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How to compete in the Fourth Industrial Revolution

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Management Summary

Manufacturing Chief Financial Officers (CFOs), interviewed across the globe, have high awareness of the Fourth Industrial Revolution, with all but two study respondents able to clearly articulate its benefits for their business.

They define the Fourth Industrial Revolution as the digitalization of processes, the Internet of Things, the installation of widespread sensors in the physical environment, and the ability to rapidly enhance production economics through real-time performance data analysis.

Manufacturing CFOs, however, face a major challenge to upgrade their existing organizational setup to take advantage of the new-generation digitalized technology and grasp the benefits of the Fourth Industrial Revolution.

Moving to the digitalized manufacturing environment also introduces an accelerated frequency of technology/software upgrades and improvements, imposing further pressure on manufacturers.

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As a consequence, astute financial management, focused on improving working capital management, is now seen as one of the five key drivers of success for manufacturing companies globally.

Improve working capital / cash flow management

Acquire new-generation technology

Increase production capacity and / or flexibility

Increase operational efficiency

Provide the basis for competitive pricing

These drivers of success help fourth-generation manufacturers achieve important business benefits, described by CFOs principally as:

1. More efficient production
- Process improvement from insights provided through digital data capture and analysis
- Increased production capacity and/or flexibility
- Predictive analytics for uptime optimization
- Tighter supply chain management

2. Product offering improvements
- Improved product quality assurance through automation
- Ability to offer mass customization
- More rapid virtual product development

3. Greater customer service quality
- Increased customer ease, transparency and speed of order management and fulfillment through e-processing

4. More competitive value for customers
- Increased ability to demonstrate value through increased quality, range and speed of product delivery, together with service reliability and transparency
- Reduced costs

CFOs are therefore accessing a wide range of financing techniques over and above traditional loans to find affordable and sustainable ways of investing in fourth-generation manufacturing technology.

These techniques include asset finance, invoice finance, inventory finance, and private equity. However, the most widely used non-loan finance technique is asset finance in its various forms, employed by 70% of respondents interviewed in this study.

Respondents reported that they are employing this range of financing techniques to: access the capital to keep their operating technology updated; align payments with benefits gained from the technology to improve working capital management; obtain financing that fits their particular business circumstances; embrace virtual assets such as software in their financing agreements; and improve clarity and transparency of planning with reliable, sustainable financing methods.

Accordingly, the essential qualities of non-loan financing solutions were summarized by respondents as:

- **Easy and flexible** – allowing manufacturers to raise the finance they need, when they need it, on terms that make sense for their particular circumstances, supported by customer-focused processes

- **Expert, appropriate and transparent** – from financiers who understand the sector and its challenges, as well as the role equipment and technology play in addressing those challenges, and can therefore offer customized finance solutions linked to desired outcomes that assist financial planning

- **Reliable and sustainable** – from financing partners that have a track record of association with the manufacturing sector and are looking to build long-term customer relationships

Introduction

The Fourth Industrial Revolution, competitive manufacturing, and the role of finance

The main theme of the latest World Economic Forum was the Fourth Industrial Revolution – a term encapsulated in a watershed book of the same title from Dr. Klaus Schwab.[1] Dr. Schwab and other commentators define the Fourth Industrial Revolution as "a new era that builds and extends the impact of digitization in new and unanticipated ways... [it] can be described as the advent of 'cyber-physical systems' involving entirely new capabilities for people and machines."[2] In short, the Fourth Industrial Revolution creates a world where technology and people are digitally enabled to interact better with one another, resulting in improvements in product quality, production efficiency, client service quality and machine intelligence/automation, all of which helps deliver improved value to end customers. The notion is not new – the German government started an initiative known as Industrie 4.0 back in 2011. Some European countries have, to an extent, picked up the Industry 4.0 label, but other nations have chosen their own titles for broadly similar initiatives, such as Made in China 2025 or the USA's Advanced Industry Portal. In any case, the notion of the Fourth Industrial Revolution is now gaining significant momentum and recognition from governments and manufacturers around the world.

