11.09.2018

Understanding of Industry 4.0 concept and its spread. Situation of companies in regional and industry breakdown based on PwC's global study

PwC Magyarország Kft.

pwc

Strictly private and confidential

Gábor Riba | PwC Senior Manager | Digital Architecture

Gábor RIBA

PwC | Senior Manager

+ 36 30 527 5398
gabor.riba@pwc.com
www.linkedin.com/in/gabor-riba
http://www.pwc.com/hu/hu

Professional Bio

I'm a Senior Manager in PwC's technology consulting practice specialized in the technology, info-communications and entertainment industry sector. Previously I have worked for Accenture. I hold MSc degree from the Budapest University of Technology and Economics and also have ITIL Foundation, Six Sigma Green Belt and LEAN certificate.

I have more than 12 years experience in telecommunication and IT developments, telco and IT strategy, operation and process due-diligence and cost saving projects. I have also experienced in CRM, Billing and OSS systems, processes and technologies area.

I mainly focus on defining real life use cases of Artificial Intelligence e.g RPA and Industry 4.0.

Role description

I'm a senior manager in the Technology Advisory team of PwC Hungary. I'm leading Artificial Intelligence, Robotic Process Automation (RPA) and Industry 4.0 initiatives. I'm representing PwC in the RPA workgroup of Hungarian Outsourcing Association (HOA) and in the National Technology Platform (industry 4.0 platform).

As a Senior Manager I have other roles which include:
- Project and program management
- Leading projects and project teams
- Coaching people

PwC's Digital Services
Confidential information for the sole benefit and use of PwC's client.

Agenda

01

PwC short introduction

02

Industry 4.0 introduction

03

PwC Strategy&'s 2018 Global Survey on Industry 4.0

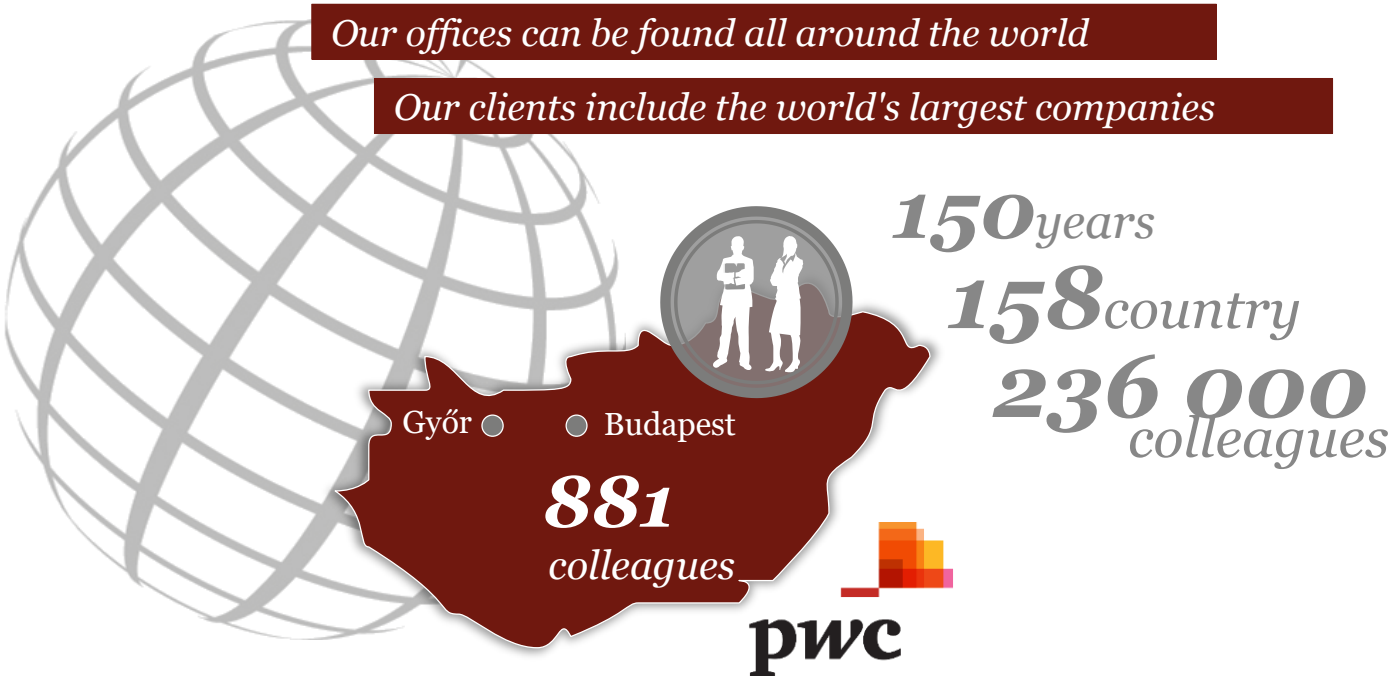
04

Current status of Hungary

Confidential information for the sole benefit and use of PwC's client.

01
PwC Introduction

PwC Introduction

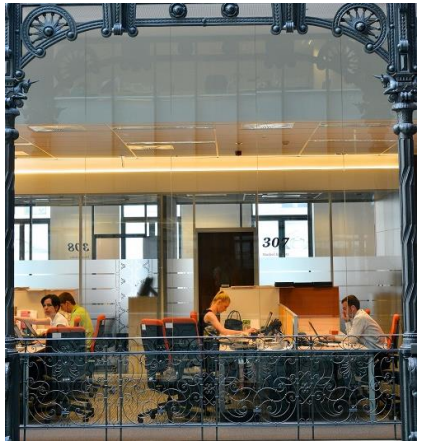


Confidential information for the sole benefit and use of PwC's client.

Our office at Budapest

Universum: PwC is the 2nd most attractive employer in the world*

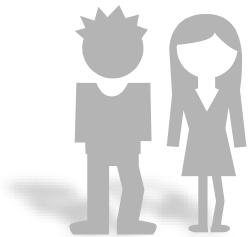
*based on the inquiry of 240,000 students in business studies from 12 economic world-power countries



Confidential information for the sole benefit and use of PwC's client.

PwC as Workplace

- *Partner*
- *Director*
- *Senior Manager*
- *Manager*
- *Assistant Manager*
- *Senior Associate / Senior Consultant*
- *Associate / Consultant*
- *Intern*



- Expertise
- Competitive salary
- Fringe benefits
- Development opportunity, carrier path

Confidential information for the sole benefit and use of PwC's client.

We are working for several sectors

Retail and consumer sector

Technology

Financial services

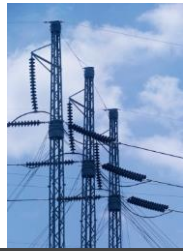
Automotive industry

Pharmaceutical and healthcare industry

Entertainment industry

Industrial products

Communication



Energy and utilities

Public sector

Confidential information for the sole benefit and use of PwC's client.

Service Lines and Services

Assurance

- 318 colleagues
- 18 interns
- 3 segments – Audit, RAS, CMAAS
- 3 audit groups– CIP, TICE, FS

TLS

- 251 colleagues
- 40 interns
- 2 segments – Tax, Legal Services
- 4 groups– GIS, CT, TRC, TRS

Advisory

- 114 colleagues
- 45 interns
- 3 segments – Deals, Management Consulting, Technology

Confidential information for the sole benefit and use of PwC's client.

Advisory

Deals

- Complex research, analysis, data room
- Business evaluation, financial modeling, transaction support, fraud detection
- Excel, interactive model, study
- Accounting, finance, business evaluation, corporate finance

Management Consulting

- Client interviews, brainstorming, benchmarking, data analysis
- Corporate strategy, process, organizational structure, cost-benefit analysis, study
- Presentation: understandable message from the numbers
- Business economics, project management, strategy

Technology Advisory

- Client interviews, brainstorming, benchmarking, data analysis
- IT strategy, BI tools, system implementation, digitization
- Presentation & dashboards, mobile app
- Computer science, economic informatics, project management

Confidential information for the sole benefit and use of PwC's client.

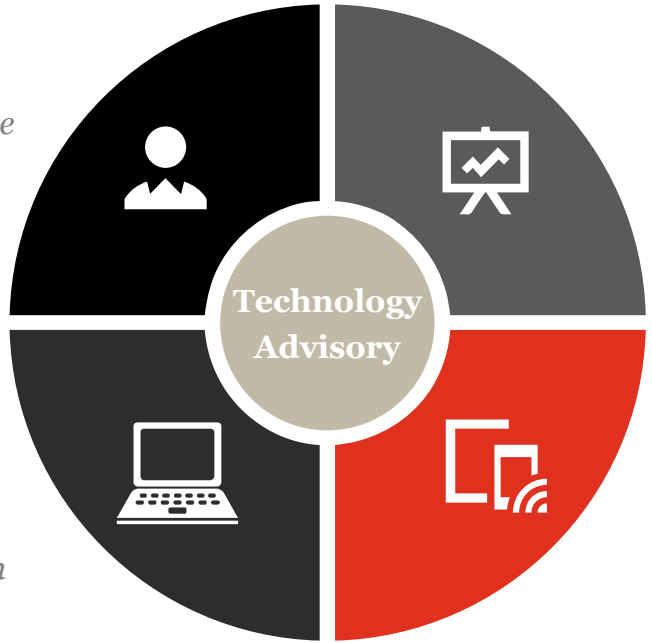
Technology Advisory

CIO agenda

IT strategy, governance model, processes, business models

IT system integration

Supplier selection, system implementation



Big data & data analytics

Datawarehouse, Big Data solutions, data analysis, BI tools

Digital

FinTech, Industry 4.0, IoT, drone technologies, digital channels, mobile technologies

Confidential information for the sole benefit and use of PwC's client.

02

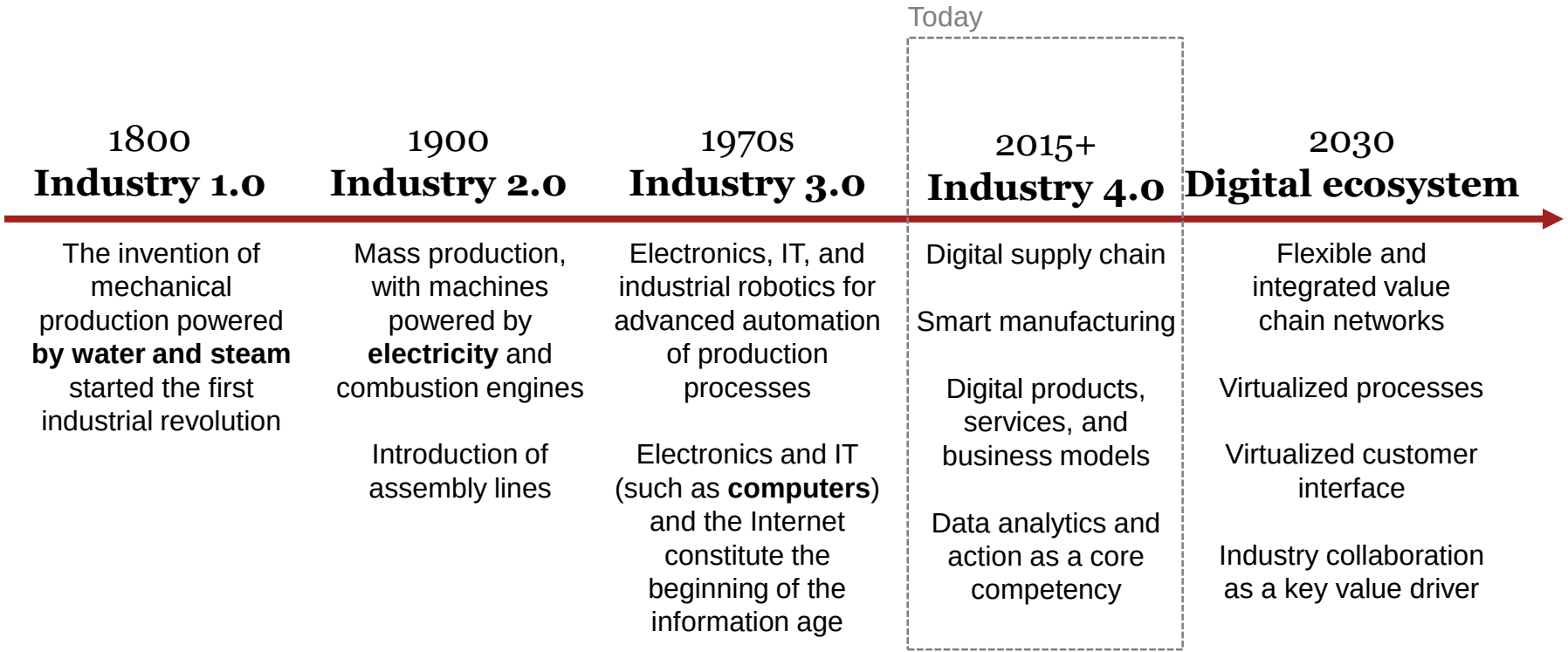
Industry 4.0 introduction

Question

- Do you know the stages of the industrial revolution?
- What does Industry 4.0 means?

Confidential information for the sole benefit and use of PwC's client.

Road to Industry 4.0

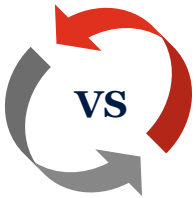


Confidential information for the sole benefit and use of PwC's client.

Definitions of Industry 4.0

Industry 4.0 is the evolution to cyber-physical systems, representing the fourth industrial revolution on the road to an end-to-end value chain with Industrial IoT and decentralized intelligence in manufacturing, production, logistics and the industry. (i-scoop.eu)

Computers and automation will come together in an entirely new way, with robotics connected remotely to computer systems equipped with machine learning algorithms that can learn and control the robotics with very little input from human operators. (Marr, 2016)



In PwC's view, Industry 4.0 is driven by:

1) Digitisation and integration of **vertical** and **horizontal value chains**
2) Digitisation of product and service offerings
3) Digital business models and customer access

Confidential information for the sole benefit and use of PwC's client.

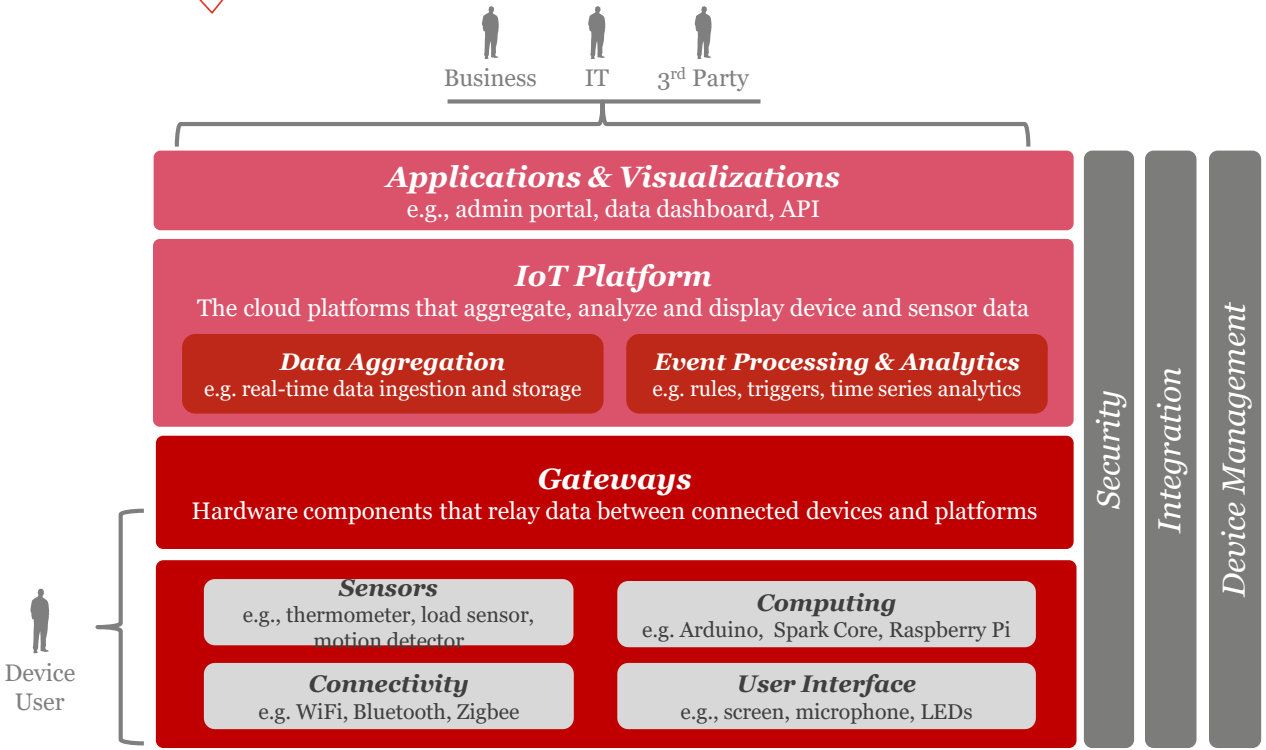
Question

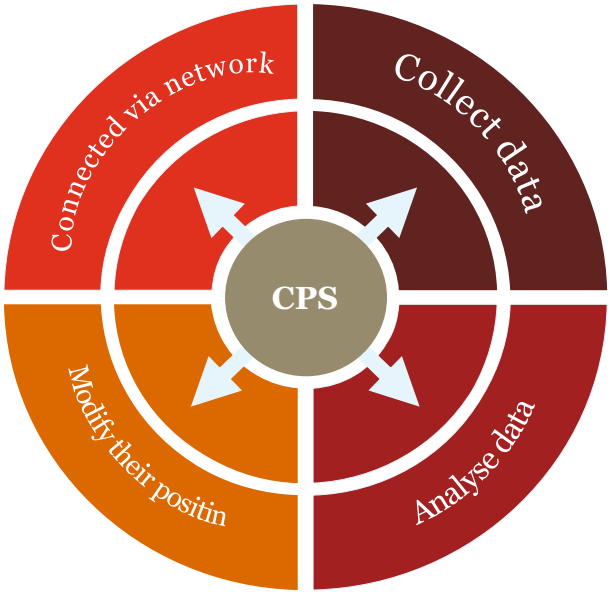
- What technologies does Industry 4.0 utilize?

