Smart Factory in Europe: 2019 and Beyond

The challenges and opportunities of Smart Factory today and tomorrow

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teknowlogy Group, October 2019

Premium sponsor:

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PREFACE

The fourth industrial revolution is upon us and digital technology is creating a hyperconnected world in which end-customers are finding themselves much closer to factory production lines. Suddenly, factories don't just make things, they also produce services which are customized to individuals. Not only this, customers are now demanding to buy at any time, from any place, using any device and they want to know how ethical and environmentally friendly their purchases are. This is the driving force for technological innovation and the reason why implementing a data driven smart factory is so important.

This survey highlights that only 28% of manufacturers are utilising smart factory data today, and a further 29% will be within 3 years. As more and more people realize the potential of the data driven smart factory, manufacturers have the chance to come of age in very tangible (and profitable) ways. What's happening is that IT and OT are coming together within manufacturing organizations to create a smooth and seamless flow of data that customers can connect in to. That, in turn, generates even more valuable data which can be used to fine tune outputs, achieve mass customization and ultimately improve the customer's experience.

There are some good examples of the data driven smart factory already present in the manufacturing space. In the consumer goods industry for example, you can reduce the amount of illicit products on the open market by using digital initiatives such as imbedded NFC tags in products. Big fashion brands on the other hand are offering customers the ability to customize the materials, colors and design of their training shoes. Meanwhile, data driven AI combined with image recognition is helping to improve product quality and worker safety in large heavy metal manufacturing companies. Not forgetting the automotive manufacturers who are leveraging quantum technologies to improve productivity safety with almost zero capital investment.

The survey also concludes that one of the major challenges with Smart Factory projects is the high level of investment required. Fujitsu recognize the uptake of Smart Factory initiatives is relatively slow for large global manufacturers due to the level of investment required. However, we believe that targeting the correct initiatives that deliver the best ROI back to the business and embracing digital solutions that transform the end customer experience will accelerate the uptake significantly and make you the leader in your field.

At Fujitsu, we're helping to pioneer all of these elements. We are, after all, a manufacturer too and we've been manufacturing for over 80 years. We're proud to be at the forefront of this new data driven era. We're actively delivering Industry 4.0 and ensuring that as the manufacturing sector comes of age, we can all harness the benefits.

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Being smarter about Smart Factory

INTRODUCTION

Factories in Europe today are facing difficult macroeconomic headwinds. But under these pressures, many companies are looking to technology, specifically what teknowlogy Group refers to as either Smart Factory or Intelligent Factory, to enable them to be more efficient and profitable.

WHAT IS SMART FACTORY?

teknowlogy argues that the Smart Factory is a concept borne out of research around 'Industry 4.0' – the name given to the current trend of automation and data exchange in manufacturing technologies.

It includes cyber-physical systems, the Internet of Things (IoT), cloud computing, Artificial Intelligence and more.

The basic principle of the Smart Factory is that by connecting machines and other systems, businesses are creating intelligent networks throughout the manufacturing process that can control each other autonomously, or at least semi-autonomously.

Within modular structured Smart Factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world (a 'Digital Twin') and make decentralized decisions. Over the Internet of Things (IoT), cyber-physical systems communicate and cooperate with each other and with humans in real time, both internally and across organizational boundaries, even extending to suppliers and partners in the value chain.

ABOUT THIS STUDY

This Europe-wide survey shines a light on the latest challenges and opportunities around the Smart Factory concept, asks where manufacturing firms are on their journey to the Smart Factory, and questions how companies plan to invest in technologies, skills, and processes to help them transition to a future-ready Smart Factory.

But is the concept even real, and not mere hype from IT and operational technology (OT) vendors?

To find out, teknowlogy Group surveyed IT and OT decision-makers at 204 European manufacturing companies with more than 500 employees, which have at least some Smart Factory initiatives in place. The study was conducted in May and June 2019. Interviewees were drawn from the UK, Central Europe (Germany and France), Southern Europe (Spain and Italy) and the Nordics (Finland, Sweden and Denmark). A detailed breakdown of respondents can be found in the Methodology section of this Executive Summary.

Some of the chapters in the full study include:

Smart Factory maturity; goals; investment plans; challenges; execution venue (including cloud, on-premise and edge), partners, ROI, and lastly, future technologies relevant to Smart Factory.

