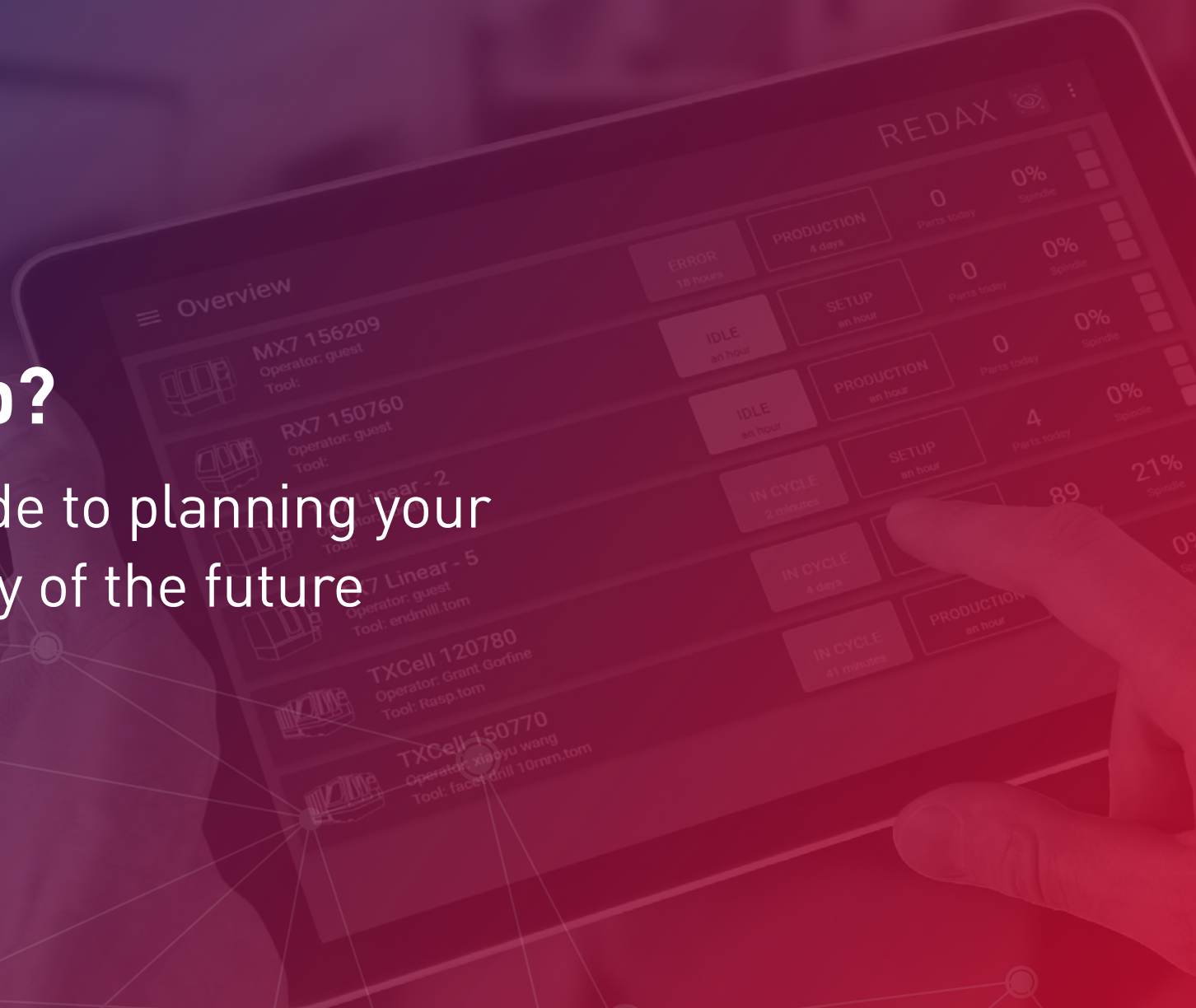


When to jump?

The practical guide to planning your road to the factory of the future



01

The factory of the future – you're closer than you think

Toolmakers have always been subject to technological change. The first revolution came with steam power, followed quickly by electricity and mass production. Later, computers entered the picture, allowing for automation and ever greater efficiency gains. Now we're looking ahead into the future of yet another revolution.



Today the future of tool making innovation goes by many names. The Factory of the Future (FoF), the Smart Factory, or Industry 4.0. Whatever it is called, there's one common factor: it's revolutionary, and it will redefine and optimise the way in which we work daily.

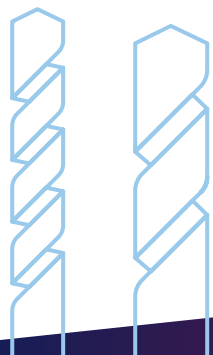
For tool manufacturers this will be a new landscape that places big data analytics and interconnected technology at the heart of daily work. It means streamlined business operations that allows rapid expansion into new and emerging markets and technology throughout the process to remove the need for human intervention.