Confidential information for the sole benefit and use of PwC's client.

Technical background of Industry 4.0 – IoT / CPS

Example

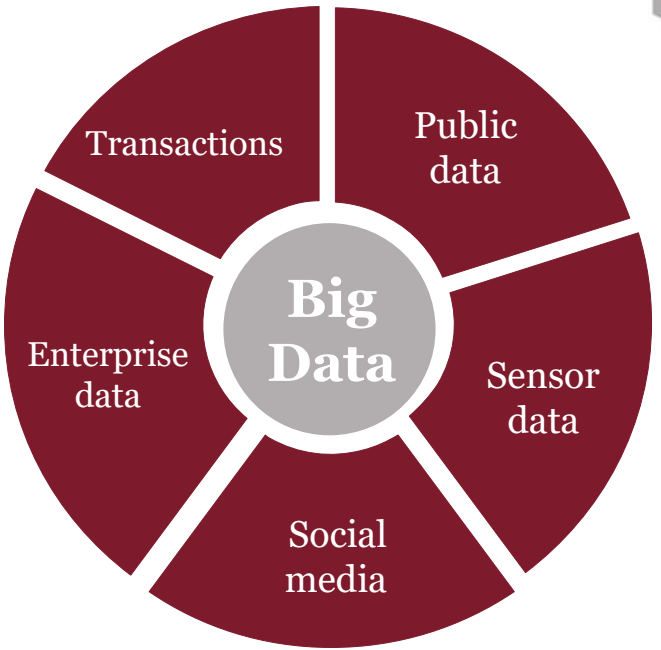


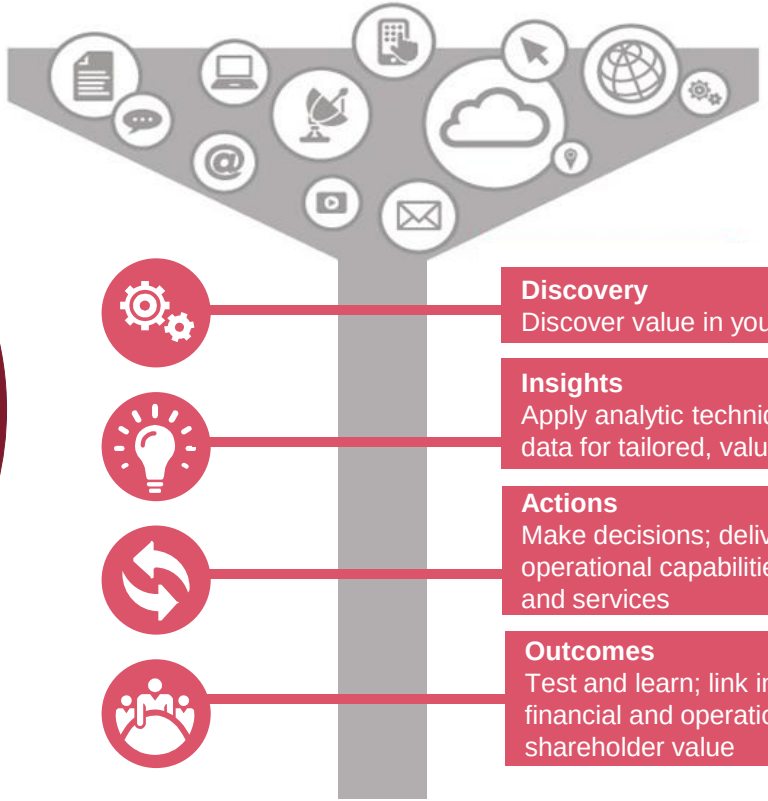


Confidential information for the sole benefit and use of PwC's client.

Technical background of Industry 4.0 – Big Data

Example





Discovery
Discover value in your internal and external data

Insights
Apply analytic techniques on internal and external data for tailored, value-creating insights

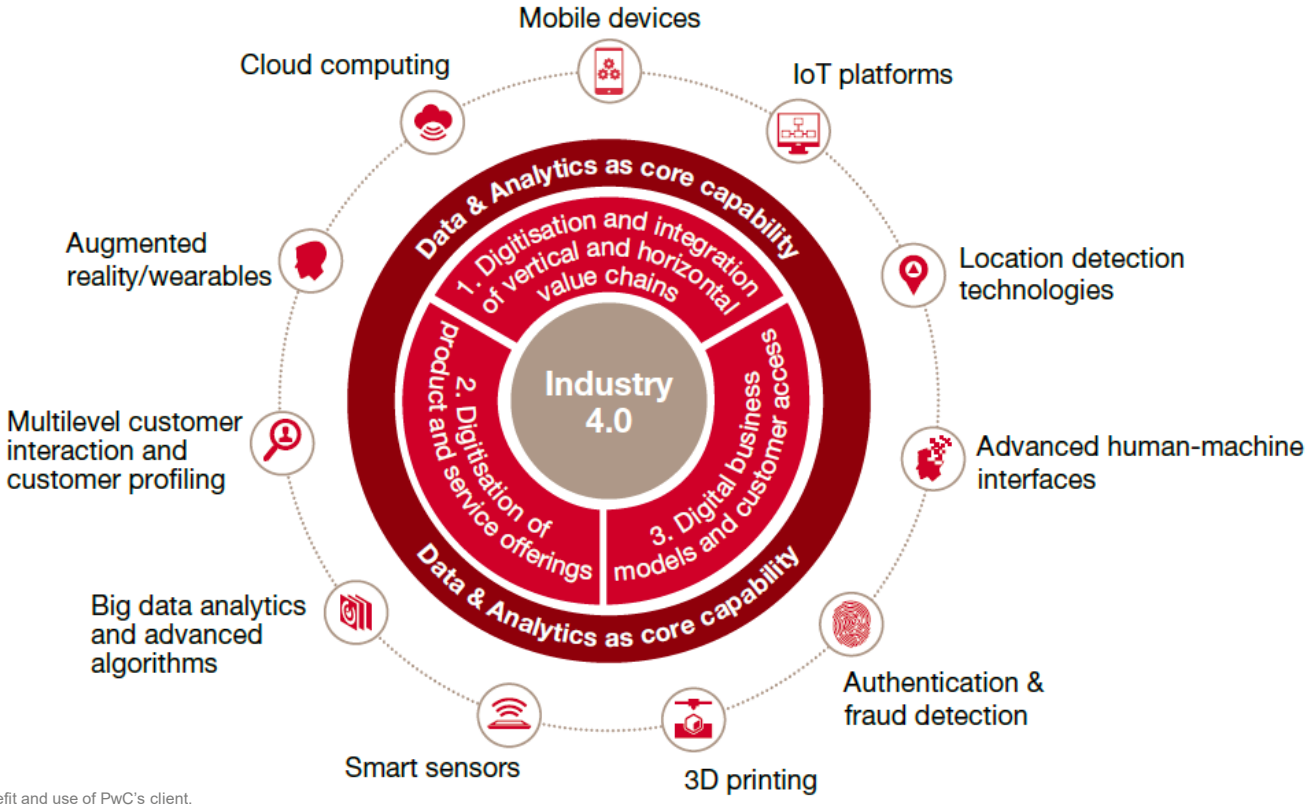
Actions
Make decisions; deliver quick wins; build operational capabilities to enhance products and services

Outcomes
Test and learn; link insights and actions to financial and operational metrics; enhance shareholder value

Confidential information for the sole benefit and use of PwC's client.

PwC Industry 4.0 framework and Contributing digital technologies

Summary



Confidential information for the sole benefit and use of PwC's client.

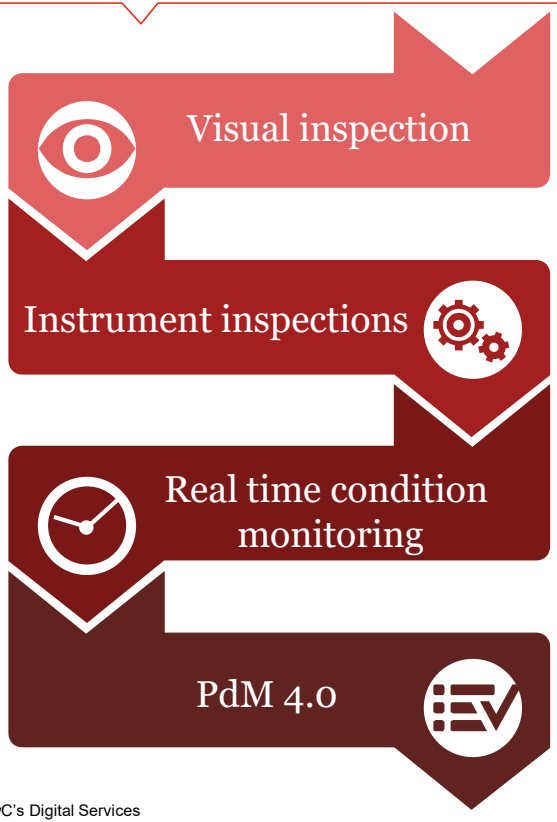
Question

- What solutions does Industry 4.0 realize?

Confidential information for the sole benefit and use of PwC's client.

Phases of maintenance – Predictive Maintenance

Example



Periodic physical inspections: conclusions are based solely on inspector's expertise.

Periodic inspections: conclusions are based on a combination of inspector's expertise and instrument read-outs.

Continuous real-time monitoring of assets, with alerts given based on pre-established rules or critical levels.

Continuous real-time monitoring of assets, with alerts sent based on predictive techniques, such as regression analysis.

Confidential information for the sole benefit and use of PwC's client.

Connection between Maintenance and Industry 4.0 – Predictive Maintenance

Example

Sensor	*Data*	*Insight*	*Action*	*Outcome*
Connected Assets • Onboarding • Connectivity • Device management • Security	**IT/OT Convergence** • Big data Ingestion • Big data infrastructure • Merging sensor data with business information	**Data analysis** • Root-cause analysis • Asset health monitoring • Machine learning • Anomaly detection • Triggering of corrective actions	**Maintenance activities** • Prioritized maintenance and service activities • Optimized warranty and spare parts management • Perspective maintenance • Quality improvements	**Connected Assets** • Onboarding • Connectivity • Device management • Security

Confidential information for the sole benefit and use of PwC's client.

Predictive maintenance in a mining company

Example
Real life use-case

The Problem

- **40** km of conveyor belts
- **80** employees
- Insufficient **reliability** of visual checks
- High **maintenance costs**
- **Damaged** conveyor belts
- **Loss** of mining capacity

Confidential client data

Annual conveyor belt servicing costs
+ more losses caused by reactive style of maintenance

Confidential information for the sole benefit and use of PwC's client.

Predictive maintenance in a mining company

Example
Real life use-case

Possible Solutions

- **Sensors**
- **Thermal cameras**
- **Drones**
- **Optic cables**
- **Noise detectors**

Confidential client data

Expected investment
after testing and business case calculations

Confidential information for the sole benefit and use of PwC's client.

Predictive maintenance in a mining company

Example
Real life use-case

Key Benefits

- Salary **cost savings**
- **Facilitation** of maintenance work
- **Increased** maintenance accuracy
- **Faster** repairs procedures
- **Less** damage to conveyor belts
- **Increased** mining capacity

Confidential client data

Expected annual cost savings
with positive ROI in less than 1 year

Confidential information for the sole benefit and use of PwC's client.

Case summary

Example
Real life use-case

Return on investment in less than 1 year

Current annual costs

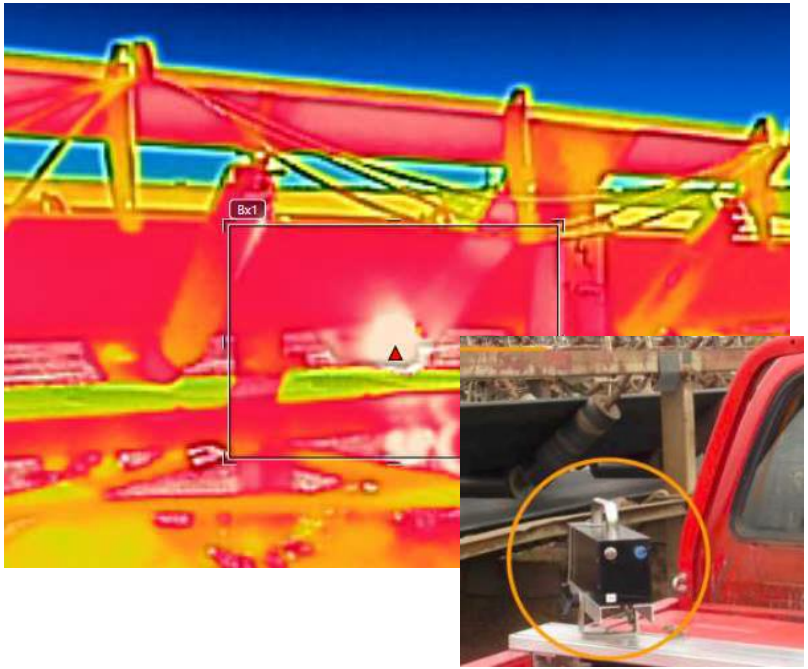
One-time investment

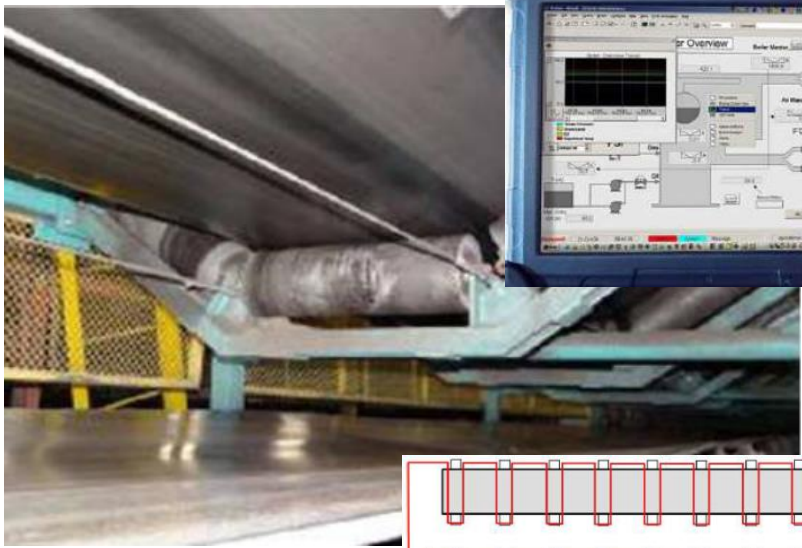
Annual savings

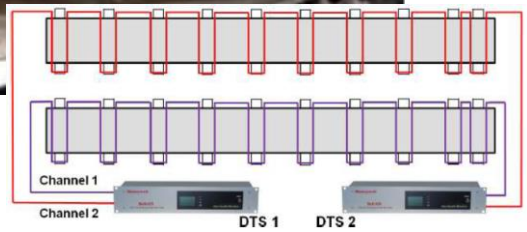
Confidential information for the sole benefit and use of PwC's client.

Possible solution – thermal camera / optic cable

Example
Real life use-case



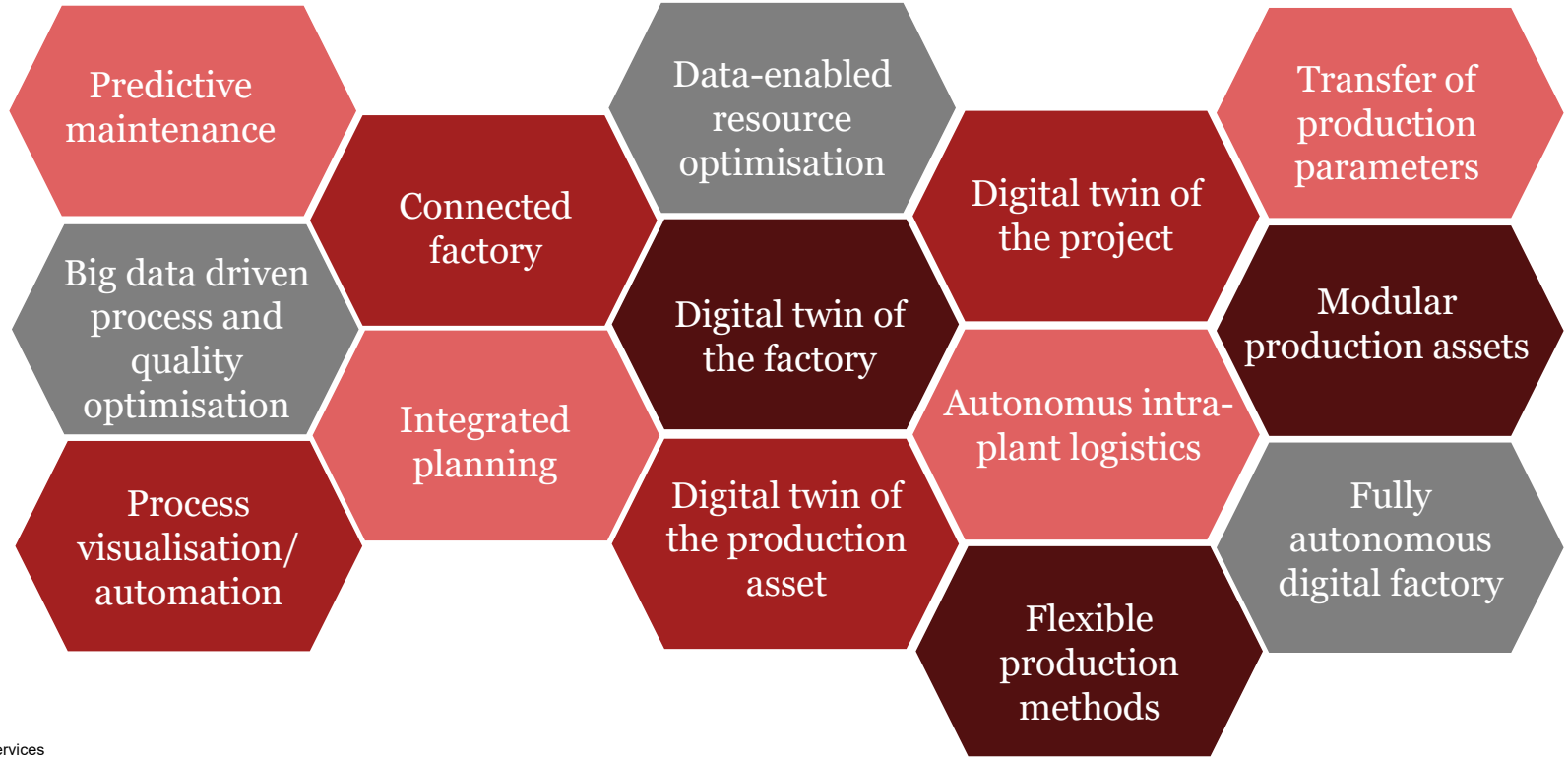




Confidential information for the sole benefit and use of PwC's client.