KEY FINDINGS

Most companies are increasing investment in Smart Factory initiatives
An overwhelming 63% of companies said that they plan to increase their investment in Smart Factory in the next three years.

Smart Factory is a key strategic objective
Smart Factory is a very strategic objective for most companies. Most respondents, 66%, ranked Smart Factory a 7 out of 10 or higher on their list of strategic priorities.

Return on Investment
56% of our respondents are yet to see ROI but many are still in the early stages of their roll-out. In the study we look at how quickly companies are seeing ROI, and how they achieved it.

Many Smart Factory initiatives have already come of age
It is clear from our survey that smart factory initiatives are really building across Europe. 8% consider themselves to already be in the advanced stages of deployment. We also delve into the other stages companies have reached.

Internal goals of Smart Factory strategies
Companies said that they are primarily doing Smart Factory to improve product quality, support digital transformation and enable easier and more efficient customization of products, but many other reasons were given. The number one external benefit of a Smart Factory is to improve customer satisfaction.

Challenges of Smart Factory initiatives
The biggest challenge with Smart Factory is the high level of investment required. After that the challenges included building the business case, lack of skilled staff, complexity of analysing data, and challenges integrating IT with operational technology (OT).

Smart Factory, the cloud and the edge
Most companies' Smart Factory deployments are evenly split between public and private clouds. The rest use multi-vendor public cloud, single-vendor public cloud, or their own private cloud. Many admitted they are not analysing much of their Smart Factory data yet. We also found more are moving to analyse data at the edge – closer to plant machinery on the factory floor.
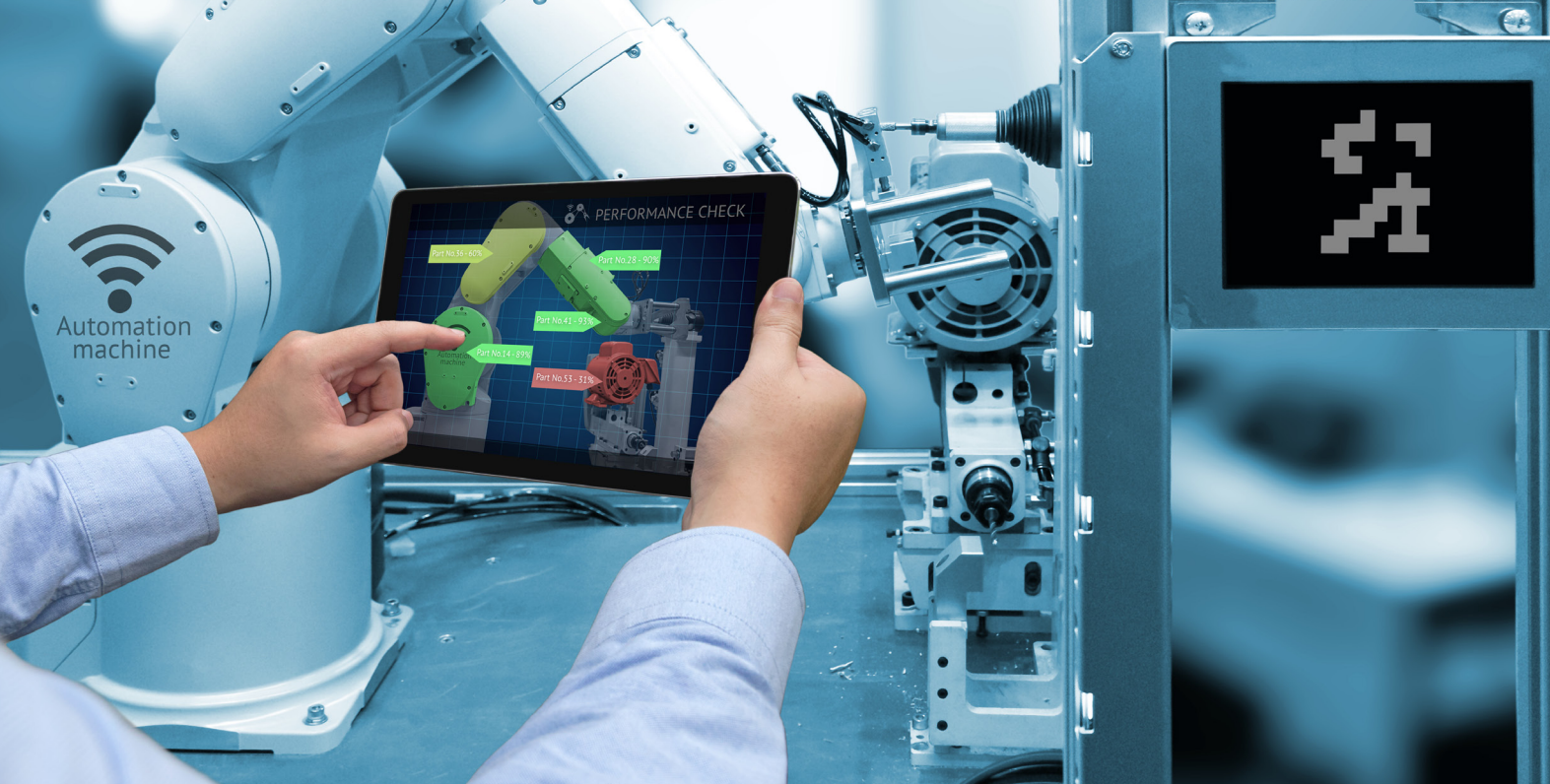
SMART FACTORY MATURITY, STRATEGIC IMPORTANCE AND CHALLENGES