The digitalization of processes, the Internet of Things, the installation of widespread sensors in the physical environment, the link between physical and virtual reality, and the ability to rapidly enhance production economics through real-time performance data analysis are all hallmarks of fourth-generation manufacturing.[3] Dr. Schwab's book offers a few choice quotations that bring home the importance of this critical tipping point for manufacturing industry across the globe. He says, "Aside from speed and breadth, the Fourth Industrial Revolution is unique because of the growing harmonization and integration of so many different systems. ... Today, for example, digital fabrication technologies can interact with the biological [world] ... AI (artificial intelligence) has made impressive progress, driven by exponential increases in computing power and by the availability of vast amounts of data ... ." In technological terms, digitalization of the production environment is required to create the infrastructure for fourth-generation manufacturing; but in parallel, it is the consequent ability to introduce greater levels of intelligence, automation and tailoring for each individual customer, which is making a transformatory contribution to customer service, competitive edge and ultimately, profits. And this is providing manufacturers with a real challenge. As Dr. Schwab notes, "The question for all industries and companies, without exception, is no longer 'Am I going to be disrupted?' but, 'When is disruption coming, what form will it take and how will it affect me and my organization?'"

The special interest of this research paper (which is based on qualitative interviews with leading manufacturing CFOs in 13 countries around the world) is how manufacturers can access the considerable financial resources needed to upgrade their companies to fourth-generation manufacturing technologies. Overall, respondents to the study state that they are employing financing techniques that draw on diverse sources, that are easy and flexible to arrange, that are appropriate to their needs and help transparent financial planning, and that are demonstrably reliable and sustainable in the long term. The term "smart finance" has been used throughout this paper as a label for this set of qualities.

The study highlighted that the term "the Fourth Industrial Revolution" is already very familiar to respondents, perhaps precisely because of its use by well-publicized global campaigns, such as those promoted by the World Economic Forum. Two further related phrases were consistently used by respondents – namely, "fourth-generation manufacturing" and "fourth-generation technology." This paper has, therefore, adopted the phraseology used by respondents as the research results are described on the following pages.

In summary, this paper addresses three key issues relevant to the Fourth Industrial Revolution that emerge from the research study:

1. What drives success in fourth-generation manufacturing?

2. What does the Fourth Industrial Revolution really mean to manufacturers?

3. What does smart finance for fourth-generation manufacturing look like?

[1] Klaus Schwab, The Fourth Industrial Revolution, 2016, ISBN 1944835008
[2] Nicholas Davis, World Economic Forum, What is the Fourth Industrial Revolution? 16 Jan 2016
[3] See, for instance: Bundesministerium für Wirtschaft und Energie, Umsetzungsstrategie Industrie 4.0, April 2015; European Commission, Overview of digital manufacturing initiatives across Europe, 2015; McKinsey, Poland 2025: Europe's new growth engine, Jan 2015; Future Watch Report, Advanced Manufacturing in Russia, 2014; Turkish Government, The manufacturing industry in Turkey, 2014; HM Government (UK), Strengthening UK Manufacturing Supply Chains, Feb 2015; Hennik Group, Annual Manufacturing Report 2016; Kurt Salmon, L'Industrie 4.0; la 4eme revolution industriellesauvera-t-elle l'industrie francaise, 2015; Chalmers University of Gothenburg, Industry 4.0 lab, 2015; Chinese government, Made in China 2025; McKinsey, China's next chapter, 2013-2016; United States, Advanced Manufacturing Portal; Spanish Ministry of Industry, La Transformacion de la Industria Espanola, OCT 2015

Drivers of success in the Fourth Industrial Revolution

76%
Improve competitive positioning

82%
Provide the basis for competitive pricing

76%
Increase operational efficiency

70%
Increase production capacity / flexibility

76%
Acquire new-generation technology

73%
Improve working capital / cash flow management

Percentages represent the proportion of respondents prioritizing each issue as a key driver of success on the road to fourth generation manufacturing, regarding each as a strategic pressure/challenge

Expert and transparent

Easy and flexible

Reliable and sustainable

Smart finance 4.0

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1. What drives success in fourth-generation manufacturing?

Role of digitalization

Do you consider digitalized, fourth-generation technology important in helping you meet your key strategic challenges?

91%

% saying "important", "very important" or "critically important"

Priority for implementing digitalization

Does your company consider it a priority to implement digitalized technology?