This may sound like there will be a giant leap required to move into this new and promising future. You may be asking,

- When do I need to start doing this?
- Is the technology ready to enable this now?
- What benefits will this really give me?
- When is the right time to make the leap?

... And how big a leap will it be?

Relax. You are further down the road than you realise. While it sounds far off, many of the technologies the FoF will require are already here. In fact, the odds are that you're already well on the way. It's just a matter of just taking the time to think holistically about your end-to-end processes.





Change will not happen in one radical moment

For almost 50 years we've been on the journey to help our customers move towards a smart factory solution. Every world-first technology development we've introduced, from 3D simulation software to Laser Plus, our in process measurement system, to RoboTeach, which makes robotic loaders accessible and easy to program, has been iterative rather than completely revolutionary.

That's why we recognise that instead of preparing for a massive overhaul, what is needed to feel confident about becoming a factory of the future is clarity around how to reassess your existing practices, and a blueprint for how your Factory of the Future (FOF) could look.



02

Smart factories mean being smarter everywhere

When we look at customers who are already making progress on their own journey to becoming a FoF the general trend is towards smaller, more manageable, clean, well-organised, and highly flexible factories.



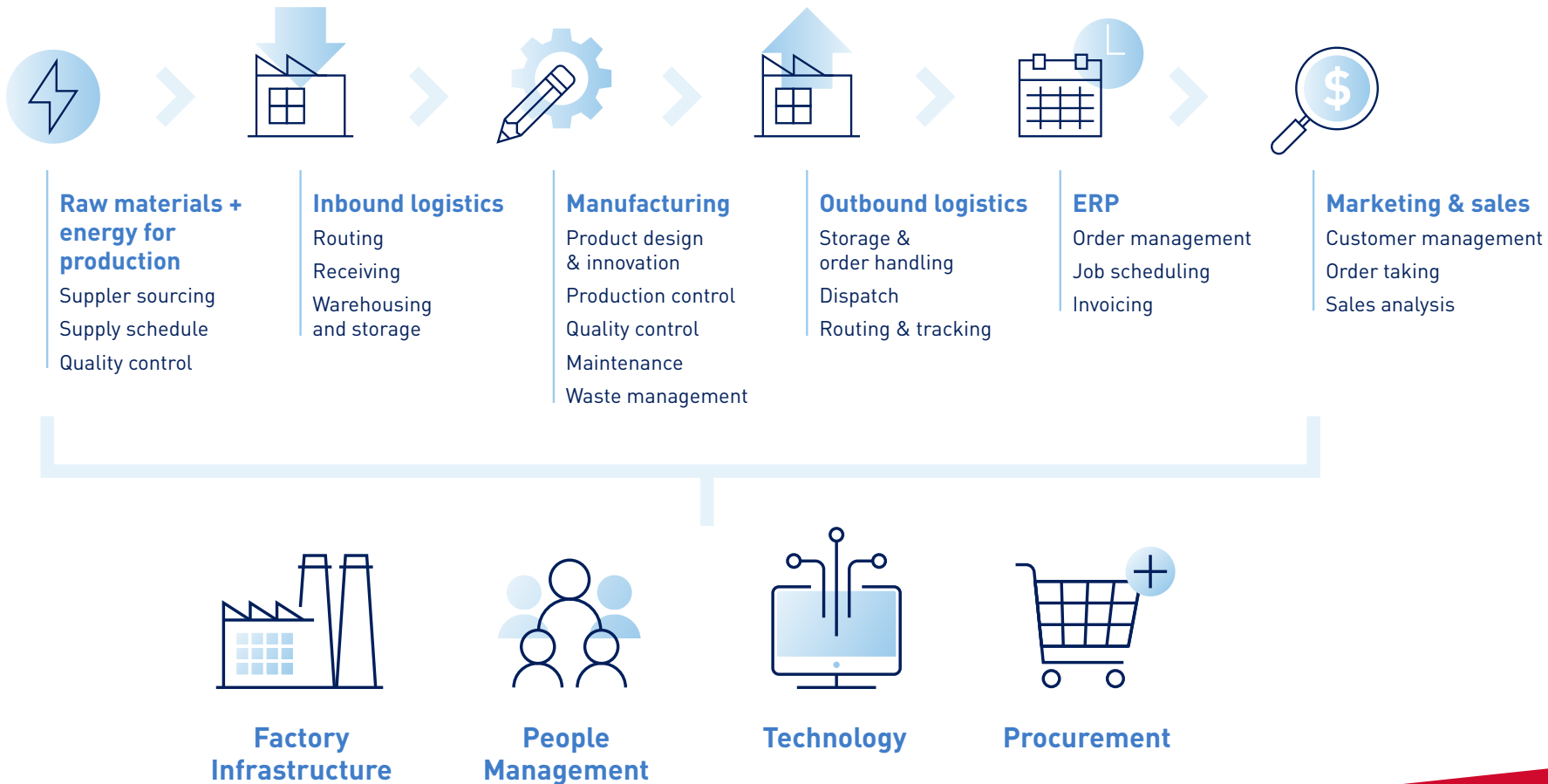


Rather than reinventing the grinding wheel, they are making use of updated but traditional technologies like the cloud, robotics, and in process measurement, allowing tool production to be quickly ramped up to meet volume while being able to deliver precision and quality in response to changing customer and market requirements.

But knowing that the ability to provide precision at the lowest possible cost will be the key to remaining competitive tomorrow, toolmakers are also looking across the entire lifecycle of their operations to find efficiency improvements.



From the initial stage where you order and receive your raw materials, to the final step where you dispatch and invoice the tools you have made, at every stage there are opportunities to make a real difference to your value chain – which means profit – by focusing on being smarter both inside and out. Here’s where big efficiency gains may lie:





Production

Even the most effective factories spend 15% of their time on non-value-adding tasks like machine changeovers, stoppages, maintenance, and production of faulty products. Efficiency improvements can be found by incorporating simulation and modelling tools into the tool manufacturing process. Greater levels of automation eliminate human error and reduce the cost of production.



Infrastructure

Connectivity becomes king in the FoF. With a range of networked machines, sensors and advanced robotics IT systems are beginning to be fully integrated into factory operations providing a real-time view of all functions across the business and allowing for faster more data-driven decisions.



Energy and waste reduction

The factory of the future allows toolmakers to be sustainable in a way like never before. With the rising cost of power and waste removal, improvements in these areas not only reduces costs but also signals a responsiveness to consumer and industry demand for greener, more environmentally-friendly business practices as well as significant cost savings.



Communication and data analytics

With globalisation increasingly placing tool manufacturers at a distance from their customers – and potentially their own factories - more efficient communication and better access to data via cloud-based management software will help toolmakers design, test and produce tools in an intelligent and unified way, no matter where they, or their facilities are.