Industry 4.0 solutions realized through digital technologies

Summary



Confidential information for the sole benefit and use of PwC's client.

Industry 4.0 = Smart Factory?

What makes a factory industry 4.0 ready?

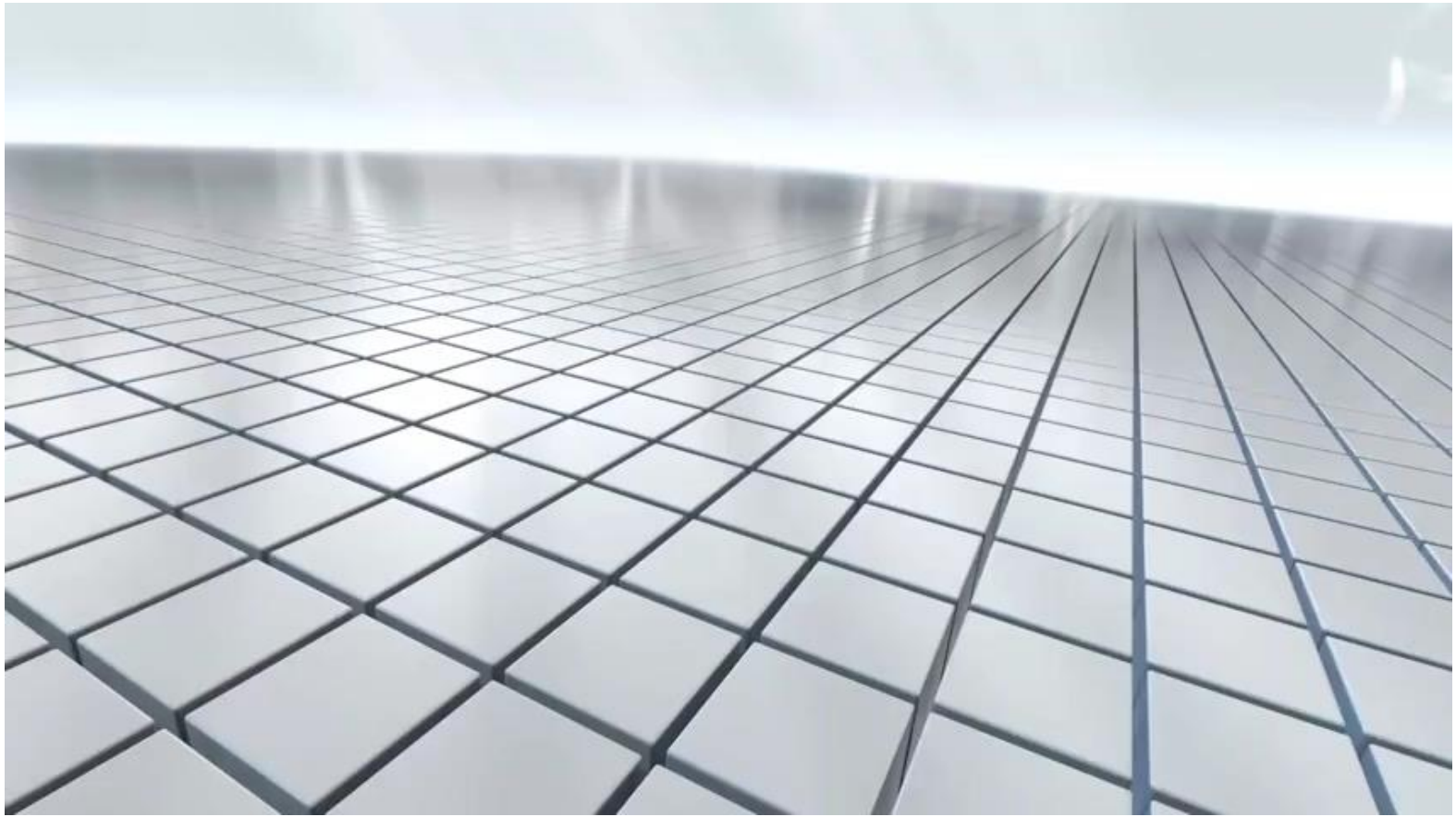
Interoperability
Machines, devices and people connect and communicate with each other

Information Transparency
System create virtual copy of physical world trough sensor data

Technical assistance
Systems to support humans in making decisions, solving problems and assist with tasks

Decentralized decision-making
Cyber-physical systems make simple decisions become as autonomous as possible

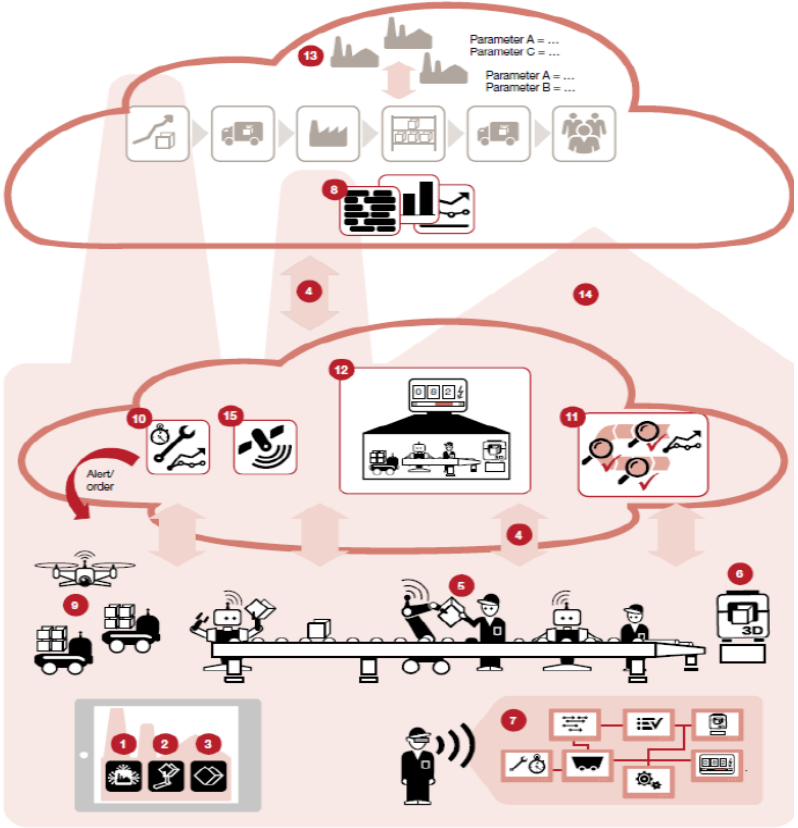
Confidential information for the sole benefit and use of PwC's client.



https://www.youtube.com/watch?v=h9t06cyC7Es

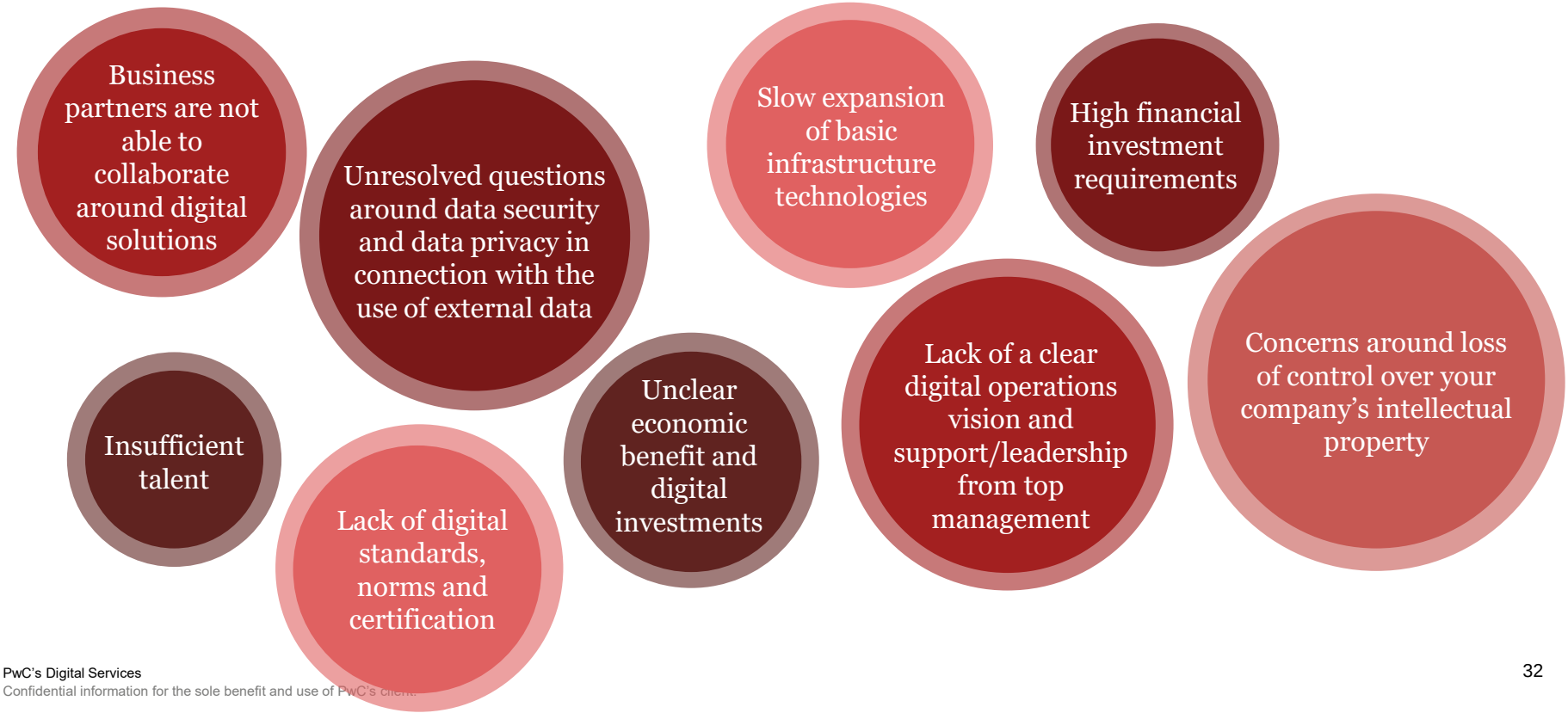
Confidential information for the sole benefit and use of PwC's client.

Key technology features of a Smart Factory enabled by Industry 4.0



1. Digital twin of the factory
2. Digital twin of the production asset
3. Digital twin of the product
4. Digital twin of the production asset
5. Modular production assets
6. Flexible production methods
7. Process visualisation/automation
8. Integrated planning
9. Autonomous intraplant logistics
10. Predictive maintenance
11. Big data driven process/quality optimisation
12. Data enabled process optimisation
13. Transfer of product parameters
14. Fully autonomous digital factory
15. Track and trace

Biggest challenges or inhibitors for building digital operations capabilities



Confidential information for the sole benefit and use of PwC's client.

Along the challenges several benefits bound to Industry 4.0

1. Better planning and controlling in manufacturing and logistics
2. Higher customer satisfaction, involving customers in the design process
3. Greater flexibility in manufacturing
4. Faster time to market (in product development)
5. Improved quality
6. Individualisation, customization of products

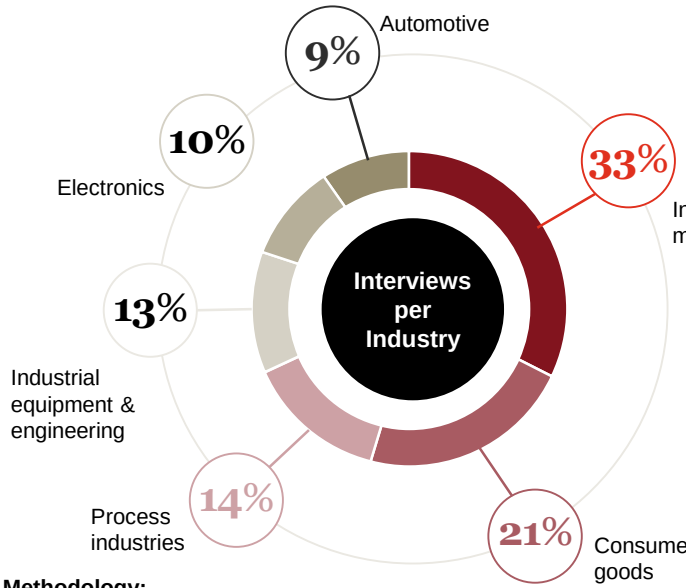
Confidential information for the sole benefit and use of PwC's client.

03

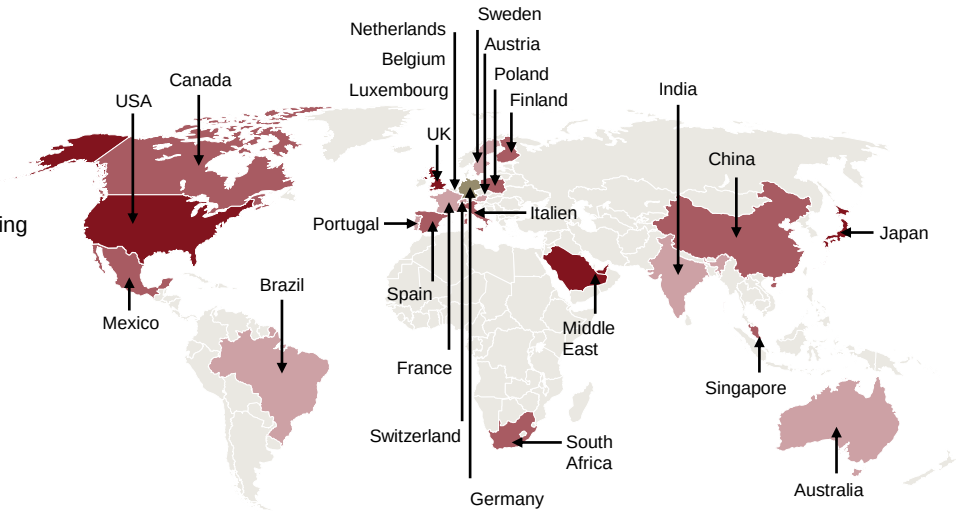
PwC Strategy&'s 2018 Global Survey on Industry 4.0

PwC | Strategy&'s Global Digital Operations Survey 2018 is the biggest survey of its kind of studies of Industry 4.0 to date

Industry split



Participating countries



Methodology:

Based on research conducted between September and December 2017 with over 1,155 senior executives from industrial products companies in 26 countries. The majority of participants were Chief Digital Officers or other senior executives with top-level responsibility in their company for Industry 4.0 strategy and activity.
Results were weighted by country GDP to provide a balanced view in global.

Confidential information for the sole benefit and use of PwC's client.

Legend

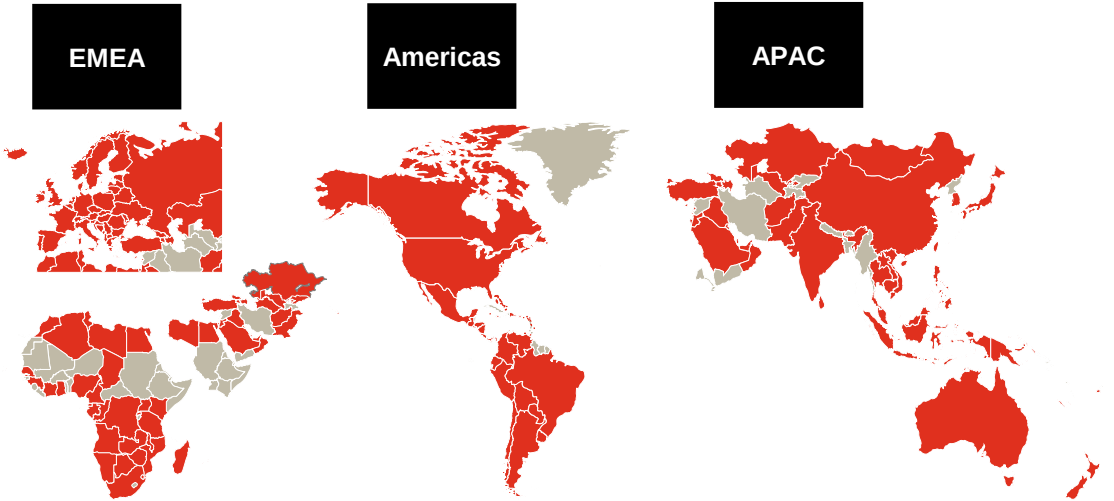
Digital operations maturity

- **DC** Digital Champion
- **DI** Digital Innovator
- **DF** Digital Follower
- **DN** Digital Novice

Key industries

- Automotive
- Consumer goods
- Electronics
- Industrial equipment & engineering
- Industrial manufacturing
- Process industries

World regions



Confidential information for the sole benefit and use of PwC's client.