79%

% saying "priority", "high priority" or "critical priority"

While industry analysts are in the business of identifying new trends and using memorable catchphrases to characterize those trends, real-life industry leaders – commercial, operational and financial – tend to talk and think in more pragmatic terms. Senior management in industry has to deliver revenue, growth and profits, while also thinking about longer-term business trends. So, although respondents to this study were highly articulate about the Fourth Industrial Revolution and its impact on their business, they also related it to clearly described drivers of success in a fourth-generation manufacturing world. These drivers of success represent the key strategic pressures and challenges that forward-thinking manufacturers are prioritizing to achieve strong, sustainable growth. They comprise a number of interdependent factors, forming an ecosystem of best practice, all of which need to be in place for manufacturers to fully reap the benefits of transition to fourth-generation manufacturing.

As a starting point, respondents highlighted the imperative of acquiring the latest-generation technology – the fundamental platform for digital enablement of their processes and their people – to compete successfully in a fourth-generation manufacturing world. Digitalization of processes and people, the benefits of which are described in more detail in the following section, were seen by a majority of respondents as prerequisite for fourth-generation manufacturing success.

Respondents also noted the strategic need to improve their working capital and cash flow management if they want to upgrade operating technology to the new digitalized generation. This principally involves accessing financing tools that allow the manufacturer to only pay for technology as it is used and, most importantly, as it delivers benefits, revenues and profits to the company. Financing techniques that align costs with benefits in this way prevent precious working capital from being "locked" into technology acquisition and keep it available to invest in other growth activities such as sales initiatives, marketing campaigns, events, acquisitions, and more. The areas for which respondents gave more detail on the characteristics of such "smart" finance are outlined in the last section of this paper.

Once new-generation technology has been acquired, using appropriate financing techniques, the organization should then realize three key benefits. New technologies deliver improved operational efficiency, allowing more product (and possibly a higher-quality product) to be manufactured in a shorter time. This should also give the manufacturer the ability to introduce more competitive pricing, either through a reduction in cost base or an improvement in product quality, leading to a compelling value (quality-to-price ratio) for the customer. Moreover, new-generation technology has the potential to deliver an increase in capacity, along with greater flexibility to swap between production runs or even run a series of short runs at a speed and economy comparable to former mass-production scenarios.

Put together, operational efficiency, production capacity and/or flexibility, product quality improvement and gains in customer service capability – achieved in an affordable, sustainable way through appropriate use of customized financing techniques – provide an ecosystem that ultimately provides the foundation for overall improvements in competitive positioning for a manufacturer in the Fourth Industrial Revolution.

In this study, respondents drew a firm correlation between being able to acquire (and finance) new-generation technology, and their ability to achieve their strategic growth goals.

Nine out of every 10 respondents noted the causal link between investment in digitalized technology and their company's ability to meet strategic growth targets and benefit from the competitive advantages of fourth-generation manufacturing. Slightly fewer, (roughly eight in every 10), said that their organization was prioritizing implementation of that technology, reflecting the high level of urgency that digitalization occupies in the minds of manufacturers interviewed.

It is interesting to note how, in the minds of leading manufacturers across the globe, financing has now achieved strategic status, enabling the essential new-generation technology acquisition that underpins competitive success in increasingly demanding, fast-paced and global markets. This would explain the growing importance of financing techniques such as asset finance, invoice finance, inventory finance and private equity to release capital from being "locked" in technology acquisition, instead liberating that working capital for, among other things, new product development, sales and marketing initiatives, opportunistic acquisitions, partner promotions, and other tactical growth projects. The more capital is unlocked, the more is available to invest in growth initiatives. This is further discussed in the final section of this short paper.

Having established, therefore, the recognition among manufacturing respondents of the fundamental enabling role played by finance in acquiring and deploying the digitalized technology that sits at the heart of the Fourth Industrial Revolution, this study then sought to clarify exactly what respondents understood "revolution" to mean – in terms of practical benefits for their businesses.