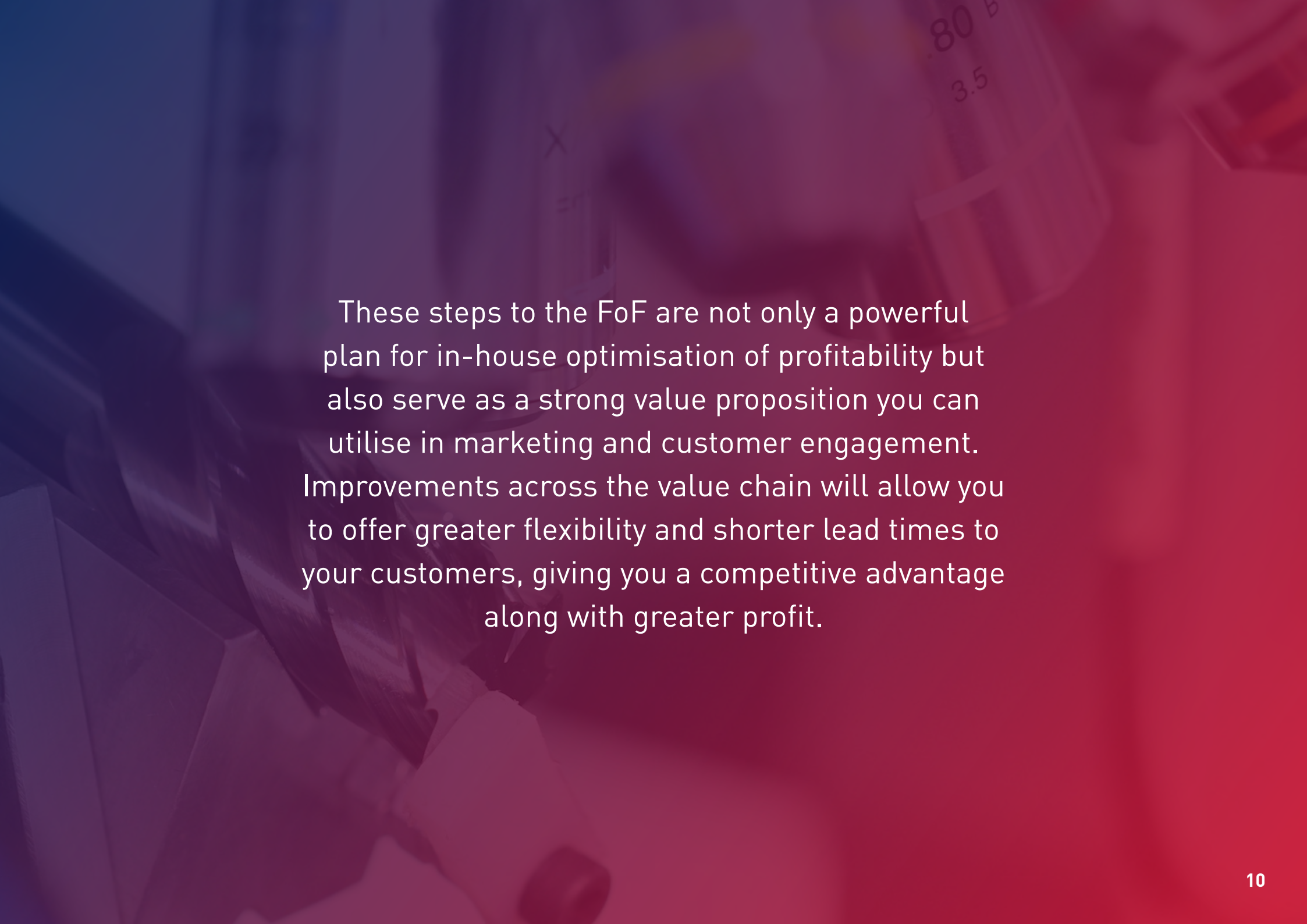
Transportation

Gaining complete visibility of your entire operation helps to sync inbound and outbound logistics. Moving away from a 'stop-start' supply chain to a 'just in time' model ensuring manufacturing resources are maximised and product cycle times are reduced.



Finance

While much of the value chain depends on technological processes that support production, cash flow improvements can be found through faster order taking and invoicing. Integrating your ERP system provides a complete view of current and forecasted orders helping you manage the overall level of manufacturing output to manage labour, machines, storage and supplier capacity.



These steps to the FoF are not only a powerful plan for in-house optimisation of profitability but also serve as a strong value proposition you can utilise in marketing and customer engagement. Improvements across the value chain will allow you to offer greater flexibility and shorter lead times to your customers, giving you a competitive advantage along with greater profit.

What are the safe technology bets?

The FoF does itself a disservice to a certain extent by appearing to be a far-off goal, when much of the core technology that will support the FoF is in place and readily accessible to tool manufacturers right now.

Components of the tooling factory of the future

● IoT related

● Not IoT related

Suppliers	Production			Customers	
<ul style="list-style-type: none"> ● Smart supply network Transparency over supplier inventories and vehicle logistics allowing for automatic and optimized supply decisions 	SOFTWARE	<ul style="list-style-type: none"> ● Next gen manufacturing systems Seamlessly integrated manufacturing systems making smart, automated decisions (e.g. production scheduling) offering remote monitoring, visualization, control and alerts 	<ul style="list-style-type: none"> ● Data analytics Advanced decision algorithms and real-time analytics 	<ul style="list-style-type: none"> ● 3D simulation & modelling Precise, virtual design simulation with a range of compensation and adjustment options 	<ul style="list-style-type: none"> ● Responsive manufacturing Individual manufacturing steps are designed for customer interaction so that products can be tailor made for customers. ● Integrated business processes Integration of non-production business systems including ERP and CRM systems.