37% said they are in the planning phase of Smart Factory rollouts, which means that they are merely in the planning and evaluation stage. We know that this group of companies, based on their more detailed survey responses, have in some cases done little more than discuss the idea of Smart Factory.

teknowlogy believes that Smart Factory projects are complex technology implementations, that in most cases require some integration and collaboration between IT and operational technology (OT). For this reason we can understand why many companies are in the early stages of their projects, particularly as no one – or at least, very few companies – in the manufacturing sector is in any position to write blank cheques for an investment on this scale.

Next, 36% said they are in the early phase of Smart Factory rollouts, which means that they are running some Smart Factory projects and pilots. In our experience talking to manufacturing companies, there is a wide range and style of implementations that would fall under this banner. Some companies run pilots for months or even years; others start with a small pilot in only one limited and discrete area (such as predictive maintenance or connected worker – which we shall discuss in more detail later).

What about companies that are further ahead with their Smart Factory projects? We found that 19% consider themselves in a medium phase of deployment, which is what we describe as having the first live Smart Factory initiatives that are generating business impacts. We'll talk in the full report about the kind of business

impacts that companies said they are experiencing form the Smart Factory implementations, and how quickly they find that those business impacts – in particular whether they deliver return on investment (ROI).

The last group – those that consider themselves to already be in the advanced stages of deployment, where they have an organization-wide Smart Factory initiative supported by consistent architectures and best practices, came in at 8%. We consider this a relatively high number given the complexity of Smart Factory deployments and the fact that it is, as a concept, relatively new.

RELEVANCE OF SMART FACTORY TO OVERALL ORGANIZATIONAL STRATEGY AND FUTURE COMPETITIVENESS

How high (on a scale of 1-10 where 10 is the highest priority) do you consider Smart Factory to be on a list of your company's key strategic objectives?
How vital (on a scale of 1-10 where 10 is the most vital) do you consider Smart Factory initiatives to be to ensure your company's future competitiveness?

● Consideration of Smart Factory to be on the list of the company's key strategic objective
◆ Vitality of Smart Factory initiatives for the company's future competitiveness