»We use a mixture of in-house and external financing. With asset finance, the main benefit is that it allows us to acquire fourth generation that we would otherwise find it difficult to produce a compelling business case for because of the opportunity loss of not having access to our own accumulated funds.«

UK

»We are a supplier for the aerospace and defense industries, and operational efficiency, automation and digitalization are critically important for us to meet the client's requirements.«

India

2. What does the Fourth Industrial Revolution really mean to manufacturers?

Most commentators on the Fourth Industrial Revolution describe its hallmarks as (a) the digitalization of processes, using sensors to coordinate, automate, monitor and measure manufacturing processes, and then (b) using the performance data captured digitally to identify and implement improvements and predictively address process, service and maintenance issues. Is this, in fact, how manufacturing CFOs see the benefits of fourth-generation manufacturing?

Respondents to this study certainly demonstrated an extensive understanding of fourth-generation industry, broadly agreeing with this general definition, but also tending to focus on specific practical business gains empowered by fourth-generation manufacturing technology. A selection of the principal benefits cited by respondents is listed below:

- Enhanced value that skilled workers can deliver to the business through automation, not merely to replace formerly manual processes, but also to manage process performance in a more accurate and sensitive manner

- Added-value customer service enhancements through e-processing of orders, and improved quality control through process automation, to provide customers with 24/7 service

»For us, fourth-generation manufacturing is particularly focused on the processing of orders that are increasingly coming in online and are managed through production in an automated or semi-automated fashion through our IT systems, providing the customer with progress tracking and allowing us to better manage quality control, production stream efficiency, worker productivity and uptime maximization.«

Finland

»If the manufacturing sector is to stay profitable, the changes introduced by the Fourth Industrial Revolution are critical, either automating processes or enhancing the value of skilled workers. «

China

»Nowadays it seems that with almost every new order implemented, we can identify potential technological improvements (via our digitally enabled employees) during the production phase.«

Germany

- Multiple short product runs at similar economies to former mass-production prices (this service usually being termed "mass customization") through variable production technologies

- On-the-spot process monitoring, measurement, management and adjustment/improvement through digital enablement of the workforce, using mobile technology such as tablet reporting devices

»It's important for us – in our fourth-generation initiatives – that production equipment and manufacturing processes are now able to capture and analyze data from the physical world and [use it intelligently to] interact with each other autonomously.«

Russia

- Process and productivity enhancement (i.e., reduction of unit production cost), where opportunities for improvement are identified by performance data analysis, captured through digital sensors throughout the production line

- The ability to rapidly spot and intervene to rectify production problems through enhanced production control using digital sensor data that ensures production efficiency, product quality and error rate reporting is available in real time. Also, the ability to ensure maximum uptime by predicting upcoming failure through data analytics and taking preventative action

»Digitalization is highly important in the control process, which is the ultimate phase of our production cycle.«

Spain

»Proactive, predictive and preventive action through digitalized fourth-generation tech improves manufacturing capabilities across the board.«

USA

- Radically improved production redesign/adaptation cycles, enabled through virtualized 3D design and production process modelling/testing, delivering reduced time to market

- Reduced energy consumption, enabled through data mining that monitors consumption through digital sensors and spots inefficiency points in production processes and factory climate/environment controls

»Digitalized manufacturing is the now and future trend. We can now work in virtualized environments to test new processes, production line change impacts, even new product development… It just makes everything faster and more competitive.«

UK

»Industrie 4.0 is very important as capturing and dealing with digital production and performance information is becoming increasingly important in order to improve our efficiency of production and energy usage.«

Germany

- Improved product quality and quality control, mining defect data and production stress analytics in order to spot high failure likelihood points and adapt processes accordingly

- Accelerated innovation through access to virtualized environments where new product ideas can be rapidly built and tested with the need for physical prototyping

»Digitalization is ›must do‹ for us. Without the latest virtual digital technologies, our innovation is highly restricted.«

China

»Fourth-generation industry enables the economic production of custom-designed, high-quality, affordable and environmentally sustainable products.«

Turkey

»Digitalization improves product usability by capturing and virtually testing customer feedback to reach better business outcomes.«

Sweden

»We have planned and financed regular software upgrades for our new digitalized operating environment so we're never out of date.«

UK

- Improved product usability through virtual testing, where customer input and observations can be quickly incorporated and enhancements trialed at low cost

- Maintaining a competitive position at the technological forefront, using appropriate techniques to ensure that regular software upgrades are incorporated in the overall financing arrangement

»We look for financing packages that are in sync with today's faster software upgrade cycles. Everything needs to be included – hardware, software and other soft (but essential) elements like maintenance, service, training, and so on. That's how we reliably plan our technology deployment and return on investment.«

USA

»The Fourth Industrial Revolution is delivering [company] agility – an essential competitive advantage – and systems efficiency that's so crucial to managing our cost base.«

Spain

- Supply chain refinement/efficiency, introducing e-commerce efficiencies, and where digitalized data capture helps spot high-performance suppliers and rewards them with additional volumes of business based on their measurable performance/timeliness/low defect rates/etc.

