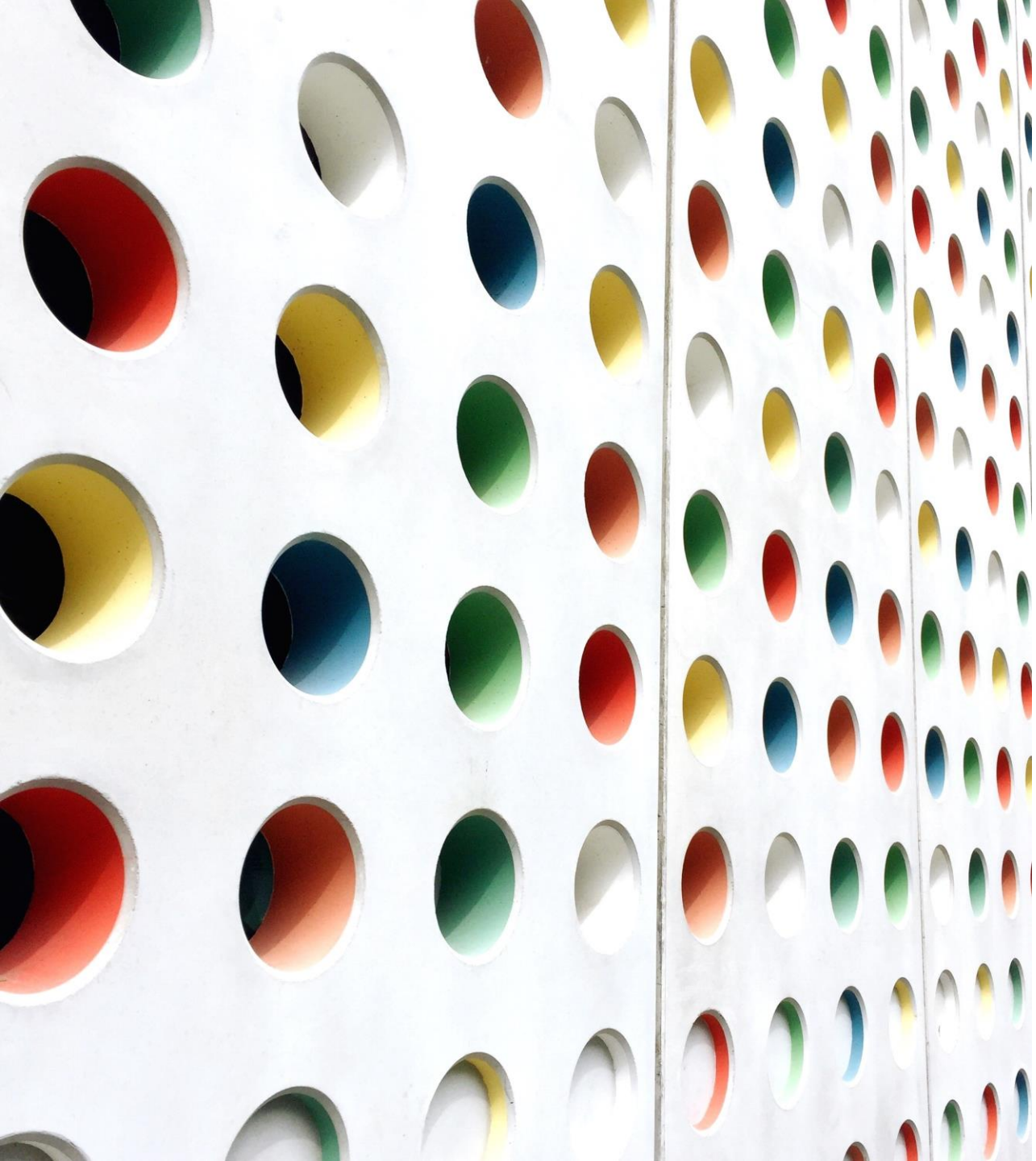

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European Federation of National Associations of Measurement, Testing and Analytical Laboratories

IMEKO

TIC Talks

Imeko TC11

THE LAB OF THE FUTURE

By Álvaro Ribeiro

1 MARCH 2022: ONLINE

Overview

Emerging technologies & trends

Digital transformation

Global market & new demands

The role of Quality

The future of Labs and the future of work

Emerging technologies & trends

Artificial Intelligence and machine learning

Development, programming, testing, support and maintenance, Forrester predicts AI, machine learning, and automation will create 9 percent of new U.S. jobs by 2025 including robot monitoring professionals, data scientists, automation specialists.