Mean: 6.8; Median: 7

Mean: 7.1; Median: 7

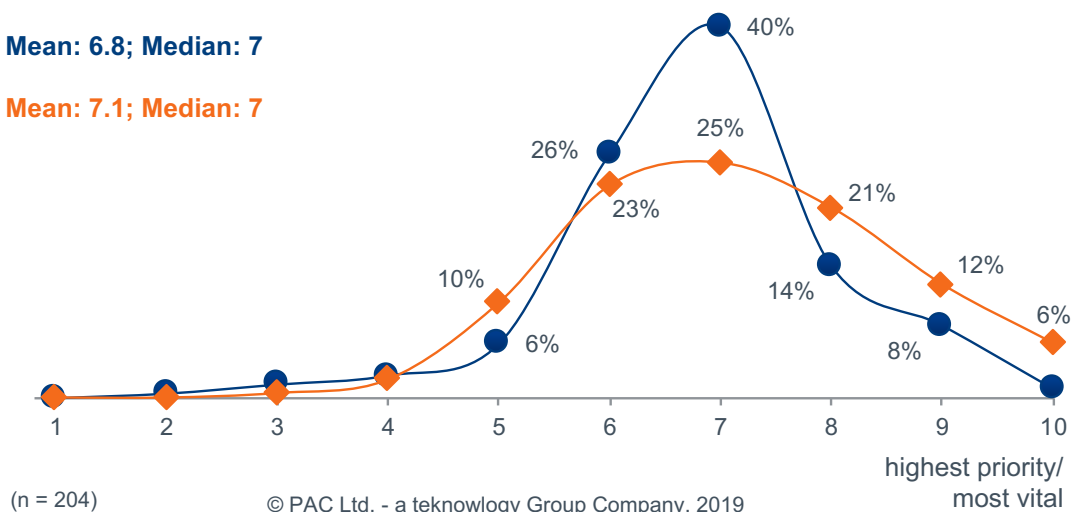(n = 204)   © PAC Ltd. - a teknowlogy Group Company, 2019

Fig. 1: Relevance and strategic importance of Smart Factory initiatives

We asked respondents two questions on the same theme. As can be seen, Smart Factory is overwhelmingly a very strategic project for most companies.

CHALLENGES

Of course, like any major strategic project, Smart Factory rollouts are not without their challenges. Remember, 37% of our respondents have only got as far as the planning stages, and a further 36% would describe themselves as at early stage of Smart Factory. So for many it is very early days.

Which of these do you consider to be a significant challenge in your Smart Factory initiatives and strategy?

Challenge	Percentage
Cost of purchase of Smart Factory solutions	58%
Building the business case for Smart Factory investment	48%
Lack of skilled staff	47%
Complexity of analyzing data (Big Data, AI, Distributed Ledger etc.)	43%
Cost of implementation and management of Smart Factory	42%
Challenges integrating OT and IT	40%
Complexity of the IT layer outside the datacenter	31%
Security	29%
Lack of standards	22%
Internal organizational challenges	19%

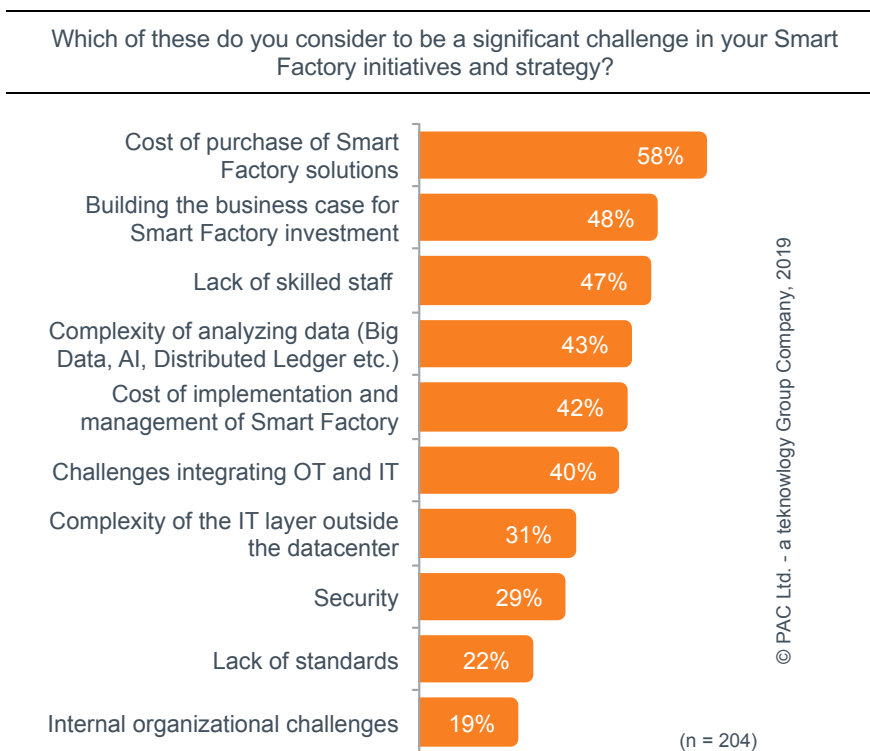© PAC Ltd. - a teknowlogy Group Company, 2019

(n = 204)

Fig. 2: Challenges regarding Smart Factory initiatives

We have already mentioned in this report just how challenging the macroeconomic environment is for companies in the manufacturing sector.