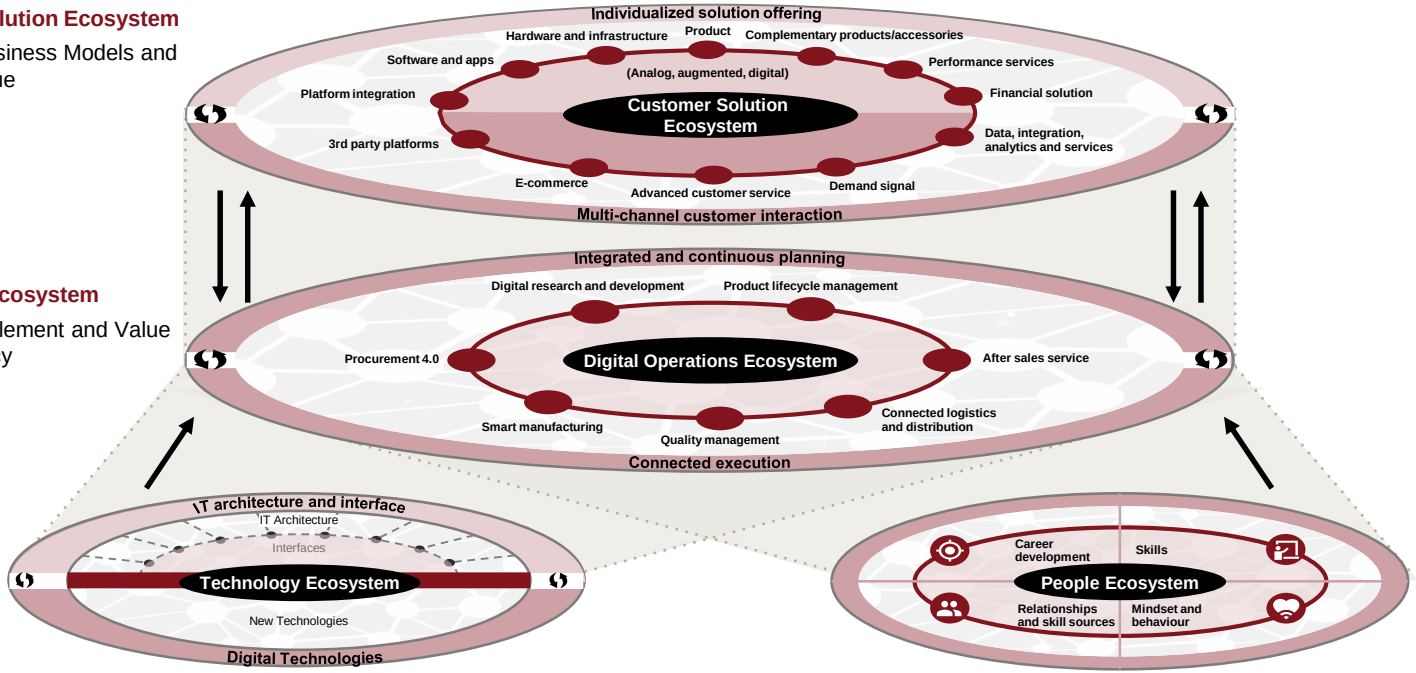
The global Industry 4.0 study focuses on Digital Operations Champions and how they master the orchestration of four different ecosystem layers

Customer Solution Ecosystem

Innovative Business Models and Customer value

Digital Operations Ecosystem

Solution Enablement and Value chain efficiency



Digital Operations Champion

Technology Ecosystem

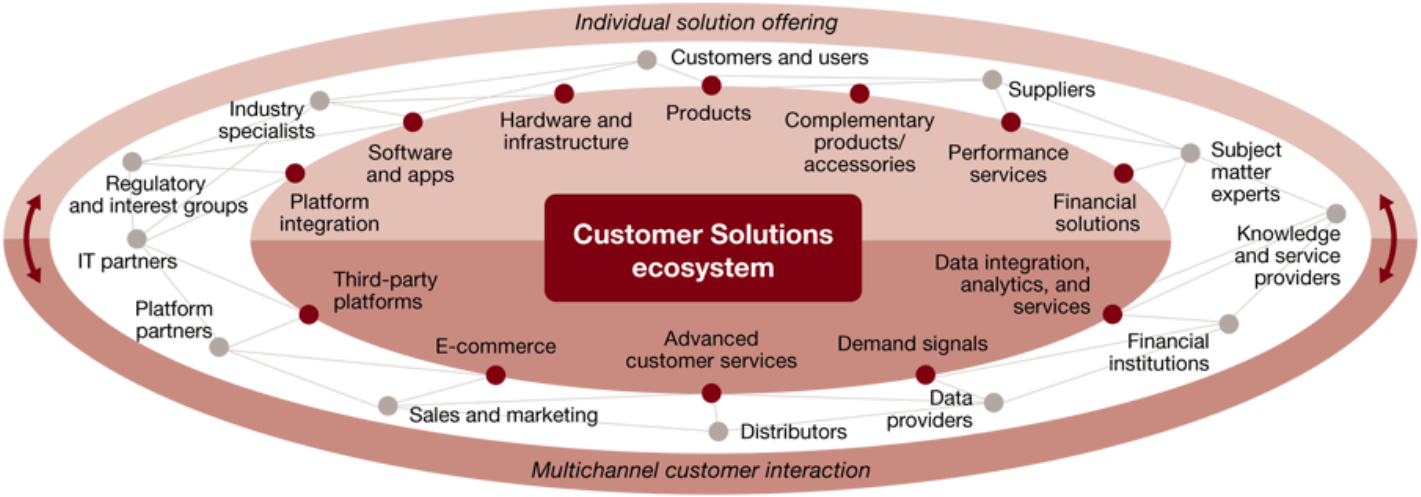
Intelligence and Connectivity

People Ecosystem

Competences and culture

Confidential information for the sole benefit and use of PwC's client.

Overview of the Customer Solutions ecosystem



Business model and customer value layer

- personalization,
- customization,
- enhanced features,
- improved logistics,
- creative revenue models,
- innovative designs and applications

- includes external entities

Confidential information for the sole benefit and use of PwC's client.

Question

- Which industry do you believe has advanced capabilities in the Customer Solution Ecosystem and why?

Key industries

Automotive

Consumer goods

Electronics

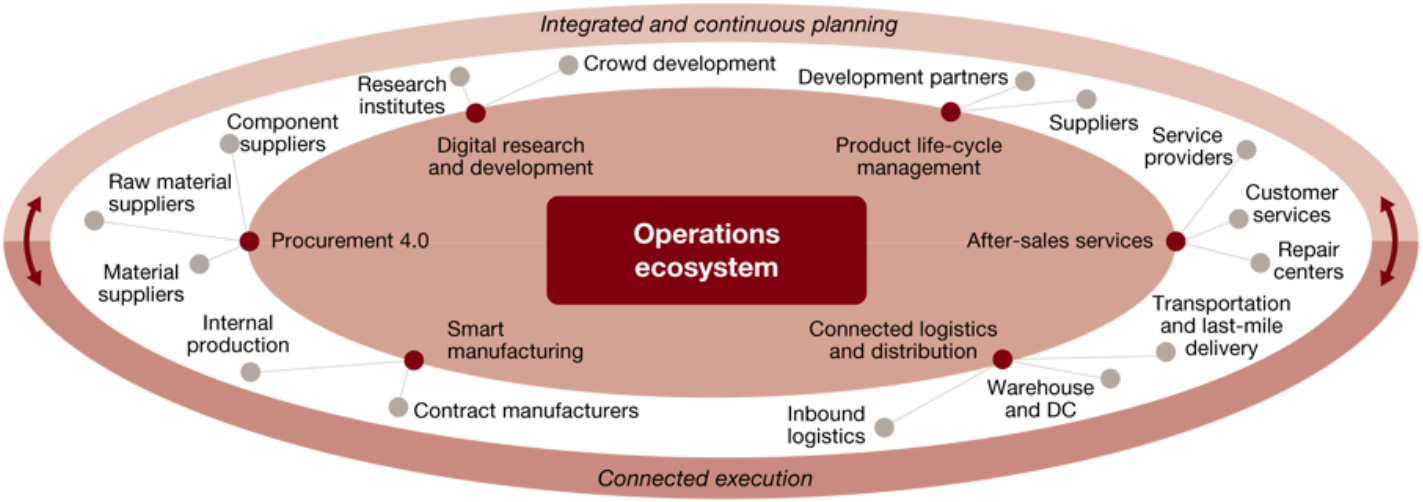
Industrial equipment & engineering

Industrial manufacturing

Process industries

Confidential information for the sole benefit and use of PwC's client.

Overview of the Operations ecosystem



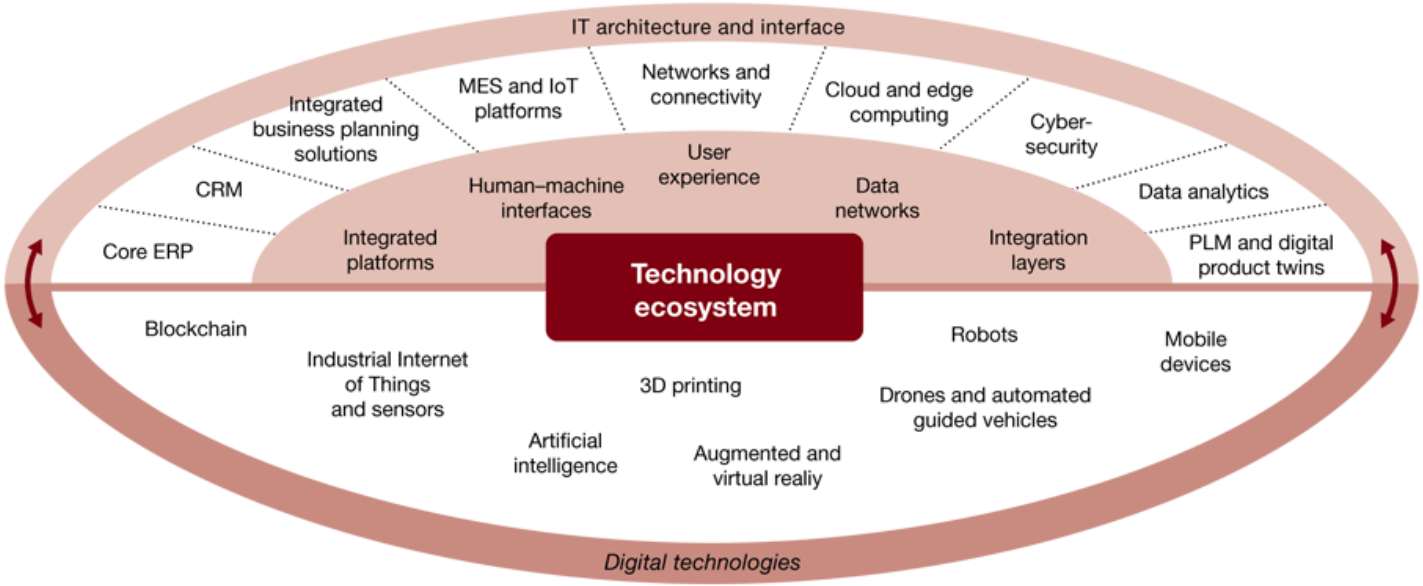
Solution enablement and value chain efficiency layer

- product development,
- planning,
- sourcing,
- manufacturing,
- warehousing,
- logistics,
- services

- includes external entities

Confidential information for the sole benefit and use of PwC's client.

Overview of the Technology ecosystem

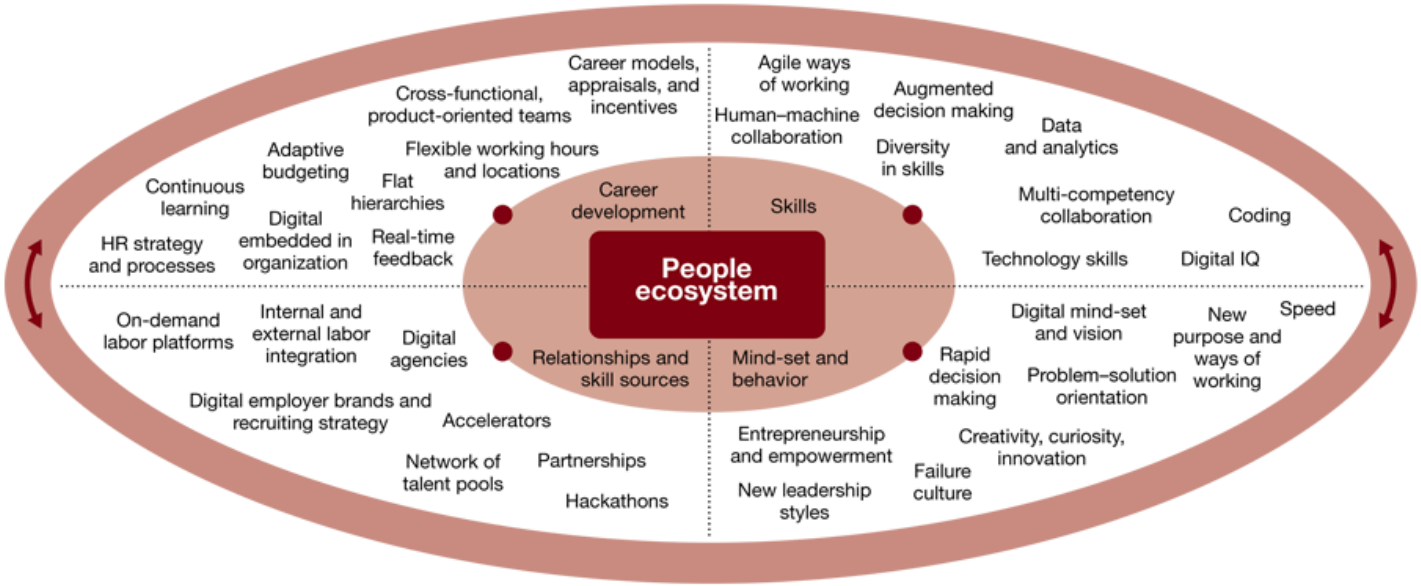


Intelligence and connectivity including pivotal technologies for Industry 4.0

- artificial intelligence,
- 3D printing,
- Industrial Internet of Things (IIoT)
- sensors,
- augmented and virtual reality,
- robots

Confidential information for the sole benefit and use of PwC's client.

Overview of the People ecosystem



Domain of organizational competence and culture

- skills,
- mind-set,
- behavior,
- relationships,
- skill sources,
- career development

Confidential information for the sole benefit and use of PwC's client.

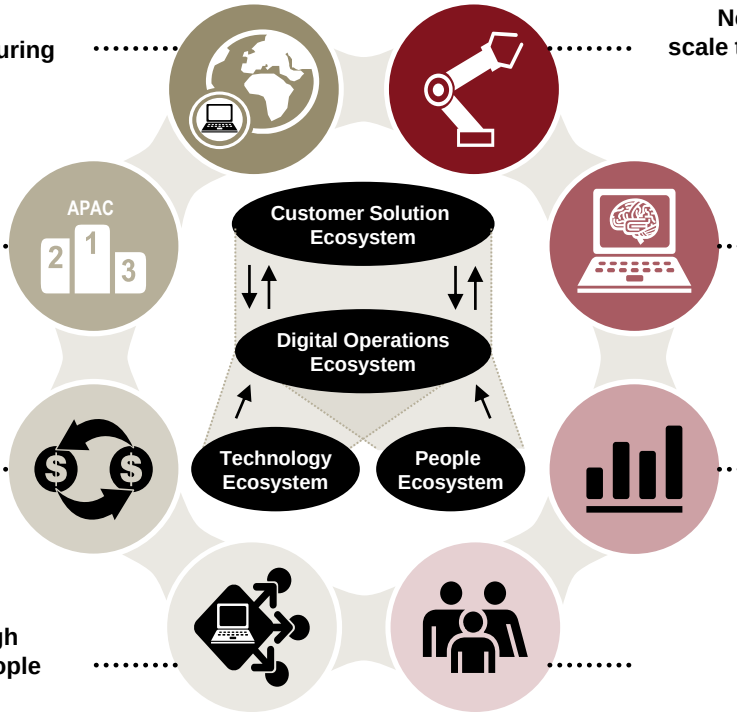
Digital Champions lead the digital transformation

Top of the world – 10% of global manufacturing companies are Digital Champions

APAC is leading the way to digitization

Digital Champions create value through integrated customer solution ecosystems

Digital Champions serve customers through integrating operations, technology and people ecosystems



New technologies are implemented at large scale to connect and collaborate along the end-to-end value chain

Artificial Intelligence is just kicking off – but will revolutionize the quality of operational decision making

Digitization will increase production in mature markets and near customers

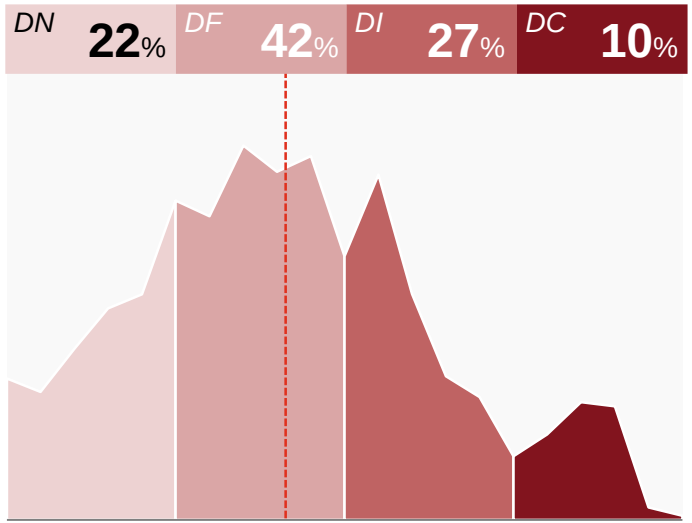
People are at the centre of digital transformation

Confidential information for the sole benefit and use of PwC's client.