Robotic Process Automation (RPA)

RPA is the use of software to automate business processes such as interpreting applications, processing transactions, dealing with data. McKinsey finds that less than 5 percent of occupations can be totally automated, but about 60 percent can be partially automated.

Edge computing and Quantum computing

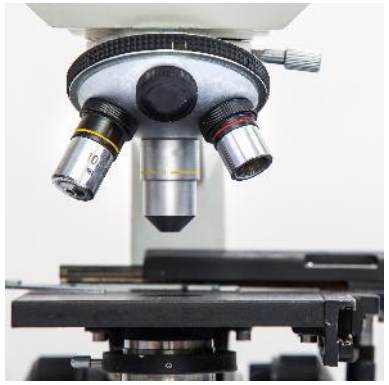
The adoption of cloud computing is still growing. Edge computing is designed to help solve some of those problems as a way to bypass the latency caused by cloud computing and getting data to a data centre for processing.

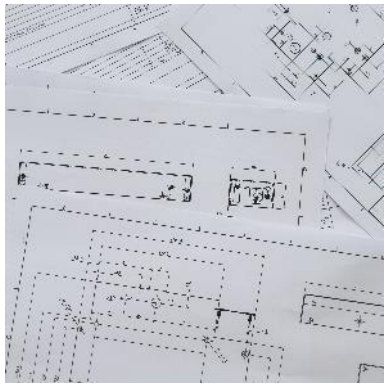
Virtual reality and augmented reality

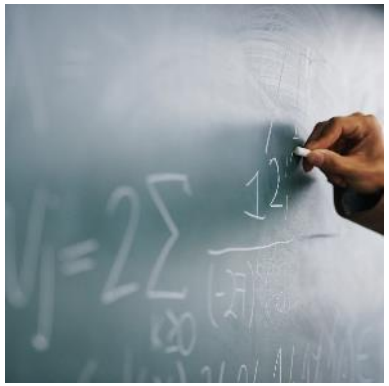
VR have enormous potential in training, entertainment, education, marketing, and even rehabilitation after an injury.

Blockchain and IoT

Blockchain offers security making a chain of data no one entity can take control of the data assuring a trusted third-party to oversee or validate transactions. The Internet of Things is the future, and has already enabled devices, home appliances, cars and much more to be connected to and exchange data over the Internet.







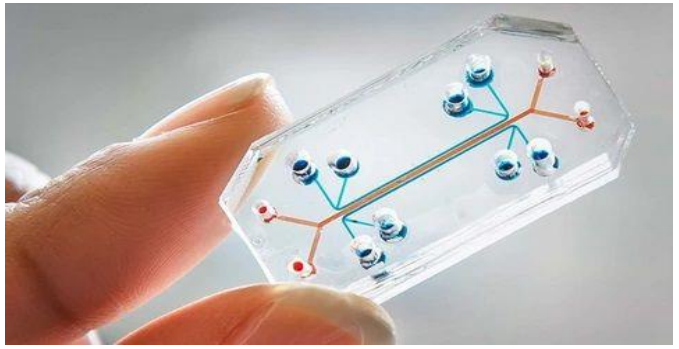

Emerging technologies & trends

Three examples:

Augmented Labs use digital assistants, or Artificial Intelligence (AI), to help technicians analyzing data samples. Since much of the data analysis performed in laboratory testing is repetitive and time-consuming, doling out simpler tasks to AI makes analysis quicker and easier, allowing lab technicians to focus on sensitive testing issues - such as analyzing abnormal or critical samples.

In the **clinical laboratory, Chemistry and Haematology** have been the earliest to adapt robotics and algorithms into its workflow. As early as 1984, the "EXPERT", a consultation system-building tool, which is a knowledge-based Artificial Intelligence (AI) programme was developed at Rutgers University for enabling sequential laboratory testing and interpretation.