So perhaps we should not be surprised that respondents said that the biggest challenge to Smart Factory rollouts is the cost of purchase of Smart Factory solutions. To some extent this is an over-simplification though, because we don't believe you can simply purchase a Smart Factory solution 'off the shelf'. It is a complicated project with many facets, so what we really mean here is that the high investment required in Smart Factory solutions is the major issue.

You might say that since later in the report we find that many companies are seeing Return on Investment (ROI) from their Smart Factory rollouts that companies would not see the cost as an inhibitor – but they still need to find the up-front investment. What's more, next on the list of challenges is building the business case for Smart Factory investment – at 48% of respondents.

In other words, lots of companies can't identify a pressing business need, and as a result even more see the high investment as being prohibitive. We think this is a finding that vendors of software and services in the Smart Factory might wish to take note of, because it suggests that more work needs to be done to help end user manufacturing companies build a business case for Smart Factory investment.

We go into more detail in the full report.

DECISION-MAKING

Most companies (62%) said that the primary decision-making force is the CxO office, and during the survey we found that people here meant the CEO, CFO, COO and CIO predominantly. Of course, the CIO is aligned to the IT department, which had its own category for respondents to choose. But we understand from the responses that when they said the CxO office they meant that decisions were being made in a top-down manner. If they chose the IT department, even if the CIO was involved, it meant that the strategy was being driven more from a bottom-up direction.

Next was a 'Digital Business Unit'. This is a relatively new phenomenon in the past few years but one that is becoming increasingly popular. For example, we know from speaking with Volvo that their digital business unit used to report into the CIO, but a couple of years ago was considered so strategic to their competitiveness that the head of digital now reports directly to the CEO.

The production department, which includes those in charge of operational technology (OT) is relatively down the line when it comes to Smart Factory decision-making. Only 24% of respondents said that it is the production department that makes the Smart Factory decisions. It seems likely from respondents' answers that the operational technology team are primarily concerned with robotics and other plant floor machinery.

The IT department made up the final 32% of respondents when it came to Smart Factory decision-making. In a Smart Factory one of the key elements is being able to analyse all of the data that comes from connected machinery, people and other assets (such as the building and environmental variables that affect production). Since data storage, management and analytics comes under the remit of the IT department, it is with good reason that 32% of respondents said that Smart Factory decision-making comes from the IT department.

COLLABORATION WITH THIRD PARTIES, AND TECHNOLOGIES IN FOCUS

The next question that we asked our survey respondents was about the kind of third parties that they turn to help them with their Smart Factory initiatives.
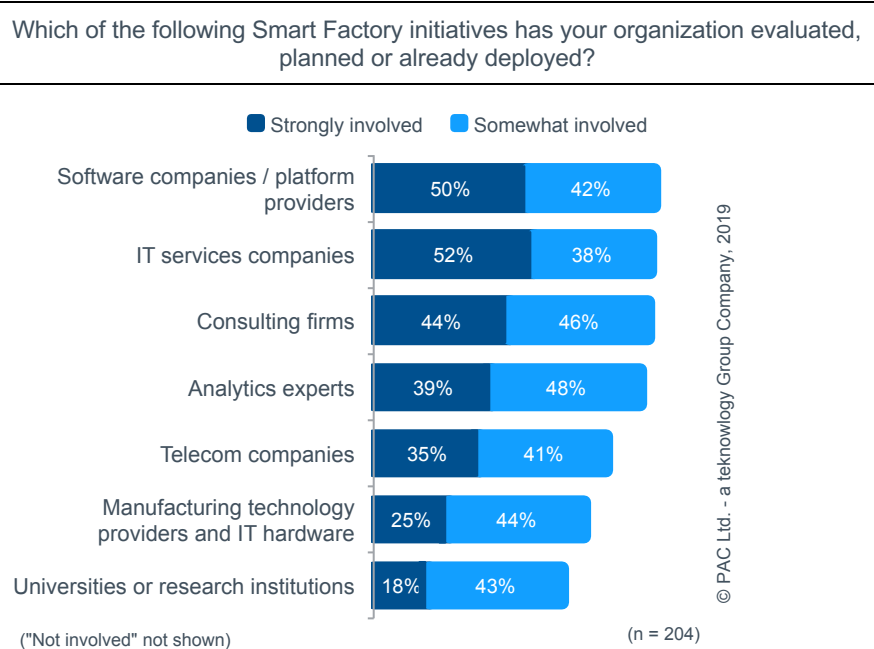
Which of the following Smart Factory initiatives has your organization evaluated, planned or already deployed?