1. Top of the world – 10% of global manufacturing companies are Digital Champions

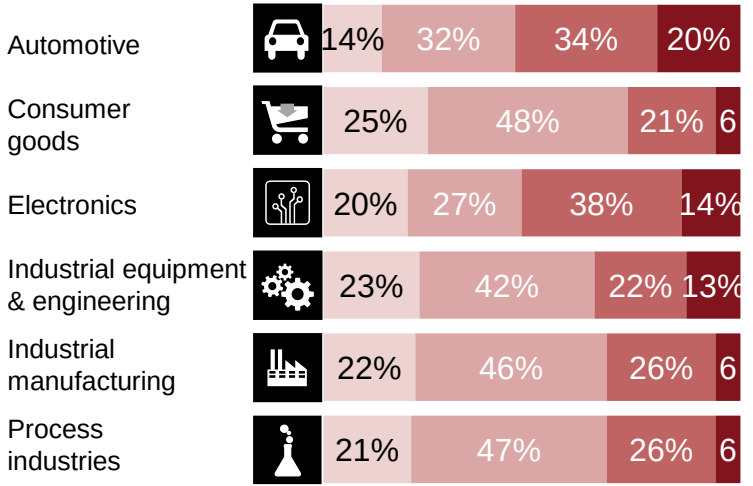
Global index distribution

Global average: **43**.3 pts.



Base: 1,155 companies

Level of Digital Operations Maturity **by key industry**



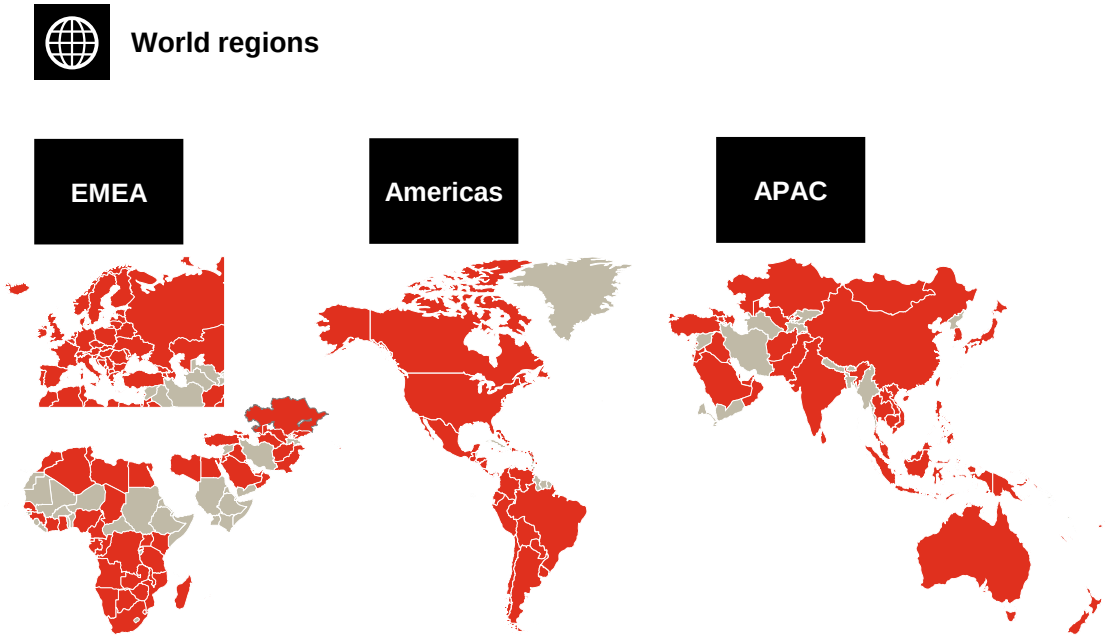
Legend

- DC – Digital Champion
- DI – Digital Innovator
- DF – Digital Follower
- DN – Digital Novice

Confidential information for the sole benefit and use of PwC's client.

Question

- Why APAC?

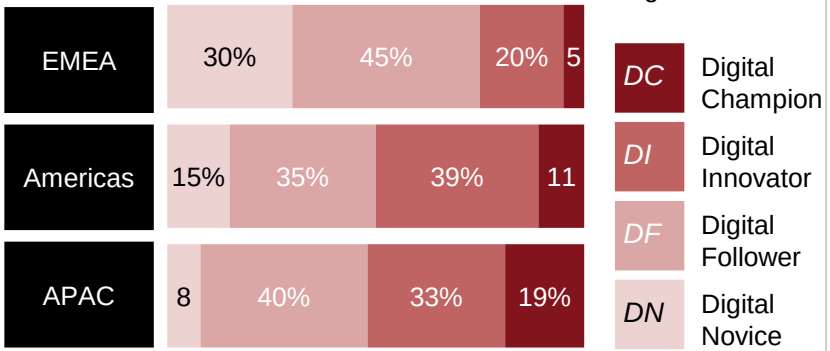


Confidential information for the sole benefit and use of PwC's client.

2. APAC is leading the way to digitization

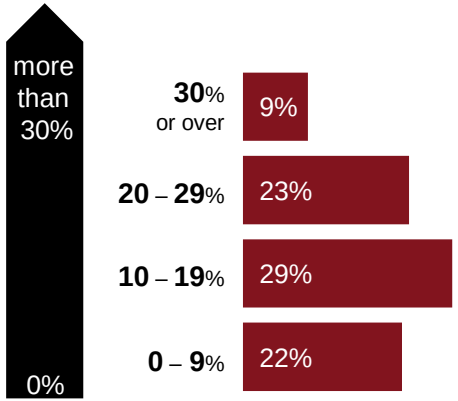
Digital Operations Maturity: Maturity Level Splits & Benefits of Investing in Digital Technologies

Level of Digital Operations Maturity
by world region



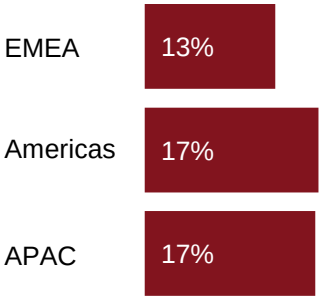
Note: Index group distribution in percent // Base: 1,155 companies

ø **14**.7 %



Cumulative revenue increase over the next 5 years

Average benefits
by world region



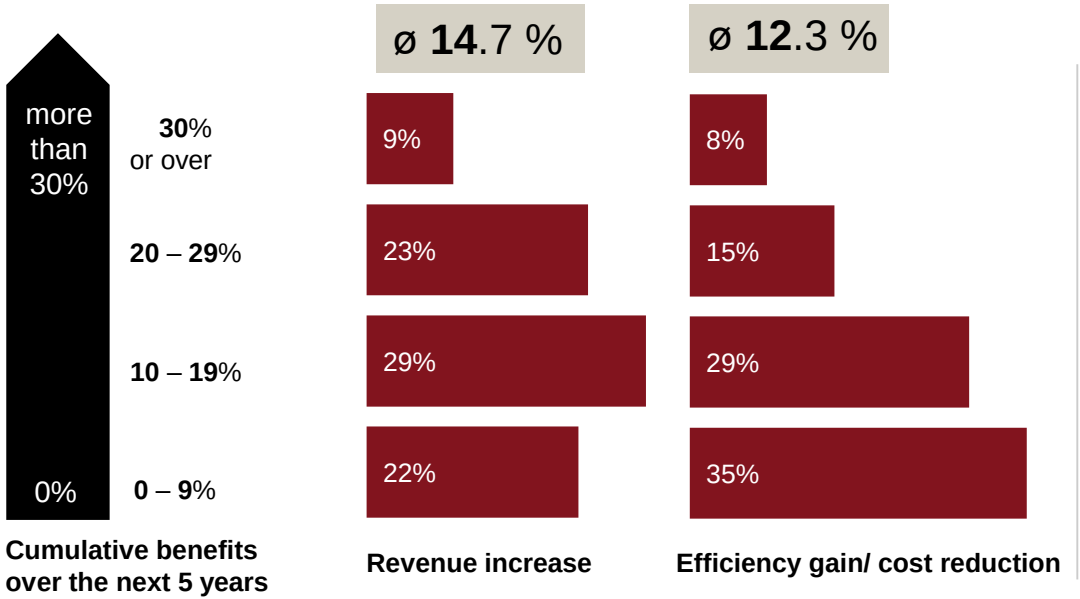
Average revenue increase

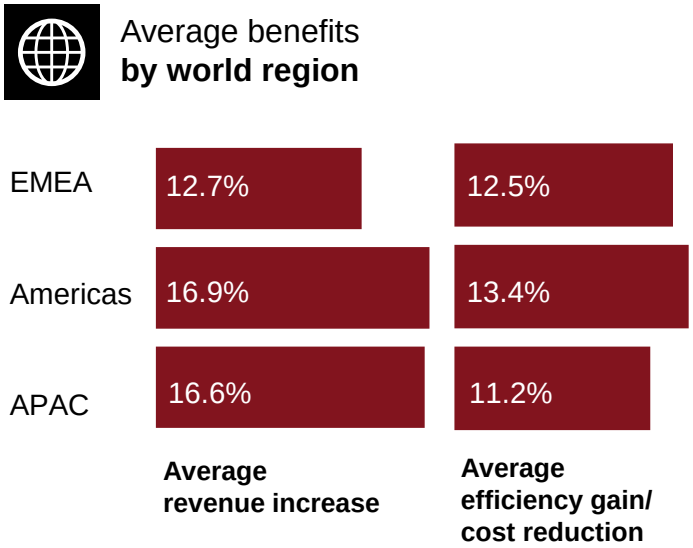
Question (Q2): **What benefits do you expect from your investments in digital technologies cumulatively over the next 5 years?**
Please compare your expected situation in five years with your situation now.
Base: 1,155 companies

Confidential information for the sole benefit and use of PwC's client.

3. Digital Champions create value through integrated customer solution ecosystems

Benefits of Investing in Digital Technologies



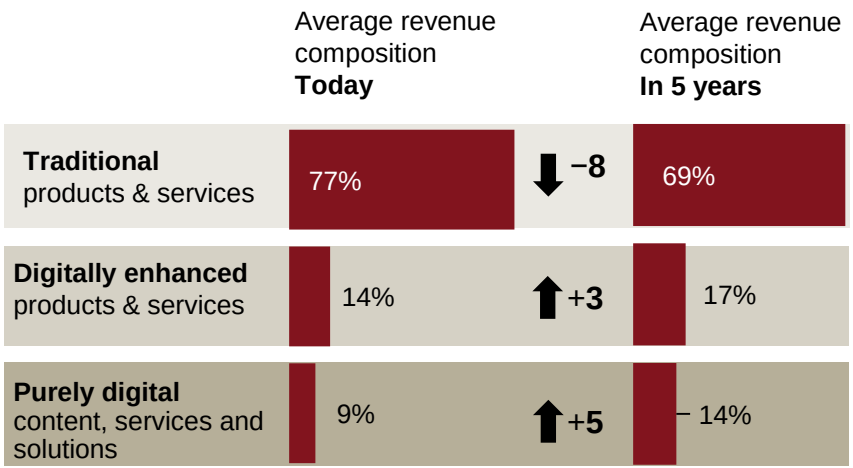


Question (Q2): What benefits do you expect from your investments in digital technologies cumulatively over the next 5 years? Please compare your expected situation in five years with your situation now. Base: 1,155 companies

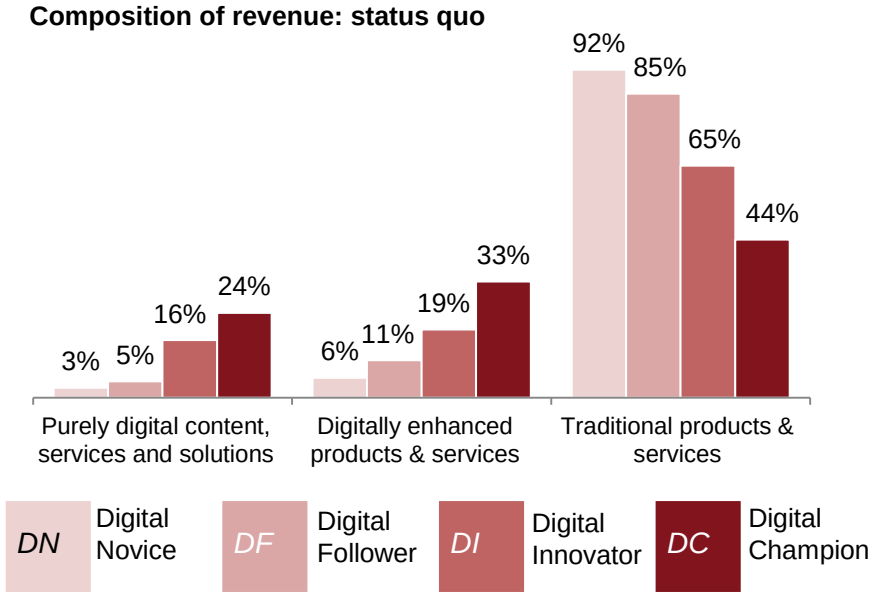
Confidential information for the sole benefit and use of PwC's client.

3. Digital Champions create value through integrated customer solution ecosystems

Leaders already generate >50% of their revenues from digital or digitally enhanced products and services



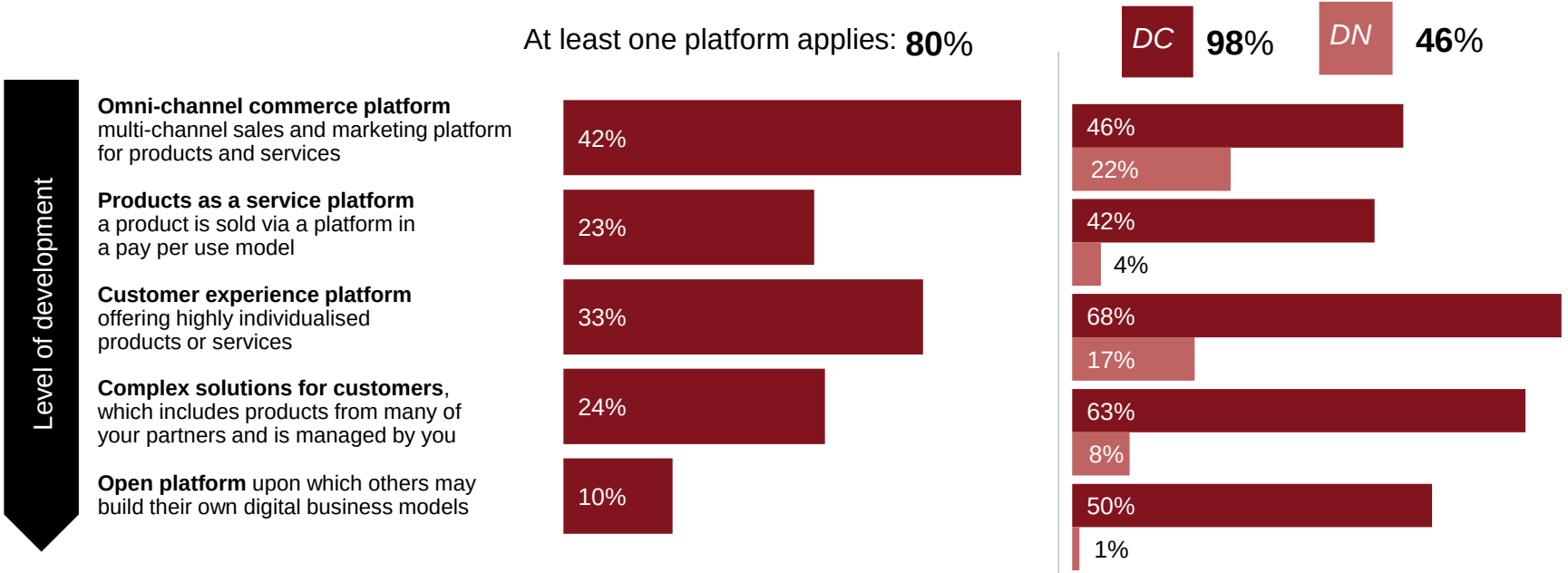
Question (Q8): What is the composition of your revenue today and in 5 years?
Note: average revenue shares in percent, differences in percentage points
Base: 1,155 companies



Confidential information for the sole benefit and use of PwC's client.

3. Digital Champions create value through integrated customer solution ecosystems

50% of Digital Champions leverage open platforms to drive digital business models



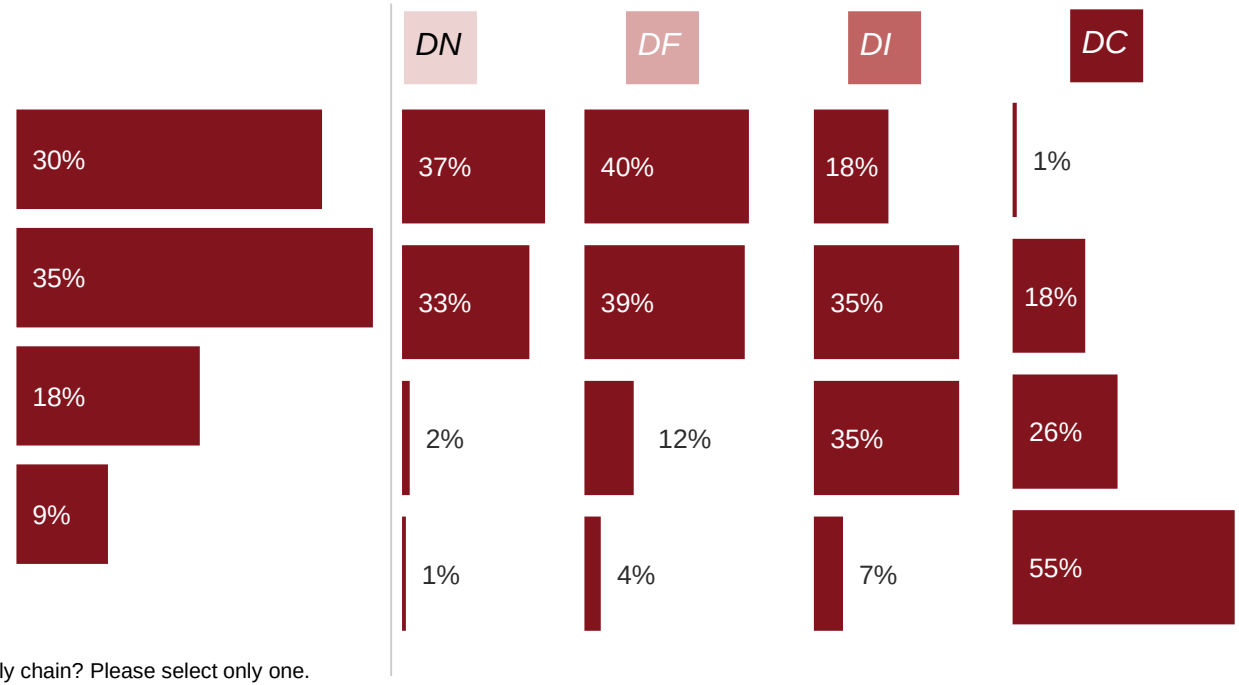
Question (Q10): Which types of platform are you focusing on to realise your business model? Please select all that apply.
Note: multiple answers possible // Base: 1,155 companies

Confidential information for the sole benefit and use of PwC's client.