Microfluidics enables the manipulation and analysis of extremely small fluid volumes within a multichannel system (10^{-9} to 10^{-18} litre). The capacity to downsize large-scale biology coupled with the capability of housing multiple experiments on a single chip.
Advantages to microfluidic technologies: very little sample is required, the volume of reagents is also significantly reduced compared to traditional large-scale analyses, the miniaturized system can still achieve high-resolution analysis, whilst maintaining sensitivity. Finally, **lab-on-chip systems** can be automated and standardized meaning there is little need for human intervention, eliminating the risk of 'human error'.



Digital transformation

Digital transformation

Green Deal & Climate

December 2019
#EUGreenDeal

The European Green Deal is about **improving the well-being of people**. Making Europe climate-neutral and protecting our natural habitat will be good for people, planet and economy. No one will be left behind.

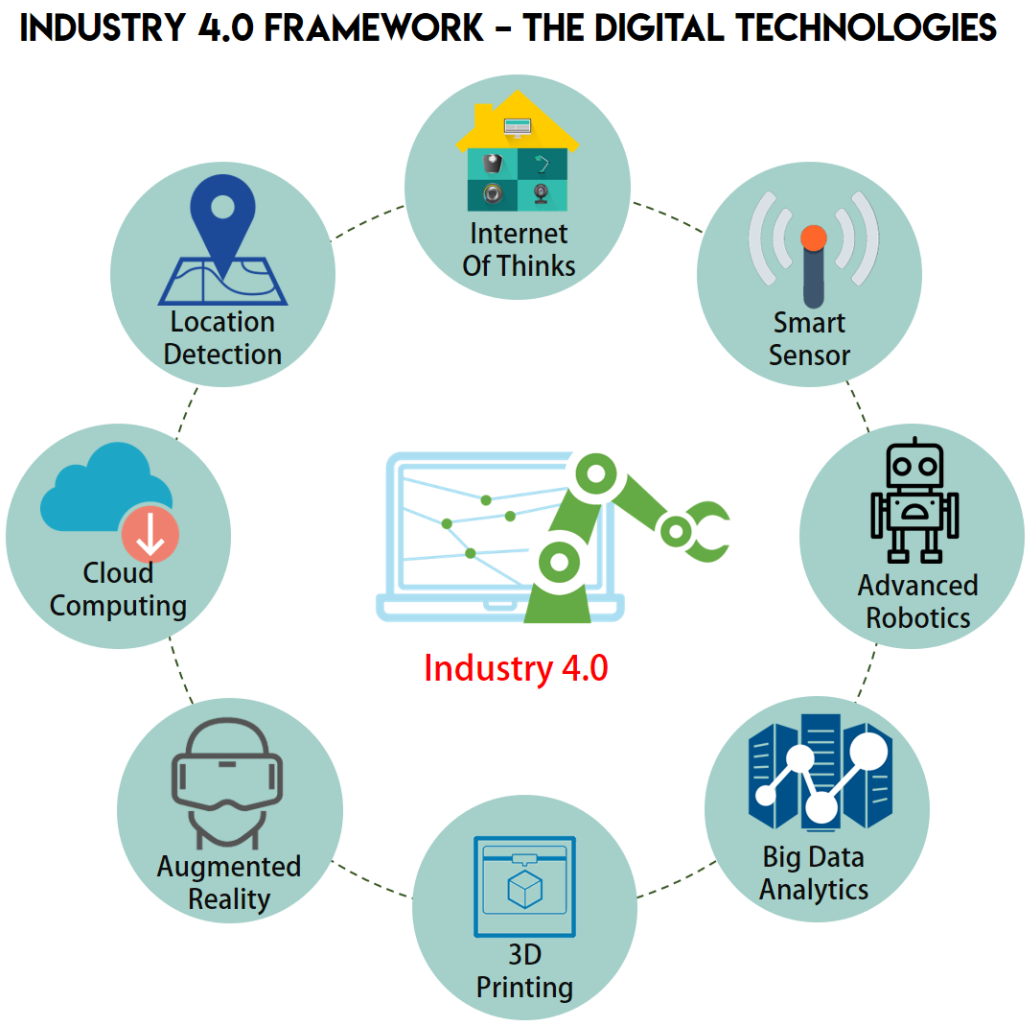
The EU will:

- Become climate-neutral by 2050
- Protect human life, animals and plants, by cutting pollution
- Help companies become world leaders in clean products and technologies
- Help ensure a just and inclusive transition

"The European Green Deal is our new growth strategy. It will help us cut emissions while creating jobs."