Fig.3: Third party involvement

SMART FACTORY TECHNOLOGY FOCUS AREAS

In the full report we look at the adoption and maturity of the following Smart Factory projects:

Connected Worker
Digital quality control
Condition monitoring
Traceability
Asset performance management
Supply chain analytics
Big Data
Digital twin or factory simulation
Edge computing
Smart intra-logistics
Mass customization
Predictive maintenance
Distributed ledger/blockchain
Deep learning/AI

CONCLUSIONS

- **Most companies (63%) are increasing investment in their Smart Factory initiatives.**

- **A small but growing proportion of Smart Factory initiatives have already come of age and are enterprise-wide.**

- **Smart Factory is a key strategic objective – most respondents rated it 7/10 where 10 is most strategic of all their projects.**

- **Most companies said that they are primarily doing Smart Factory to improve product quality, support digital transformation and enable easier and more efficient customization of products.**

- **The number one external goal of Smart Factory strategies is to improve customer satisfaction.**

- **The biggest perceived challenge with Smart Factory projects is the high level of investment required.**

- **Smart Factory projects are said to produce ROI in under three years for 44% of respondents; 56% are yet to see ROI but many are in very early stages of their rollouts.**

- **Smart Factory data is not always analysed. When asked if companies are using Smart Factory data in business decision-making, 28% said that they are, while 29% said that they plan to inside three years. Many cited lack of skills and integration between IT and OT as barriers.**

- **We also found that analytics at the edge is expected to more than double in the next five years.**
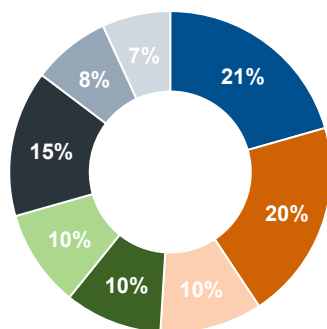
- **Organizations are already investigating Distributed Ledger Technologies, Deep Learning/AI and Quantum Computing as part of their Smart Factory plans.**

METHODOLOGY

The full study is based on interviews with IT and OT decision-makers at 204 European manufacturing companies with more than 500 employees which have at least Smart Factory initiatives in plan. The study was conducted in May and June 2019.
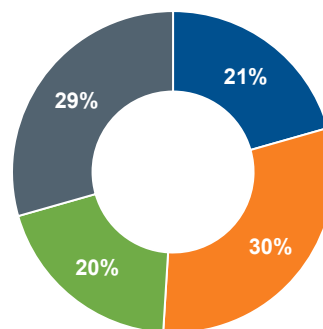
Repondents by country

■ UK   ■ Germany   ■ France   ■ Spain
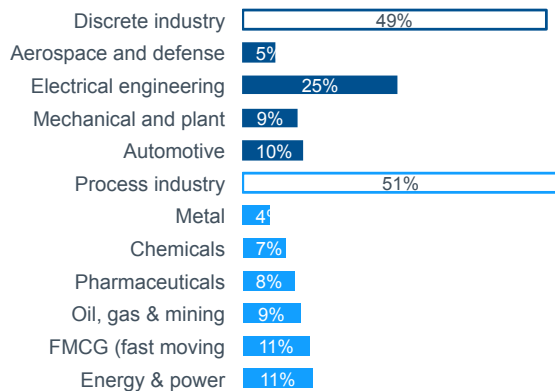■ Italy   ■ Finland   ■ Sweden   ■ Denmark

- UK: 21%
- Germany: 20%
- France: 10%
- Spain: 10%
- Italy: 10%
- Finland: 15%
- Sweden: 8%
- Denmark: 7%

Repondents by region

■ UK
■ Central Europe (Germany and France)
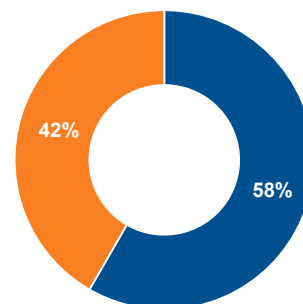■ Southern Europe (Spain and Italy)
■ Nordics (Finland, Sweden, Denmark)