		FACTORY FLOOR	<ul style="list-style-type: none"> ● Smart sensors integrated sensors wirelessly stream data providing insights about production, machine condition and more. 	<ul style="list-style-type: none"> ● In process measurement Automated 3D scanners check geometry and tolerances of critical areas. 	
			<ul style="list-style-type: none"> ● Mobile workforce Armed with mobile devices staff have access to real time information which enables them to work from anywhere. 	<ul style="list-style-type: none"> ● Smart Maintenance Machine maintenance becomes proactive, supported by predictive data and remote assistance systems. 	<ul style="list-style-type: none"> ● Cyber physical systems Interconnected systems provide control over physical entities.
		<ul style="list-style-type: none"> ● Robotics Collaborative robots automate a variety of processes freeing up operator time to focus on innovation 	<ul style="list-style-type: none"> ● Advanced materials Access to new materials such as nano-materials and integrated computational materials engineering (ICME) 		




In particular, we think the following functions offer the right combination of ease of adoption and proven technology:

Simulation and 3D modelling

Simulation and 3D modelling tools offer a way for businesses to measure and plan without requiring the use of materials outside the digital environment. The latest technology reduces the learning curve for new operators and provides for precise design simulation with a full range of compensation and adjustment options. Furthermore, designing the tool digitally achieves significant reductions in tool waste as there is no need to perfect the tool by grinding numerous versions.

For example, Scripting, a simple programming language created specifically to automate tasks within ANCA application software, can be used to automate most tool design tasks, such as entering parameter values or drawing line/arc elements in 2D editors. It can also be used to create sophisticated fully-featured custom tool wizards with graphical user interfaces. This means less work for the operator, knowledge retention through capturing design and process intelligence, and reduced programming and set up time.