Ursula von der Leyen, President of the European Commission

Digital transformation

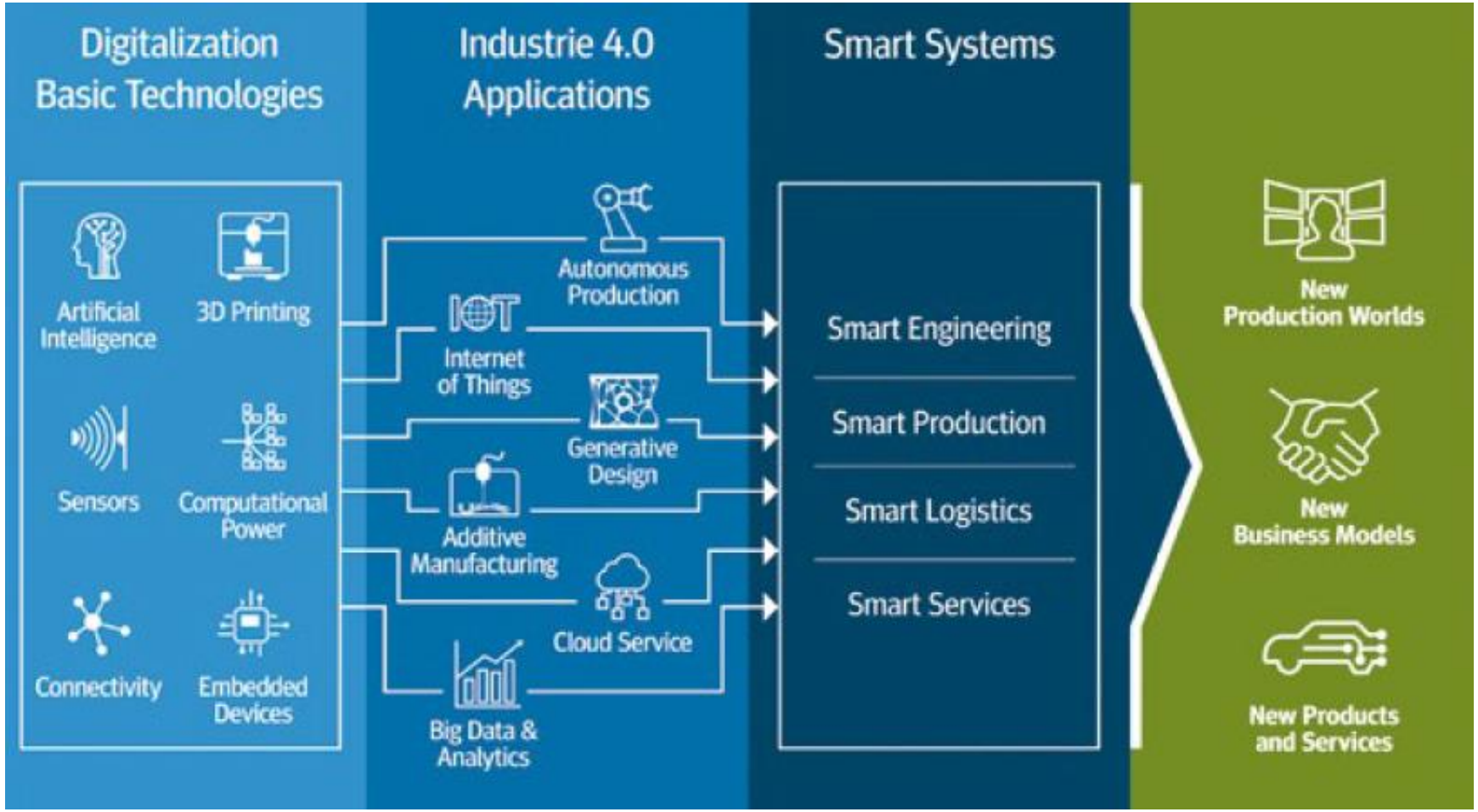


Industry 4.0
Six Design Principles

- **Interoperability**: the ability of **cyber-physical systems** (i.e. work piece carriers, assembly stations and products), humans and Smart Factories to connect and communicate with each other via the **Internet of Things** and the **Internet of Services**
- **Virtualization**: a virtual copy of the Smart Factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models
- **Decentralization**: the ability of **cyber-physical systems** within Smart Factories to make decisions on their own
- **Real-Time Capability**: the capability to collect and analyze data and provide the insights immediately
- **Service Orientation**: offering of services (of **cyber-physical systems**, humans and Smart Factories) via the **Internet of Services**
- **Modularity**: flexible adaptation of Smart Factories for changing requirements of individual modules