- Overall competitive corporate agility in rapidly changing markets, where digitally managed production processes can be quickly adapted to meet sudden changes in market requirements, geographical demand, or product specification

»We try to work mainly on our supply chain, to make it more dynamic and replace manual processes. That's what fourth-generation industry means to us. We have also introduced tablets for digital worker and process interaction across the business.«

France

3. What does smart finance for fourth-generation manufacturing look like?

Digitalizing manufacturing processes represents a major investment challenge, and the majority of respondents to this study (76%) noted that they are utilizing a widening range of financing sources to make those investments. In fact, they all afforded a high level of importance to the issue: 52% of respondents said that it is "very important" and 24% said it is "critically important" to access a wide range of financing techniques to effect the necessary fourth-generation technology acquisitions in a commercially sustainable fashion.

Acquiring fourth-generation, digitalized technology requires smart finance. What, then, does this smart finance look like? What does it need to offer? And where does it come from? Respondents were able to articulate the key attributes of smart financing.

The issue of sustainable investment does not, however, end there. Respondents noted that the digitalization of the manufacturing industry creates an expectation of more, and more frequent, upgrades and enhancements to the existing technology landscape, including software upgrades. In fact, 67% of respondents observed that technology replacement/upgrade cycles are shortening. So, to remain competitive on global markets, manufacturers need to find sustainable ways of acquiring new-generation technology.

»We need a wide range of financing tools for our various needs. For appreciating assets, such as buildings, we will tend to rely on traditional loan finance ... but for technology requirements, we tend to turn to asset finance, which is much more appropriate for depreciating assets where you need to calculate a clear cost to use. ... Then we are also exploring new offerings such as distributor finance to further manage our working capital.«

Poland

Diverse

Respondents made it clear that they are drawing on a wide range of financing sources and techniques to maximize their access to finance and to find the most appropriate financing solution for their particular needs. This contrasts with the traditional position where manufacturing businesses, especially small and medium-sized organizations, used to be primarily reliant on traditional loans from relationship banks.[4] Techniques cited by respondents cover asset finance, invoice finance, inventory finance, crowdfunding, pay-per-use, and more. Of these, by far the most respondents (70%) said they were using some form of asset finance to acquire fourth-generation technology.

Easy and flexible

Respondents highlighted the fact that traditional loans can often be a long and bureaucratic process. Therefore, they have an increasing requirement for financing techniques that are quick and straightforward to arrange. Such agile financing methods are increasingly valued by respondents as separate lines of finance, offering the flexibility to fit the manufacturer's precise needs, and allowing firms to quickly and incrementally build their new-generation technology base.

»Of course the pace of change is accelerating. Our ICT department is always working to keep up with improvements in pace and capacity as they maintain our position at the heart of digitalization.«

Turkey

Expert, appropriate and transparent

Manufacturers interviewed for this study also underlined the benefits of obtaining finance from expert financiers who understand both technology and industry applications and who are able to offer customized packages that flex to fit the manufacturers' particular circumstances and cash flow needs. Respondents note that these packages can be made comprehensive, embracing equipment acquisition, service, maintenance and even software upgrades. Moreover, these manufacturing CFOs also said tailored asset financing packages make it easy for them to understand total lifetime costs and therefore calculate a reliable cost-per-procedure – a significant advantage for transparent financial planning.

Reliable and sustainable

Finally, CFOs participating in this study noted that finance providers specializing in the manufacturing sector tend to remain committed to serving those sectors, even when economic circumstances tighten. This is important for long-term business planning – knowing there is a reliable financing partner who will be prepared to finance technology needs over time, and who will not abandon the market when times get tough. Respondents also described the advantages of dealing with long-term, specialist financing partners who will often create future-orientated arrangements that make it easier for manufacturers to embrace additional technology acquisitions without having to go through a separate, detailed financing application every time.