“In the past the simulation was in my head and that’s true of many manual cutter grinders. You have an idea of what you want, and after making the tool you hope it is produced to look like what you’ve been dreaming about. ANCA’s simulation software allows us to create the tool, with all the given parameters and see what the finished tool will look like. That combined with being able to program off machine has revolutionized how we make cutting tools.”

Alfred Lyon, Shop Supervisor, AB Tools

The cloud

Tool manufacturers are applying cloud technology – we call ours Management Suite/Redax - to monitor machines and production in real time, allowing better informed decisions to be made at the time when they will have the most impact. With the ability to remotely schedule, control and monitor networked machines, factories today can access real-time information, providing enhanced visibility and greater control over manufacturing data.

“With the installation of the Production and machine monitoring software REDAX , we have expanded the possibilities of data analysis more than ever.

Thanks to this excellent software, we can track our production planning more accurately. It means we can track the current status and activity of our machines and use the data to plan our production processes.”

Tarik Öztürk Production Manager at Turcar

Data analytics

Data analytics are already a core component of many tool manufacturers operations. The use of advanced analytics is being applied end-to-end across the production and supply chain activity. This is providing valuable insights into areas including production levels, inventory, available capacity, quality levels and order status, allowing a number of manufacturing processes to be optimised. Data analytics are even being used to predict machine failures before they happen, ensuring production uptime is maximised.



Robotics

With over 70% of ANCA customers buying machines with robotic functionality it's fair to say the age of the robots has come. Far from a nice-to-have add-on, many CNC machines now come with operator panels that provide in-built control over both the grinding software and the robotics function, opening the door to greater automation efficiencies.

More recent trends are to include dual robots within a single machine - a market first from ANCA - allowing more complex grinding to be completed with ease and improving overall productivity. The primary robot performs principle automation tasks like changing wheel packs, part loading and pallet management, while the second robot can perform

a range of functions such as part washing, metrology, part identification and laser etching to enhance flexibility and productivity.

According to Tarik: **“There are a lot of advantages of the RoboMate. The biggest advantage is that instead of a machine standing idle, automation means production can be significantly increased. Process accuracy is another advantage of this technology and the accurate surface finish is why our customers choose to work with us.”**

Automated measurement

With increasingly demanding requirements for precision when it comes to tool manufacturing, the challenge has been to grind tools accurately, while still maintaining a high level of productivity and reducing waste. Enter automated measuring solutions that can inspect and measure both in process and offline.

As an example, Zoller measurement technology has been integrated with ANCA software allowing tools to be ground, measured and validated remotely to ensure they are of the right quality to create top-grade parts. The results are automatically sent to the ANCA machine to correct any discovered errors, ensuring 100 per cent tool accuracy.



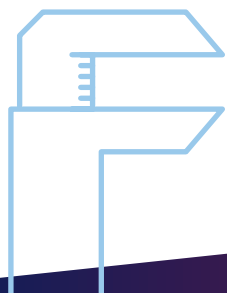


“The ability of the Zoller Genius to network directly into the ANCA machine has helped us be more competitive in the marketplace because we’re able to give customers exactly what they’re asking for, with diameters down to the millionths and cutting geometries that are plus or minus one degree,”

Jordan Armitage, Manufacturing Manager at California Tool and Cutter.

In contrast, in process measurements like ANCA's LaserPlus, allow the measurement of tool geometries to tolerances of 2 microns or less without removing the tool from the grinder, saving time in the manufacturing process and ensuring maximum accuracy in measurement.

“We have a very strong brand name and we have been making excellent tools since 1996.” says Benchmark Carbide owner Paul St. Louis. “But our customers are expecting more from us in terms of tolerances than ever before. Automation plus ANCA's on-machine laser checking system LaserPlus has allowed us to make sure every tool is reproduced to exactly the same specs every time, while operating unattended seven days a week. The better job we do, the more business we can get.”



Radio-frequency identification (RFID) technology

RFID technology is used in grinding to increase the flexibility of tool programming, automate the tool loading process and remove the need for operators to program individual loader pallet pockets to a specific tool, enabling businesses to run over-night and weekends 'lights out'.

Laser marking

For many years surface marking required screen printing or engraving. These processes were typically invasive, expensive, and non-permanent. In its place, laser marking offers the factory of the future a way to mark the surface of goods without the drawbacks of traditional processes. Already it has been adopted in many businesses and recognised as an essential component in the factory of the future.

Smart factories will walk before they run

While much of the core technology that will support the FoF is in use by many tool manufacturers to some degree, for most manufacturers the shift to smart factories will happen pragmatically through a series of phases, assisting as it does with capital expenditure, experimentation and staff training.