Digital transformation

Science → Industry → Development → TIC & Conformity



Global market & new demands

Strong fundamental growth drivers

(in "*Oaklins, spot on testing, inspection & certification*")

1. **Regulations and standards** shift towards stricter and more complex regulations and standards (often government-driven) to ensure health and safety compliance across a variety of industries, such as food, textiles, toys and electrical goods.
2. **Outsourcing** Large corporates and state-owned organizations are increasingly outsourcing TIC activities to external experts to reduce in-house costs and to pass on the responsibility for complex compliance issues to third parties.
3. **Globalization** leading to increasing trade. Imports from developing countries are required to pass stringent tests to comply with international standards.
4. **Product variety and short life cycles** These trends result in more frequent testing and certification applications as well as a higher services volume.
5. **Safety and quality control** The prevalence of social media and the risk of reputation loss escalate the need for quality requirements
6. **Growing income** rising disposable incomes, the use of consumer goods is expected to increase demand for the testing of these goods.

Global market & new demands

Environment

Metrology & Calibration

Consumer goods

Energy

Clinical

Forensic

Construction and built environment

Agriculture & Food

Manufacturing

Transportation

Pharmaceutical

Biomedical

The role of Quality

"There is no **science** without **measurements**,
no **quality** without **testing** and
no **global market** without **standards**."

European Commission**, Measurement and Testing, A European research area oriented activity, High Level Expert Group**

The role of Quality

Global market & accreditation for EU

Accreditation is the last level of public control in the European conformity assessment system. Accreditation is designed to **ensure and attest that conformity assessment bodies** (e.g. laboratories, inspection or certification bodies) **have the technical capacity to perform their duties adequately**.