4. Digital Champions serve customers through integrating operations, technology and people ecosystems

Supply Chain Maturity

Level of horizontal integration

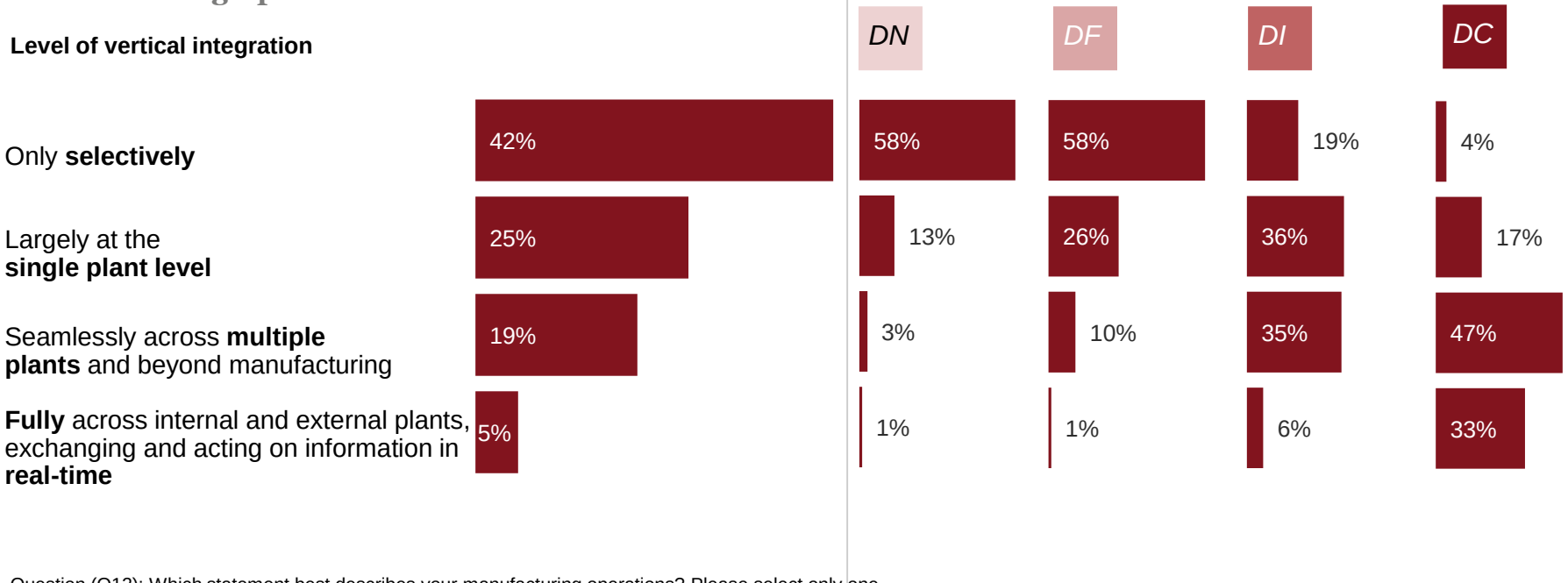


Question (Q11): Which statement best describes your supply chain? Please select only one.
Base: 1,155 companies

Confidential information for the sole benefit and use of PwC's client.

4. Digital Champions serve customers through integrating operations, technology and people ecosystems

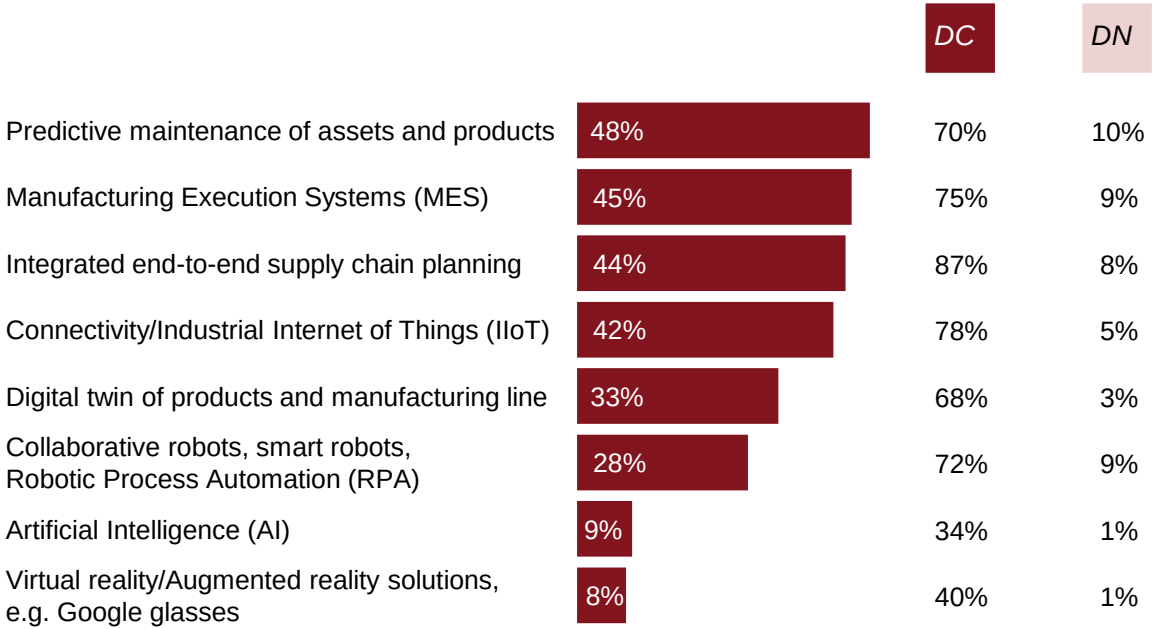
Manufacturing Operations



Question (Q12): Which statement best describes your manufacturing operations? Please select only one.
Base: 1,155 companies

Confidential information for the sole benefit and use of PwC's client.

5. New technologies are implemented at large scale to connect and collaborate along the end-to-end value chain



Question (Q1): To what extent have you implemented the following technologies within your company?
Base 1,155 companies

Average implementation rate **by industry / maturity level**

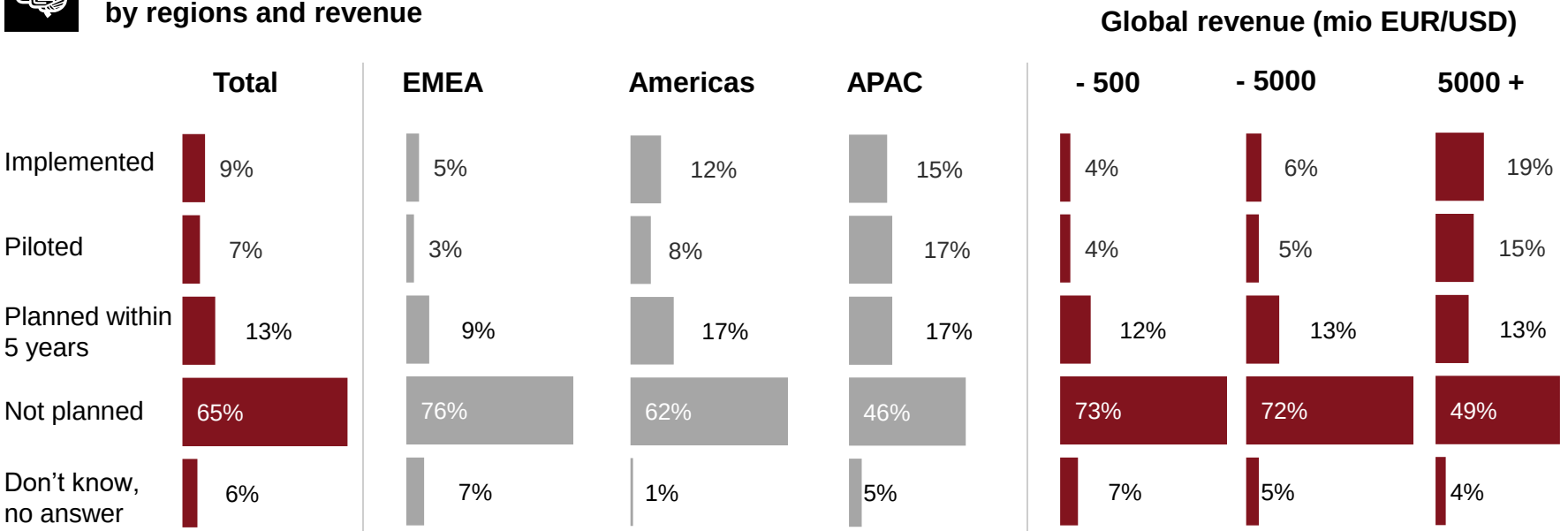
42%	DC 64%
26%	DI 46%
35%	DF 27%
27%	DN 5%
29%	
34%	

Confidential information for the sole benefit and use of PwC's client.

6. AI is just kicking off – but will revolutionize the quality of operational decision making

Most companies have not planned the use of AI - EMEA lagging behind APAC

Extend of Artificial Intelligence implementation
by regions and revenue

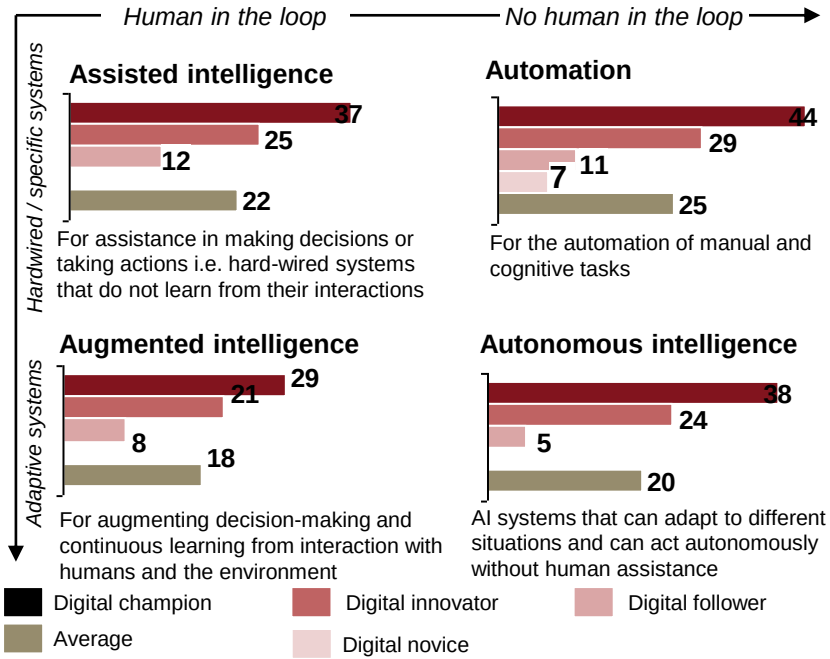


Confidential information for the sole benefit and use of PwC's client.

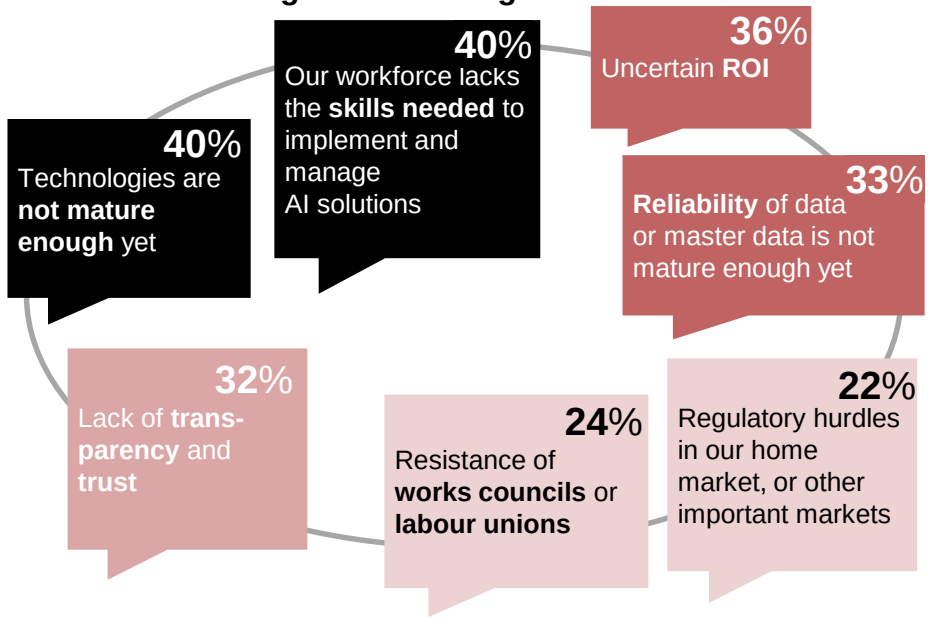
6. AI is just kicking off – but will revolutionize the quality of operational decision making

Leaders use AI beyond simple process automation to design self-learning, autonomous systems

Ways of using Artificial Intelligence



Artificial Intelligence Challenges



Question (Q4): In what way do you use Artificial Intelligence in your company?
Note: Figures in percent. Base: 98 companies that have implemented AI technologies

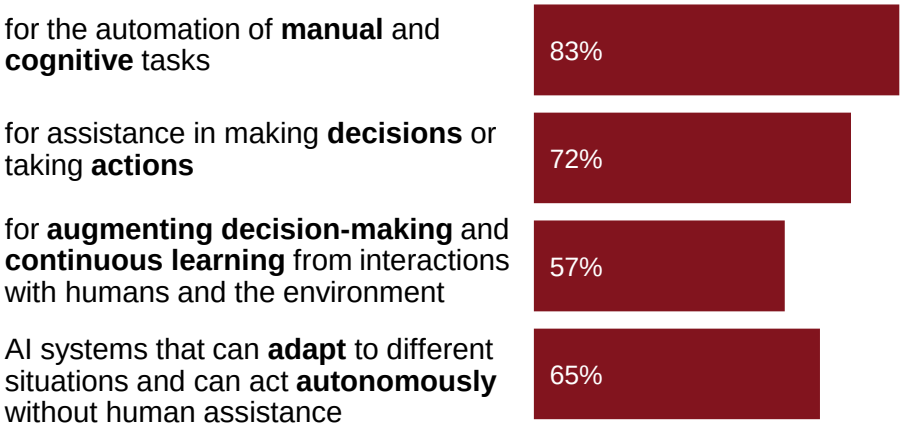
Question (Q5): In your opinion, what are the top 3 challenges associated with AI?
Base: 1,155 companies

PwC's Digital Services
Confidential information for the sole benefit and use of PwC's client.

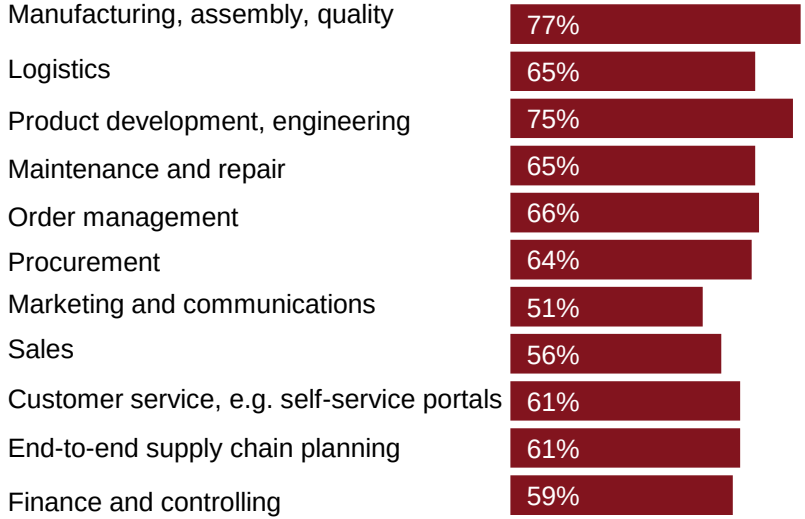
6. AI is just kicking off – but will revolutionize the quality of operational decision making

Artificial Intelligence: Implementation in Terms of Company Functions

AI businesses are active on all levels of integration



Implementation of AI by function



Left: Question (Q4): In what way do you use Artificial Intelligence in your company?
Right: Question (Q3): To what extent have you implemented Artificial Intelligence in the following company functions?
Base: 98 companies that have implemented AI technologies // Note: figures in percent; differences in percentage points

Confidential information for the sole benefit and use of PwC's client.

8. People are at the center of digital transformation

Only 1/3 of companies states to have a leadership with a clear vision for digital transformation

38% "We regard **failures** as an accepted part of the development process."

37% "Our company has **flat hierarchies** that facilitate agile working and quick decision-making."