We don't believe this means you should take a 'wait and see' approach though. Delaying your investment will not only increase the size of the technology gap you will need to close, but also result in you lagging behind more active competitors from day one.

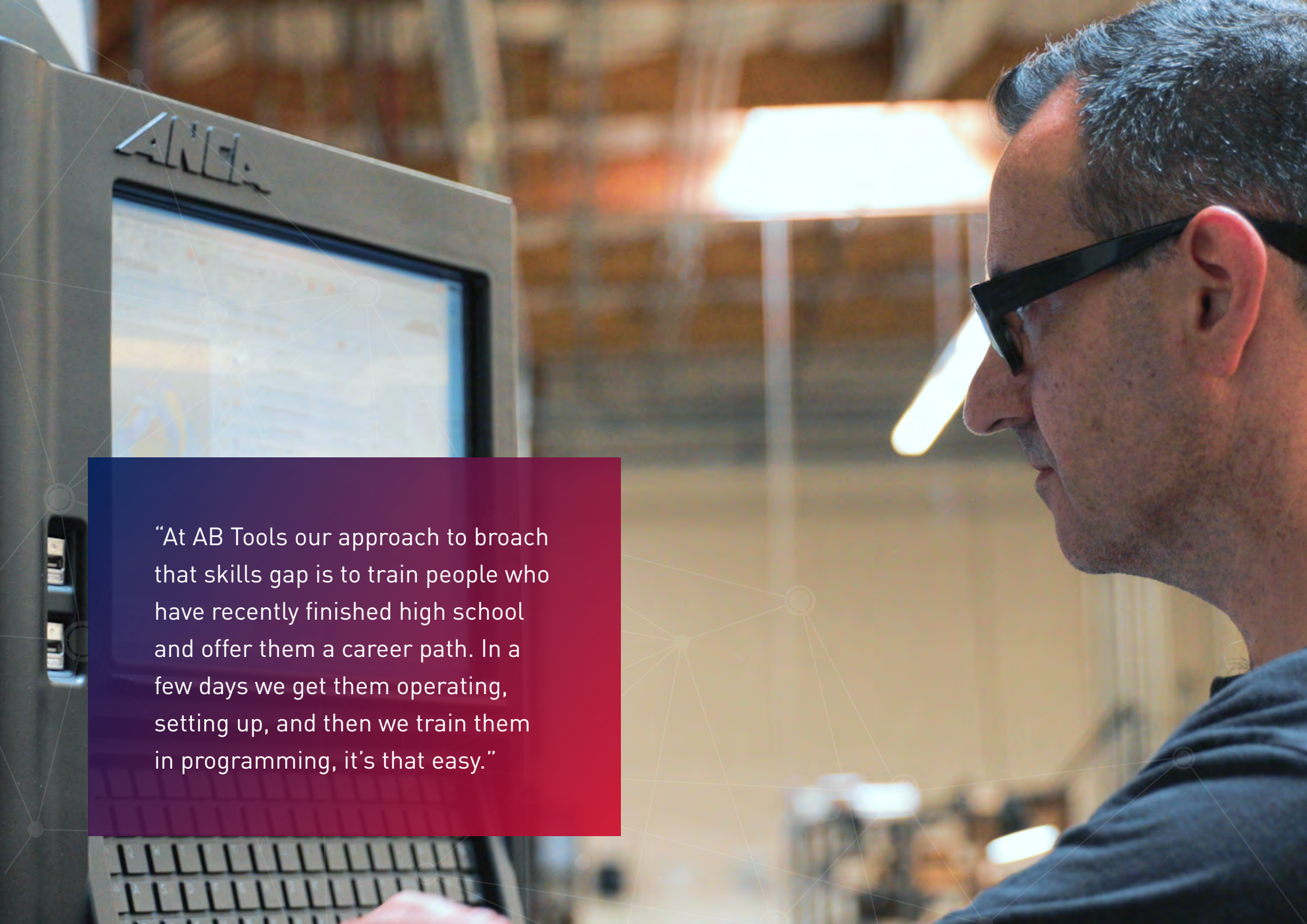
Instead, approaching the technology you introduce can be done through a series of iterations, adopting technology on one or more machines as they reach redundancy. This means expenditure can be approached on a replacement basis, while still allowing productivity improvements to be explored.

Another benefit of this strategy is the ability it provides to gradually develop skills for those in existing roles and more easily predict the need for additional new roles within the organisation.

This is the experience of AB Tools, who had invested in a new ANCA machine in the hopes of producing smaller batch runs of specialised tools faster, and with less training.

According to Shop Supervisor Alfred Lyon, **"I'd like to think I'm a fast learner, but in a day, I was grinding tools and by the second day, I felt like the trainer didn't need to be there. It was literally that fast."**

For factories anticipating the need for skill shifts in the future, work can begin now on the personnel-side of this process in anticipation of future technological innovations.

