "We've been collecting data for hundreds of years but what are we doing with that data?"



How do we create insights with the data? Helping to make the customer experience better using data is what is driving digital transformation, and that feeds into manufacturing too.” From predictive maintenance to risk management to build-to-order to tracking daily production to improving supply chain visibility and efficiency – the uses are myriad.

LOVE THY NEIGHBOUR:

No man is an island – and that counts double for manufacturing firms. Developing a smarter ecosystem of partners, suppliers and even competitors is essential to building the speed required to meet customer needs. “It is less about competition. It is all about cooperation. It is about collaborating with partners who were previously thought of as competitors. How can we collaborate and create the required agility and transparency?”

UPGRADE YOUR PEOPLE AS WELL AS YOUR TECH:

The technology exists to make smarter manufacturing a reality; the bigger challenge is overcoming cultural resistance to change, and ensuring teams have the required skills to make the transition. “Things are changing so fast that unless we upgrade our own teams regularly, bring in fresh talent and ensure that people are fully up-to-date on the new technologies that are happening, we will be left behind. Culture is probably one of the biggest impediments to digital transformation. Technology can enable change, but you need people to embrace new ways of operating.”

BE A CUSTOMER-CENTRIC MANUFACTURER:

Being customer-centric used to be purely the domain of those businesses that had a direct end-consumer touchpoint. But that is no longer the case.

“If you are going to convert into a fully smart factory, you’re looking at a few billion dollars of investment”

RAVI KRISHNAMOORTHY

Senior Industry Partner &

Head of Manufacturing, Fujitsu

“Being customer-centric is going to be the most important element going forward”

RAVI KRISHNAMOORTHY

Senior Industry Partner & Head of Manufacturing, Fujitsu

“B2B buying behaviour is changing to where it’s now a customer journey, and that is forcing a lot of manufacturers to look beyond their traditional B2B customers. You now need to think about your customer’s customer, as well as appreciate that even B2B buyers think like consumers, because they ate consumers themselves. Being customer-centric is going to be the most important element going forward.”

SECURITY IS FUNDAMENTAL – AND CANNOT JUST BE LEFT TO IT:

Any attack on IT creates problems in terms of cyber security. But the OT side creates more problems and is going to create more in the future. Bringing those two tribes closer together is a critical part of the smarter manufacturing journey. “There are a few things that you can do to ensure you are reasonably protected from an OT and IT integration perspective. Take Fujitsu, for example. We have built a solution called IntelliEdge that aggregates data, security and risk information, then sends what is needed to the MES layer on an as-required basis. Then, using AI, it can recognise what is an attack and what is not an attack. OT security is still not very mature, and is why we need more investments to go in.”



Meet the Boss

IN ASSOCIATION WITH