35% "We are focused on providing a **digital customer experience** throughout the customer journey."

34% "Our leadership has a **clear vision** for the digital future and acts as **role model**."

32% "We foster a culture of innovation with **multi-disciplinary teams**."

32% "We selectively engage with **expert partners** as supple-mental external resources."

27% "Our employees have the required **qualifications** for the digital future."

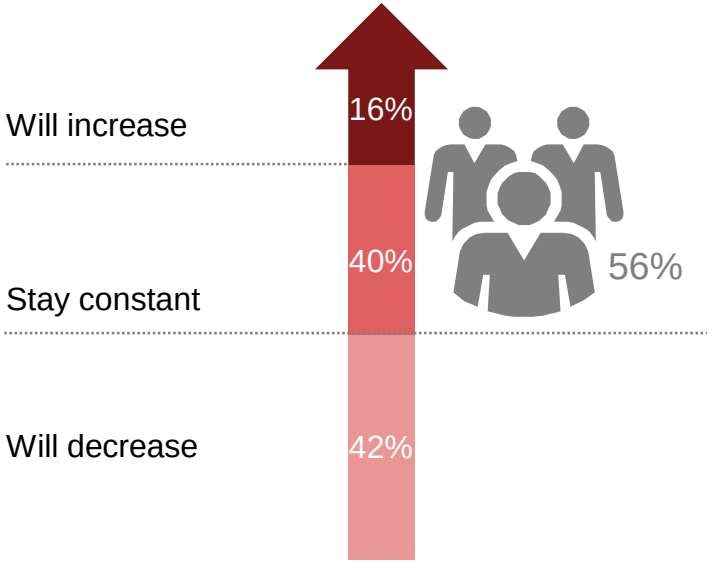
26% "We have **invested heavily in training** to make our staff fit for digital transformation."

22% "We build **tandems** or **learning groups** between digital natives and experienced staff."

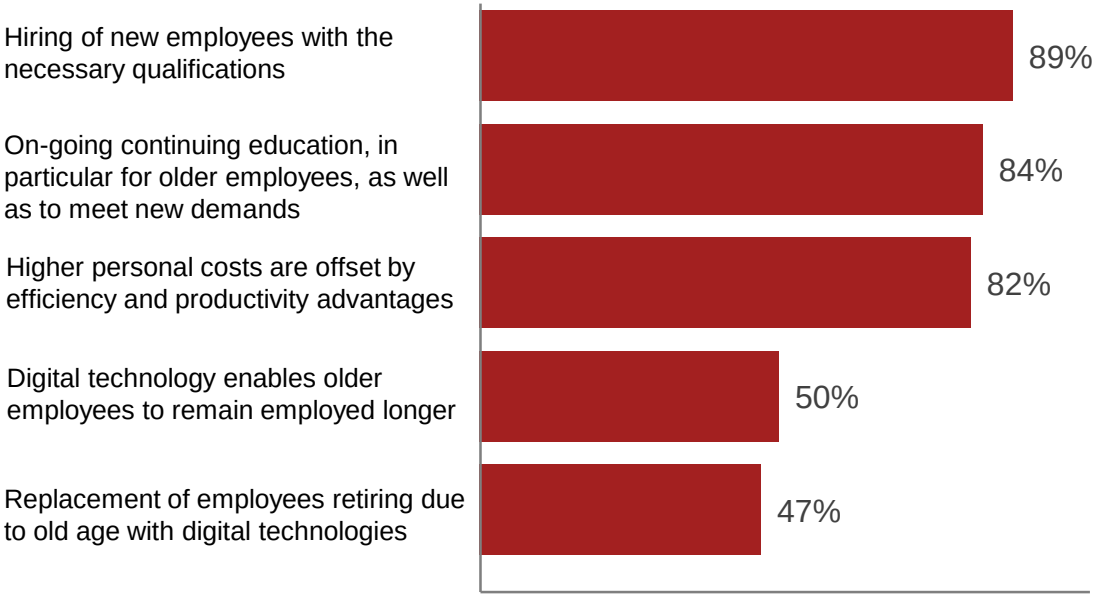
Confidential information for the sole benefit and use of PwC's client.

8. People are at the center of digital transformation

Implementing digital manufacturing means building a digital workforce



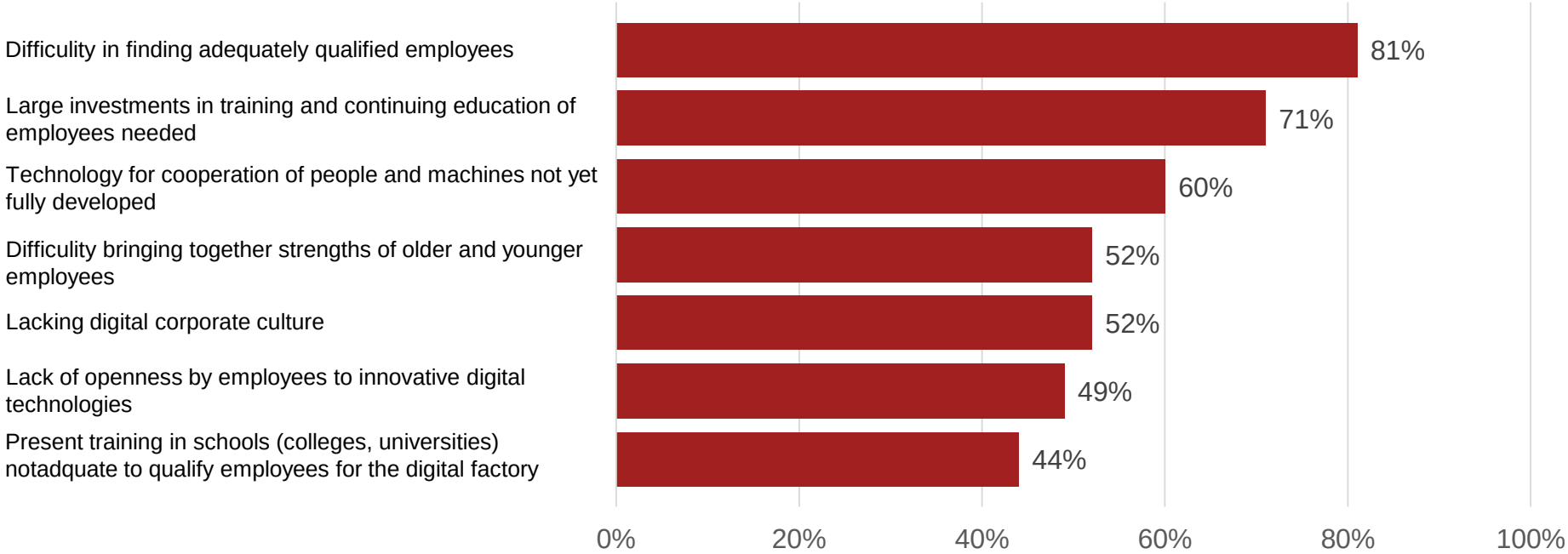
Q: What changes do you expect to the number of employees in your factories in total in 10 years as a result of digitisation?



Q: What effects do you expect for your company as a result of digtisation?

Confidential information for the sole benefit and use of PwC's client.

8. People are at the center of digital transformation



Q: Where do you see challenges for the digital factory with regard to your employees?

Confidential information for the sole benefit and use of PwC's client.

https://www.youtube.com/watch?v=l1Ta65TCJsQ

Confidential information for the sole benefit and use of PwC's client.

04
Current status of Hungary

Current status of Hungary

- More than 100 indicators
- The indicators have been selected to support
  - the **EU Digital Single Market policies** and
  - to monitor the **digital progress of European Economy and Society**

General Info

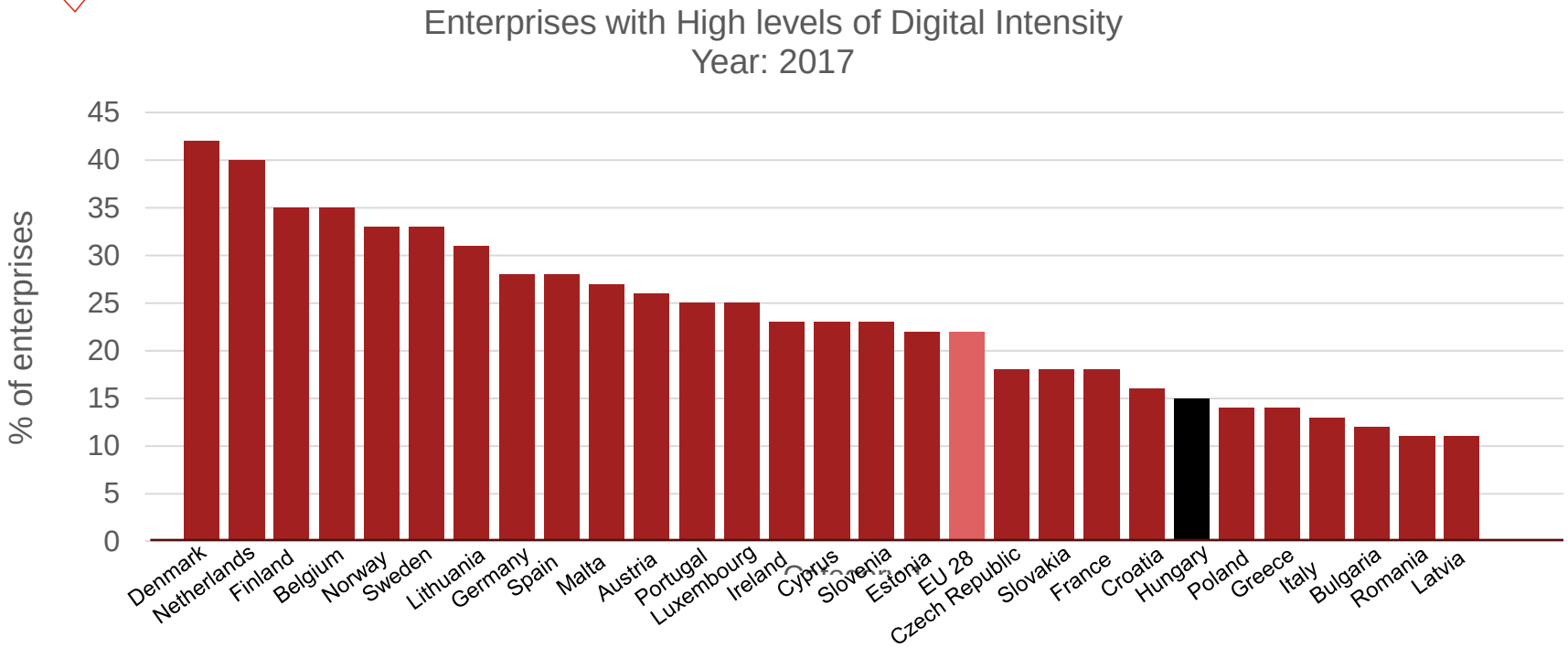
- Formed by ITM (previously NGM)
- Managed by SZTAKI
- 100 members, 7 workgroups

NTP Survey 2017:

- Needs and expectations of the (manufacturing) industry and strategic economic governance
- Present state of affiliation, acceptance and introduction of Industry 4.0,
- Industry 4.0 specific R & D and Innovation potential.
- Growth potential and its conditions
- 200 companies

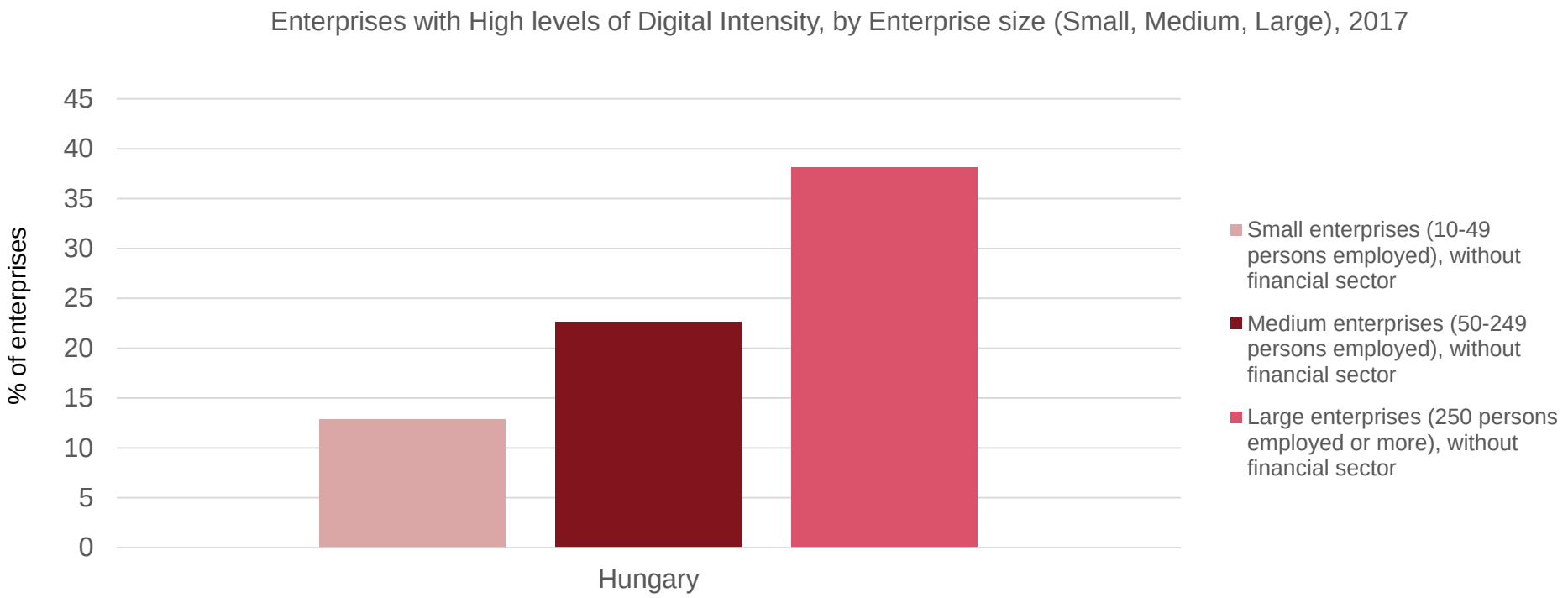
Confidential information for the sole benefit and use of PwC's client.

Status of Digitisation in Europe



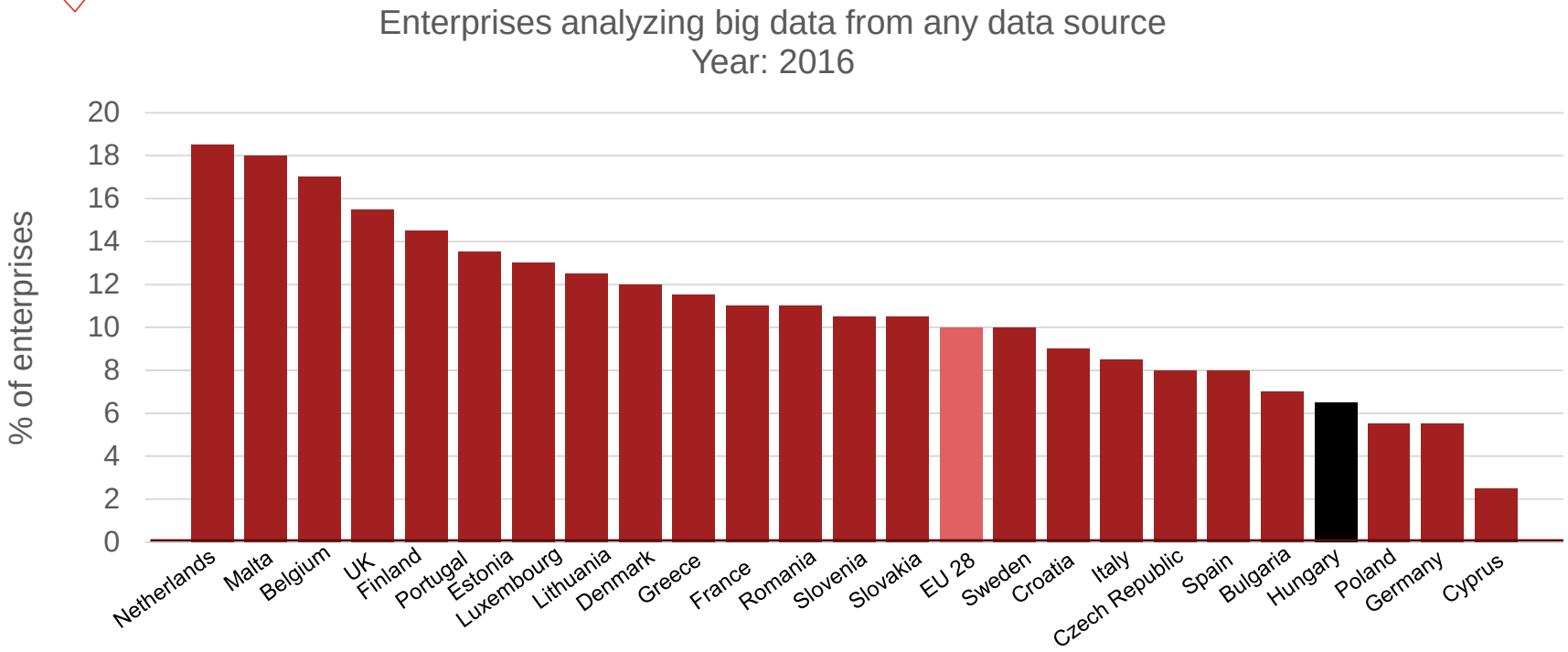
Confidential information for the sole benefit and use of PwC's client.