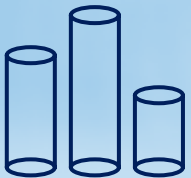


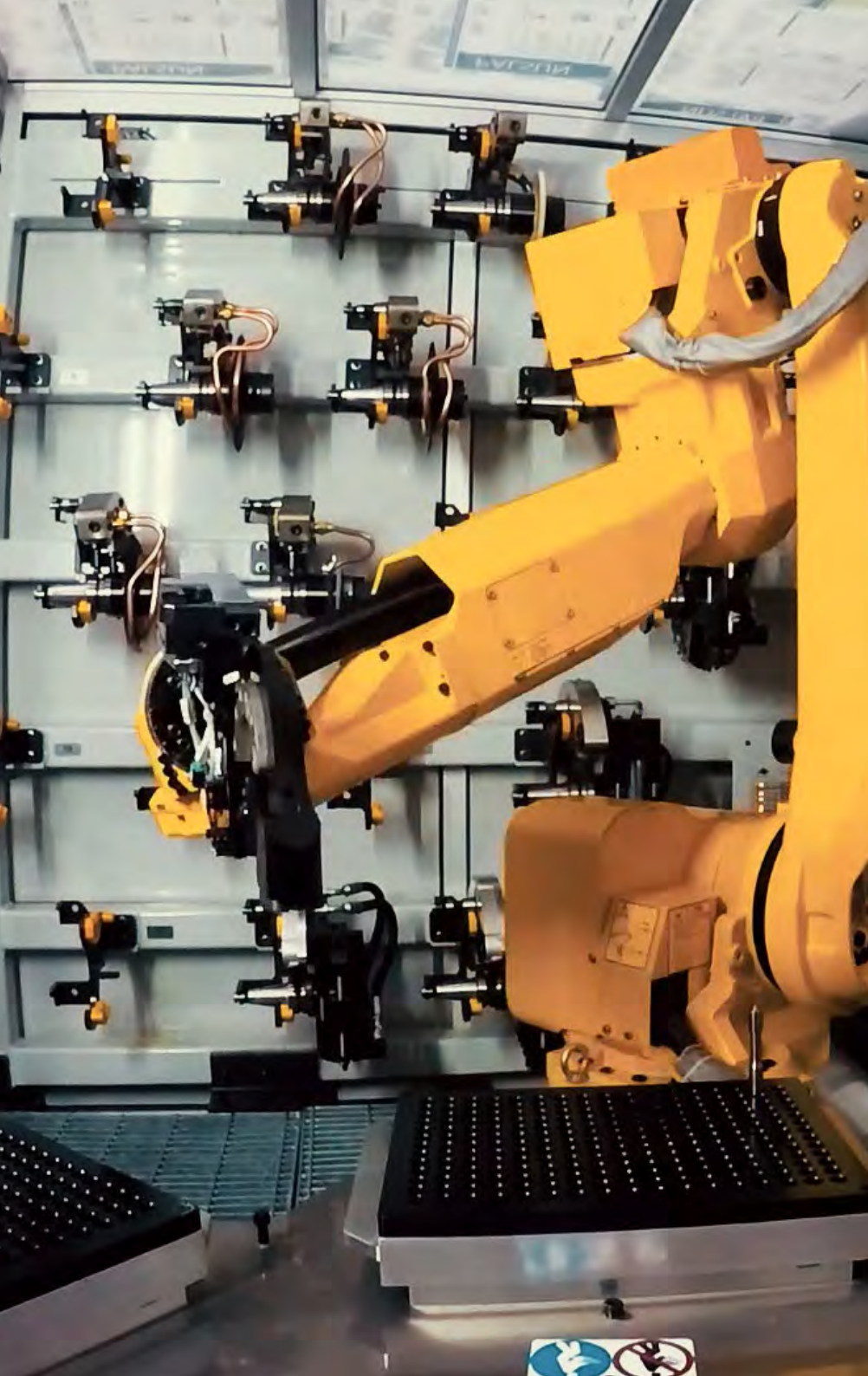
“At AB Tools our approach to broach that skills gap is to train people who have recently finished high school and offer them a career path. In a few days we get them operating, setting up, and then we train them in programming, it’s that easy.”

05

Accessing the benefits of the factory of the future, today.

For all the benefits the factory of the future promises, it's also understandable to wonder what's the compelling need to change now? In our experience, taking the first steps on the road to the FoF will begin to pay off almost immediately.