»If we want to be at the cutting edge of our sector, we need to replace our technology on a regular ... and increasingly frequent ... basis.«

France

»It's essential to get finance from non-traditional, specialist sources. ... There are a lot of formalities and procedures to go through to get a traditional loan – slow and bureaucratic – and your available security limits your borrowing capacity.«

India

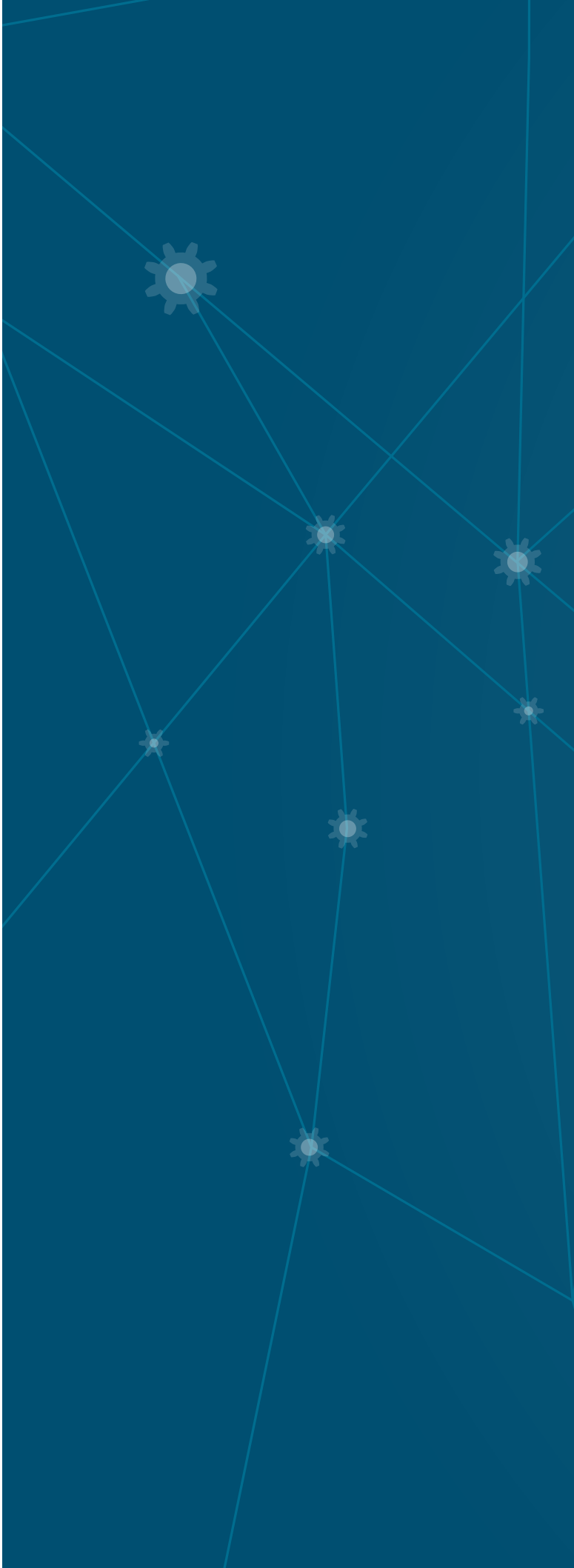
»We're working with a specialist financing partner to establish a strong relationship and develop a strong track record together. ... There aren't that many experts to choose from, and we are involved with this partner partly because they have a powerful international network that mirrors our global expansion strategy.«

Germany

»Specialist financial service providers are more willing to provide long-term financial support to manufacturing organizations looking to strategically develop their business over a longer period. ... We appreciate being able to set up an overall financing framework, where there is headroom to acquire emerging technologies over time without having to start the whole process from the bottom up.«

China

[4] See, for instance: Financial Times, China Manufacturing – adapt or die, 3 Nov 2015; K.G.Mills, B.McCarthy, The State of Small Business Lending, Harvard Business School, 2014; CityAM, European firms are too reliant on big banks, 16 Oct 2015;



Published by
Siemens AG 2016

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Updated (unless stated otherwise): April 2016

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