Status of Digitisation in Hungary



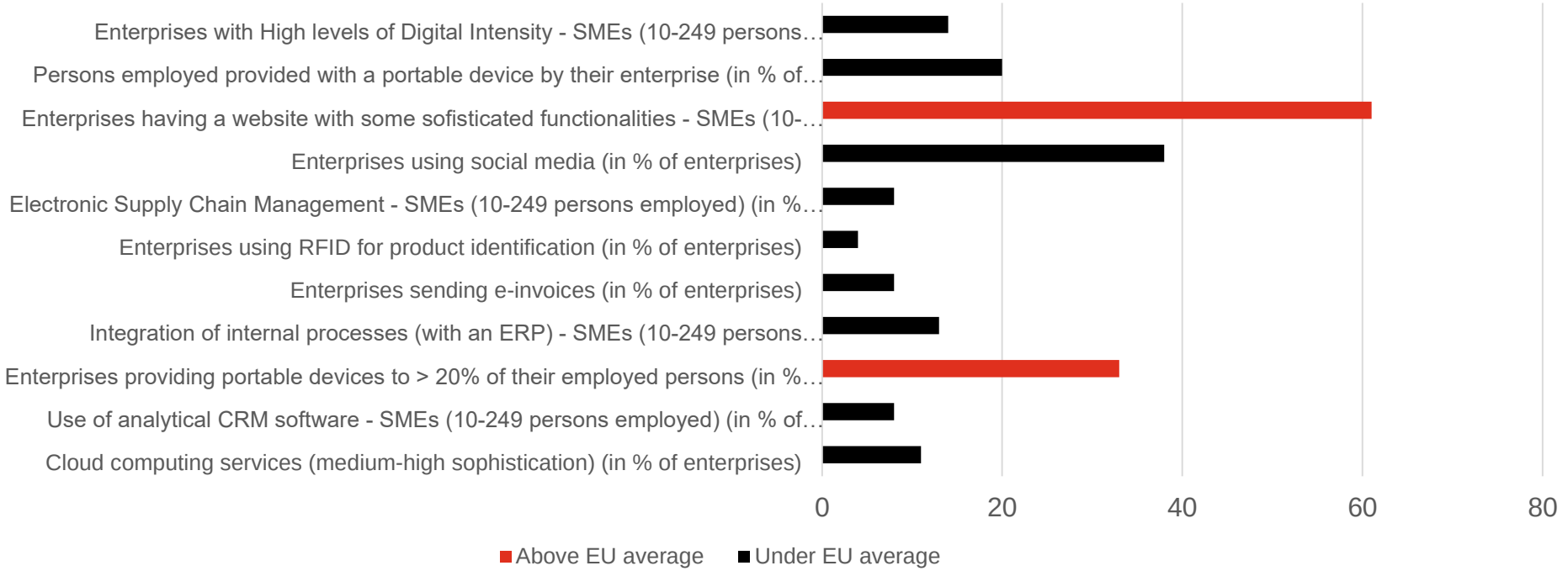
Confidential information for the sole benefit and use of PwC's client.

Status of Big Data analyzing in Europe



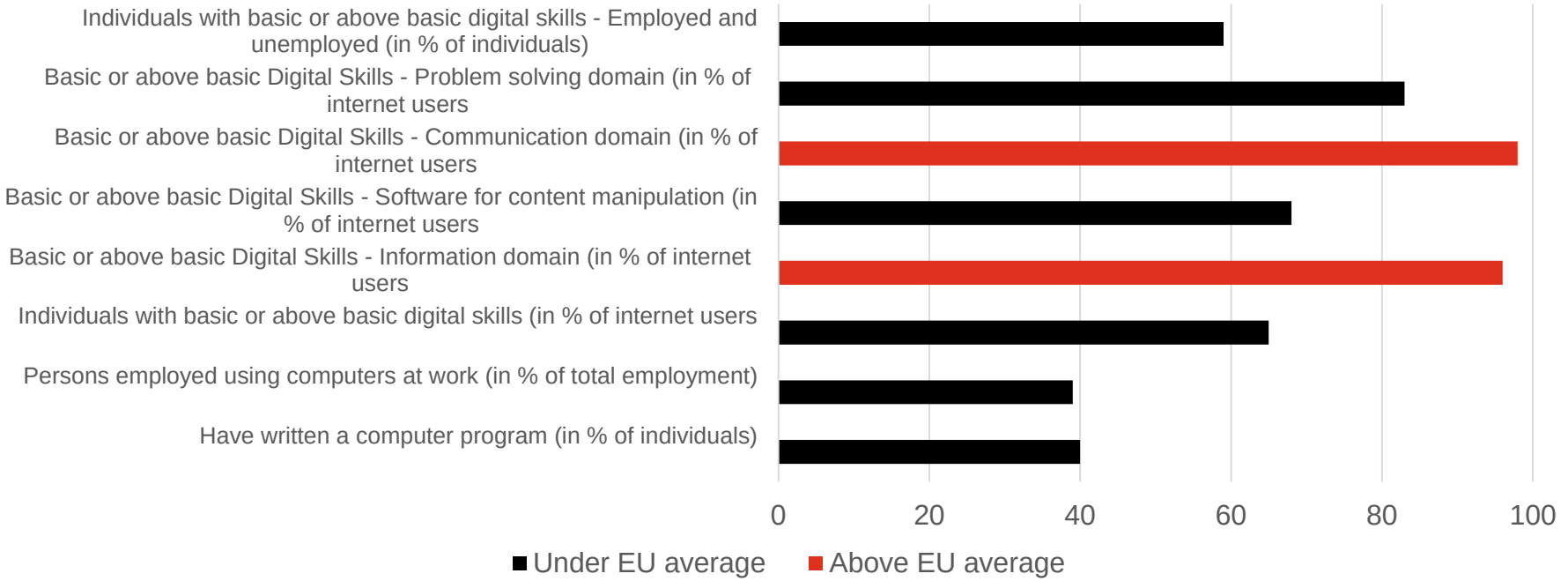
Confidential information for the sole benefit and use of PwC's client.

Country profile for Hungary, eBusiness indicators



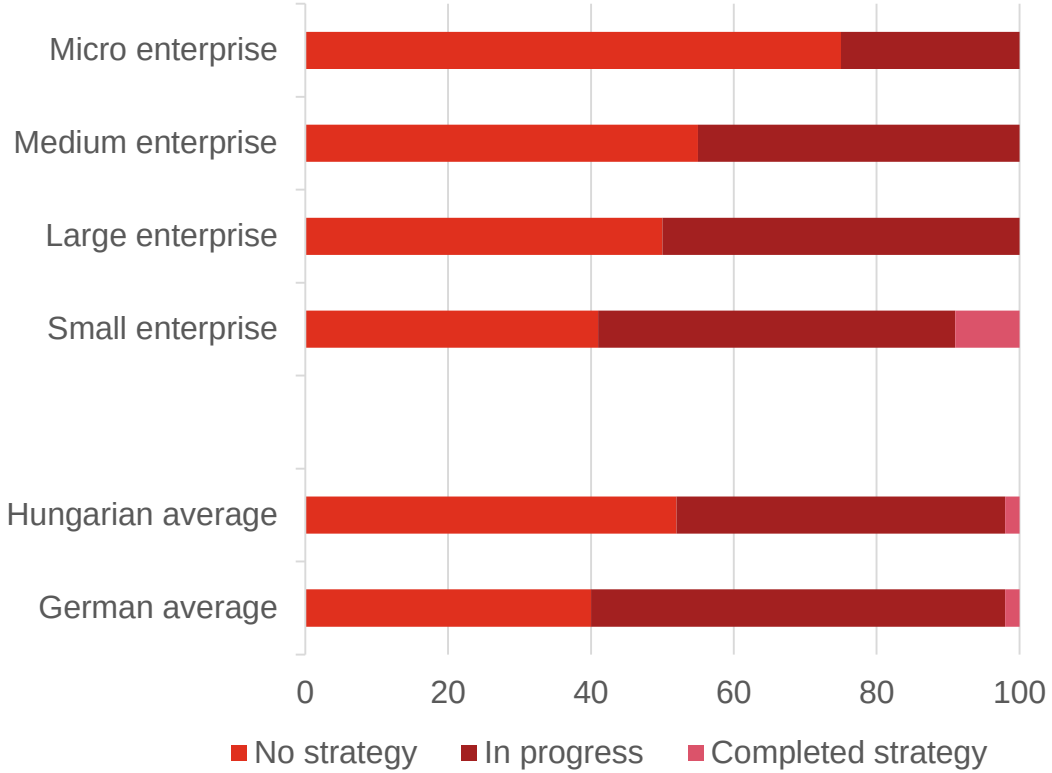
Confidential information for the sole benefit and use of PwC's client.

Country profile for Hungary, Digital Skills



Confidential information for the sole benefit and use of PwC's client.

Industry 4.0 strategy implementation at Hungarian Companies

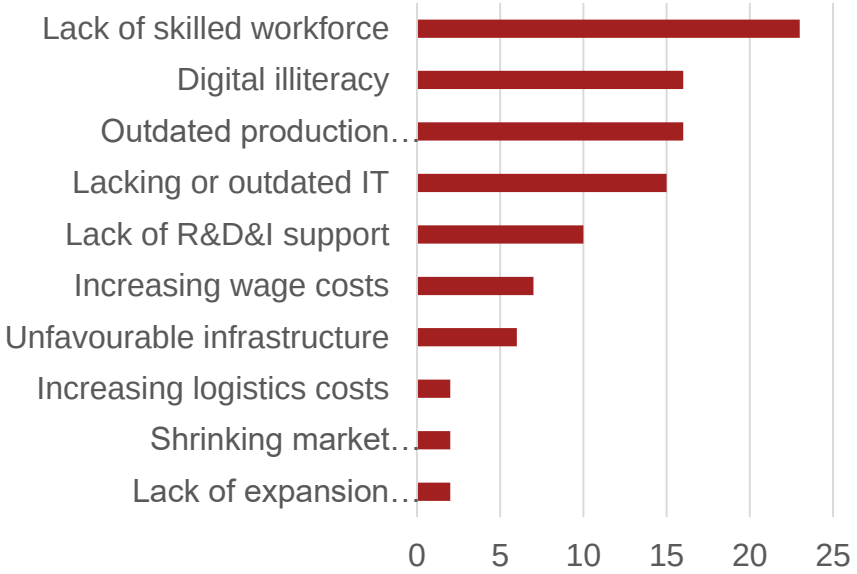


Confidential information for the sole benefit and use of PwC's client.

Technological challenges and obstacles for Hungary

Key challenges of new digital technologies

Barriers to competitiveness in industry 4.0



Confidential information for the sole benefit and use of PwC's client.

Digitising European Industry

The European Commission recognized the need for actions and launched its Strategy on **Digitalising European Industry** on 19 April 2016

The Digitalising European Industry (DEI) initiative aims towards:

Coordination of initiatives for digitising industry

Co-investing in Europe's digital innovation capacities

Providing the appropriate regulatory framework conditions

Providing human capital with the necessary skills for the digital transformation

Confidential information for the sole benefit and use of PwC's client.

Digital Innovation Hubs

DIH shall provide local industry with:

Access to the latest knowledge, expertise and technology

Connections to investors, access to financing for digital transformations

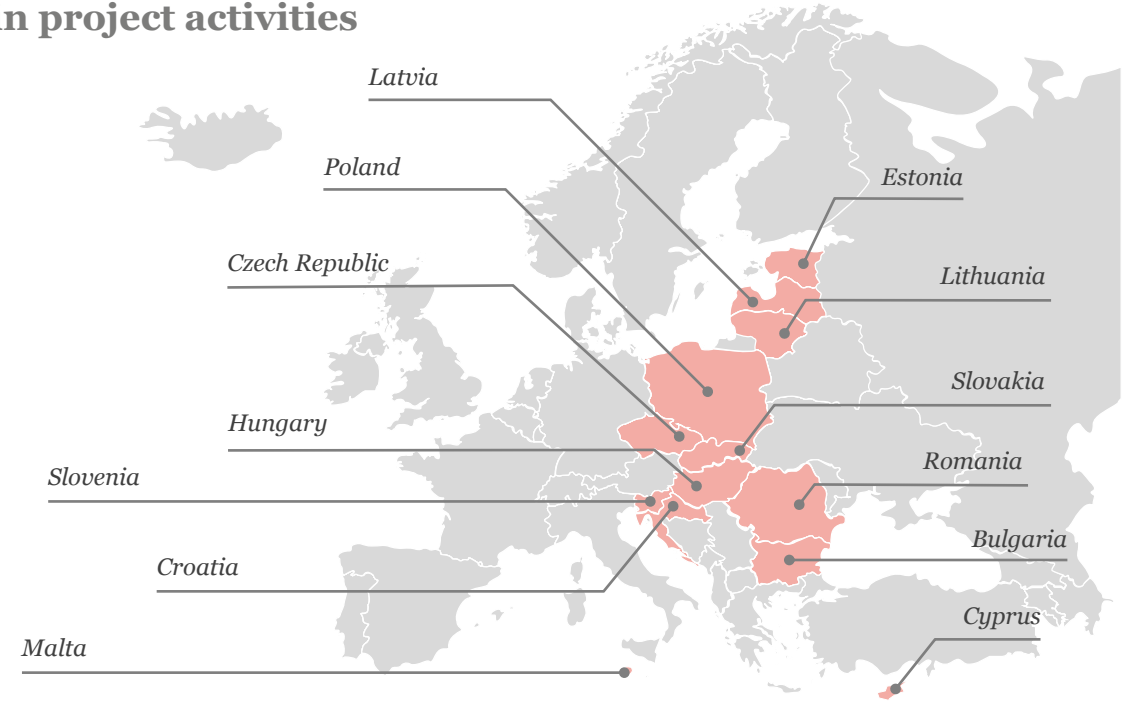
A link between users and suppliers of digital innovations across the value chain

Opportunities to foster synergies between digital and other key enabling technologies

Confidential information for the sole benefit and use of PwC's client.

Project's geographical coverage

Countries covered in project activities



Confidential information for the sole benefit and use of PwC's client.

Hungary's Digital Innovation HUBs

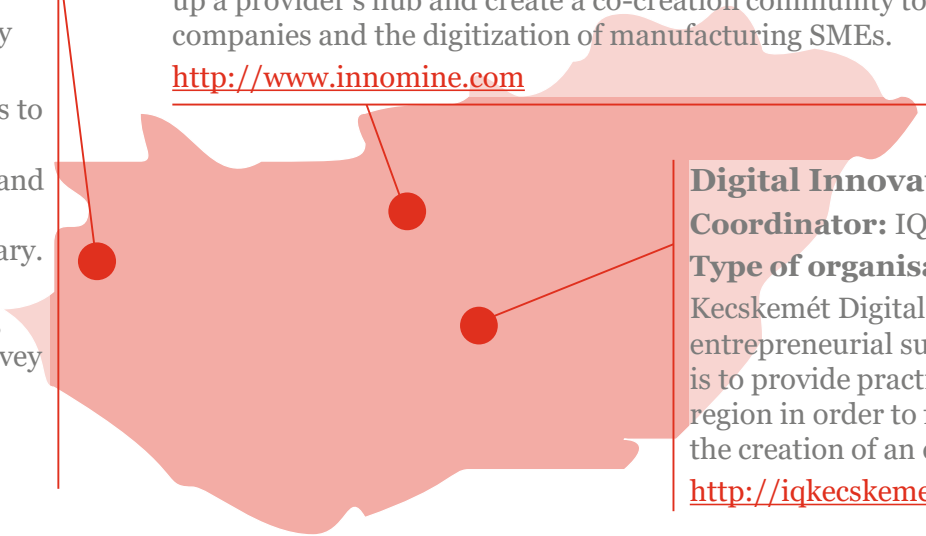
AMLab, Szombathely

Coordinator: Pannon Business Network Association

Type of organisation: Industry associations.

AMLab main objective is to become the service provider for promoting and assisting digitization of SMEs in Western Hungary. In the forefront are additive manufacturing, maturity technology survey and their broad applications.

http://www.pbn.hu



innomine Digital Innovation Hub, Budapest

Coordinator: innomine accelerator

Type of organisation: Incubators and accelerators

innomine DIH aims at fostering the adoption of Industry 4.0 solutions in order to support digitization of industry by connecting local SMEs to the most innovative Industry 4.0 technologies. The key objective is to promote Industry 4.0 solutions, set up a provider's hub and create a co-creation community to foster the start of new companies and the digitization of manufacturing SMEs.

http://www.innomine.com

Digital Innovation Hub of Kecskemét, Kecskemét

Coordinator: IQ Kecskemét Industrial Research Ltd.

Type of organisation: Incubators and accelerators

Kecskemét Digital aims at becoming a regional center for entrepreneurial support in digital transformation. The objective is to provide practical advice and support to the SMEs of the region in order to foster digital technologies development and the creation of an eco-system for innovation.

http://iqkecskemet.hu/en

Confidential information for the sole benefit and use of PwC's client.

Bibliography

https://www.i-scoop.eu/industry-4-0/

https://www.forbes.com/sites/bernardmarr/2016/06/20/what-everyone-must-know-about-industry-4-0/#38235e09795f

https://www.analyticsvidhya.com/blog/2016/08/10-youtube-videos-explaining-the-real-world-applications-of-internet-of-things-iot/

Industry 4.0: Global Digital Operations Study 2018: https://www.pwc.com/gx/en/industries/industry-4-0.html

https://digital-agenda-data.eu/charts/analyse-one-indicator-and-compare-countries

https://www.i40platform.hu/

Confidential information for the sole benefit and use of PwC's client.

Disclaimer

© 2018 PricewaterhouseCoopers Hungary Ltd. All rights reserved. PwC refers to PricewaterhouseCoopers Hungary Ltd. and may sometimes refer to the PwC network. Each member firm is a separate legal entity. Please see http://www.pwc.com/structure for further details.

This content is for general information purposes only, and should not be used as a substitute for consultation with professional advisors.

Hungarian member firms of PwC help organisations and individuals create the value they're looking for. We're a member of the PwC network of firms in 157 countries with close to 223,468 people. We're commited to delivering quality in assurance, tax and advisory services. Tell us what matters to you and find out more by visiting us at www.pwc.com/hu.