Production costs can reduce – by up to 50%

Unmanned production sounds like a thing of the future, but it's a reality for companies like Swiss toolmaker Fraisa. Incorporating automation into the manufacturing process has reduced the cost of production significantly. Functions like in-process measurement capability allow machines to run unmanned, while remote monitoring keeps staff aware of the machines progress and of any issues that need to be addressed. Machines are linked to Fraisa's factory ERP system for further efficiency gains.

“With the change from the manned three shift operation for five days a week to the unmanned seven days operation we cut costs by half. This meant we increased the productive hours from 105 on average, to 150 per machine per week which will deliver serious efficiency benefits.”

Josef Maushart, CEO and President of Fraisa

Have more freedom to invest in your IP

Remember when cameras used film? It was precious stuff, and you only took a photo when the moment really called for it. Now in the digital age, where storage is virtually unlimited and cost-free, we take thousands of shots to perfect our composition, the lighting, or our selfies. The same applies to tool design. Virtual simulation provides the ability to perfect a design without the waste, while automation is freeing up operators to be more innovative.

Get more adaptive control

Factories who are adopting technology including the cloud, 3D modelling and supply chain analytics, are experiencing a greater degree of scalability and more adaptive control. This is complemented by more easily reconfigurable systems and simplified ICT factory-wide.

Become proactive, not reactive

If we know one thing about the tool grinding industry, it's its very cyclical nature that is at the mercy of customer demand. Seemingly overnight orders can stop. And yet when the market rebounds it has the opposite effect. Factories with networked, robotic-operated machines have the ability to recognise the changes in the marketplace and scale production as market demand requires, or quickly pivot to servicing another sector when demand drops in their current one.




Be better able to exploit niche opportunities

We have a customer who is able to take customer orders in batch orders of one. That opens up a range of niche sectors who require specialist tool grinding but not at the volumes a larger tool manufacturer demands. The automation technology of the FoF is levelling the playing field for smaller manufacturers, helping them build a steady and growing customer base across a range of niche and emerging industries.

You will be a contender

With the ability to be more responsive to your customer with shorter lead times and more customisation, with the ability to read the market, predict trends and be more agile – just imagine how much more competitive you could be.





Today delivering high quality cutting tools alone isn't enough. ANCA customer CH Tools recognised the need to supply products that are competitively priced while meeting their customers high delivery expectations. To achieve this, they focused on finding efficiency improvements through more flexible and networked CNC machines, which allows them to deliver a wide range of products in small order batches very efficiently.

Remote monitoring allows the team to review the production of every individual machine from any location and allows machines to operate with less manual involvement.

“Automated manufacturing is essential as it gives us the advantages of less labour force, while ensuring the quality of the products is maintained.”

Zhu Dongwei, General Manager CH Tools



What's ahead to keep an eye out for

The factory of the future will not arrive fully formed in one 'big bang' moment. While there will be big leaps along the way, it will more often be a gradual process. But while much of the core technology is already in place, we have identified some interesting developments on the horizon which hold great promise for tool manufacturers.



New technology like self-driving vehicles. With many automotive manufacturers experimenting with self-driving vehicles the introduction of SDVs as an extension of factory automation across the supply chain is not far off.

Supply chains will see real-time tracking progress going beyond the capability of GPS to provide real-time sensor data which will help automate the production schedule. This may coincide with greater adoption of blockchain for ERP planning. Together we can see how these will flatten multiple layers of IT architecture, streamlining supply chain management.

Change can also be seen in smaller form tech, like the greater use of wearables. While there are already around 500 million people globally using wearables, the benefits of them are yet to be fully embraced in most factories. Future wearables will provide greater comfort to workers in uncomfortable conditions, assisting them in avoiding injuries, and keeping them safe in hazardous areas.



While many future innovations will arrive organically into our factories, others will need to be proactively pursued.

The addition of new workers who are technologists and specialists in this space will be essential to maintain a competitive edge, but current workers should also expect more training and upskilling in years to come. As the trend to lean manufacturing grows, greater integration and ‘sharing’ of skill sets across the factory floor will become a more common feature in pursuit of a more agile operation.



Conclusion

It's an exciting time to be part of our industry – but it's natural that excitement comes with some nerves, given the uncertainty that comes hand in hand with possibility.

With the convergence of tool manufacturing and company-wide IT systems, this next chapter is arriving at a greater speed than any one that has come before it. It is also the biggest change of its kind, as lean manufacturing and automation promises to deliver major disruption across the industry.

The challenges are big, but so too are the opportunities. If you can make more of what you have, you have the potential to establish a strong lead over competitors who drag their feet on growth. Most of all, this is a chance to level the playing field; smaller manufacturers have as much to gain as bigger ones – if not more.



About ANCA

The ANCA Group of companies consists of ANCA CNC Machines, ANCA Motion and ANCA Sheet Metal Solutions.

The ANCA Group invents technology to keep businesses innovating through the design and manufacture of Machine Tools, Motion Control Systems and metal fabrication.

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