- UK: 21%
- Central Europe (Germany and France): 30%
- Southern Europe (Spain and Italy): 20%
- Nordics (Finland, Sweden, Denmark): 29%

Repondents by industry
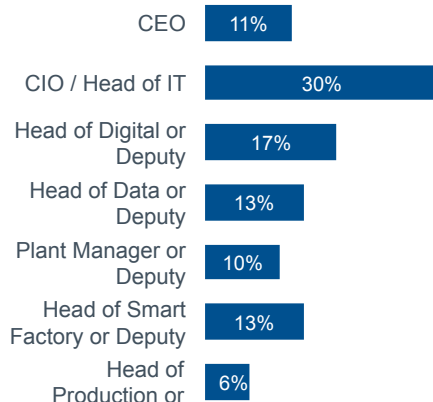
- Discrete industry: 49%
- Aerospace and defense: 5%
- Electrical engineering: 25%
- Mechanical and plant: 9%
- Automotive: 10%
- Process industry: 51%
- Metal: 4%
- Chemicals: 7%
- Pharmaceuticals: 8%
- Oil, gas & mining: 9%
- FMCG (fast moving: 11%
- Energy & power: 11%

Repondents by company size

■ 500 and 2,500 employees
■ 2,500 and more employees

- 500 and 2,500 employees: 58%
- 2,500 and more employees: 42%

Repondents by position

- CEO: 11%
- CIO / Head of IT: 30%
- Head of Digital or Deputy: 17%
- Head of Data or Deputy: 13%
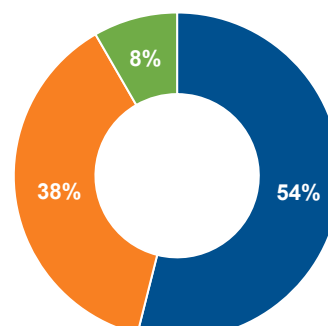- Plant Manager or Deputy: 10%
- Head of Smart Factory or Deputy: 13%
- Head of Production or: 6%

Repondents by responsibility

■ IT (Information Technology)
■ OT (Operational Technology)
■ Roughly an even split between the two

- IT (Information Technology): 54%
- OT (Operational Technology): 38%
- Roughly an even split between the two: 8%

ANNEX

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The creation and distribution of this study was supported by premium sponsor Fujitsu.

For more information, please visit www.pac-online.com.

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Fujitsu customers cover both the public and private sectors, including retail, financial services, transport, manufacturing, government and defence. With an annual R&D spend of 135 billion yen (€1.23 billion), we create innovative world-leading digital technology, services and end-to-end solutions that enable our customers to digitize with confidence.

As a world-class manufacturer ourselves, we have over 80 years of experience and understand the challenges manufacturers face on the road to digital factory transformation. Using a blend of our own and partner technologies, we develop connected solutions to continuously optimize our own manufacturing and operating environment. We know how to apply new technologies such as IoT, AI, machine-learning, RPA and Cloud services. Connecting industrial machines and devices to the internet through the Cloud is a major step in simplifying business processes, and with our range of trusted cloud solutions, we make it easy for our customers to adopt Cloud in a cost-effective and well-governed way.

We work in close partnership with our customers to co-create the most effective solutions. Through the implementation of data analytics, mobility technology, and machine-to-machine connectivity, we enable customers to gain insight from the operational data they generate every day. We help to transform processes and proactively manage all aspects of manufacturing operations - live and in real-time.

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teknowlogy Group is the leading independent European research and consulting firm in the fields of digital transformation, software, and IT services. It brings together the expertise of three research and advisory firms, each with a strong history and local presence in the fragmented markets of Europe: Ardour Consulting Group, CXP and PAC (Pierre Audoin Consultants).

We are a content-based company with strong consulting DNA. We are the preferred partner for European user companies to define IT strategy, govern teams and projects, and de-risk technology choices that drive successful business transformation.

We have a second-to-none understanding of market trends and IT users' expectations. We help software vendors and IT services companies better shape, execute and promote their own strategy in coherence with market needs and in anticipation of tomorrow's expectations.

Capitalizing on more than 40 years of experience, we operate out of seven countries with a network of 140 experts.

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