The future of labs and the future of work

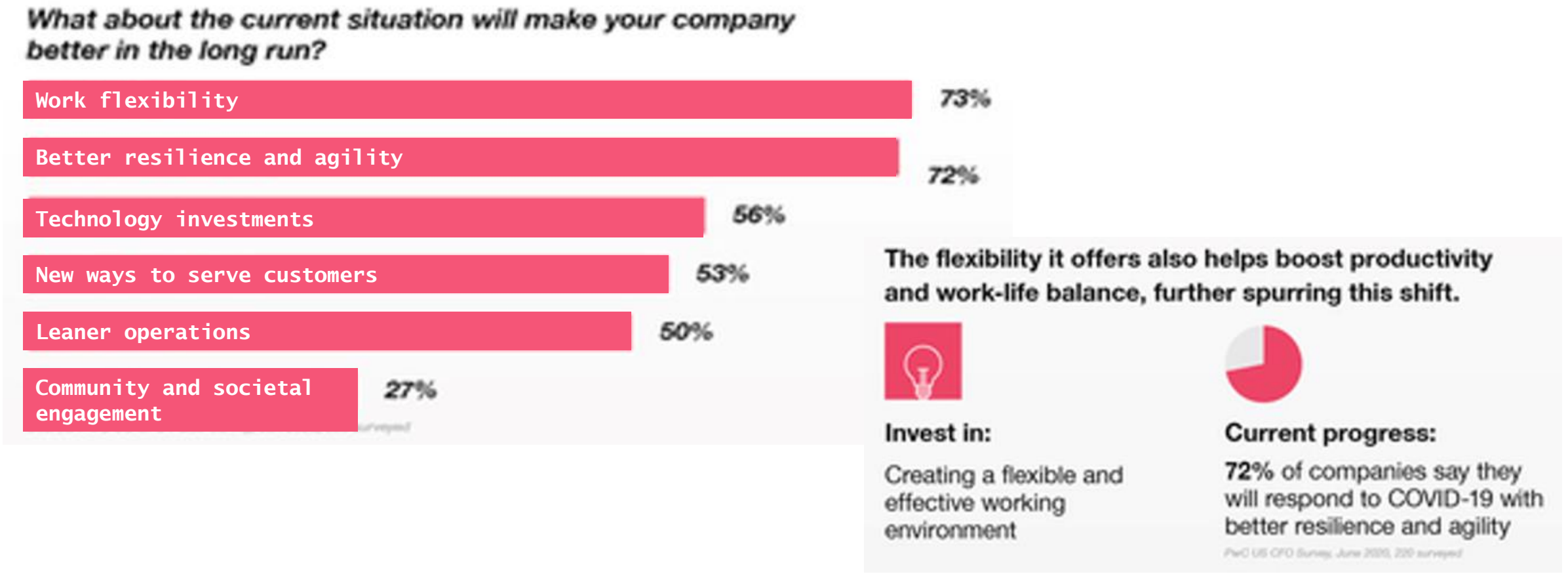
Organization impact

- Organizational Restructuring
- Communication Challenges
- Outsourcing
- Assessment and Development
- Cultural Sensitivities
- Team Effectiveness

THE CHALLENGES OF A GLOBAL MARKETPLACE Howard Morgan
(Publ. in Human Resources in the 21st Century by Marc Effron et al.
New York: JW&Sons, 2003)

The future of labs and the future of work

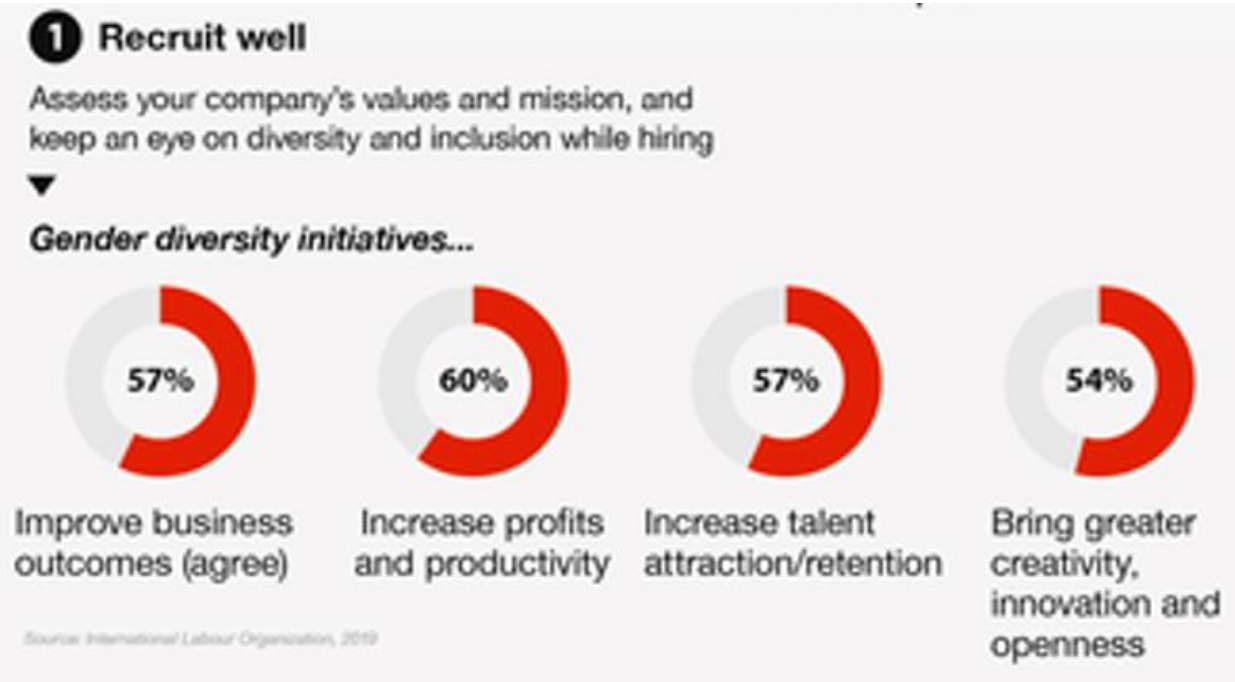
Business strategy: adaptability and prepared in the face of change



Credits: PwC 2020
https://www.visualcapitalist.com/wp-content/uploads/2020/09/5-business-priorities-future-of-work-large.html

The future of labs and the future of work

Talent planning (3 steps)



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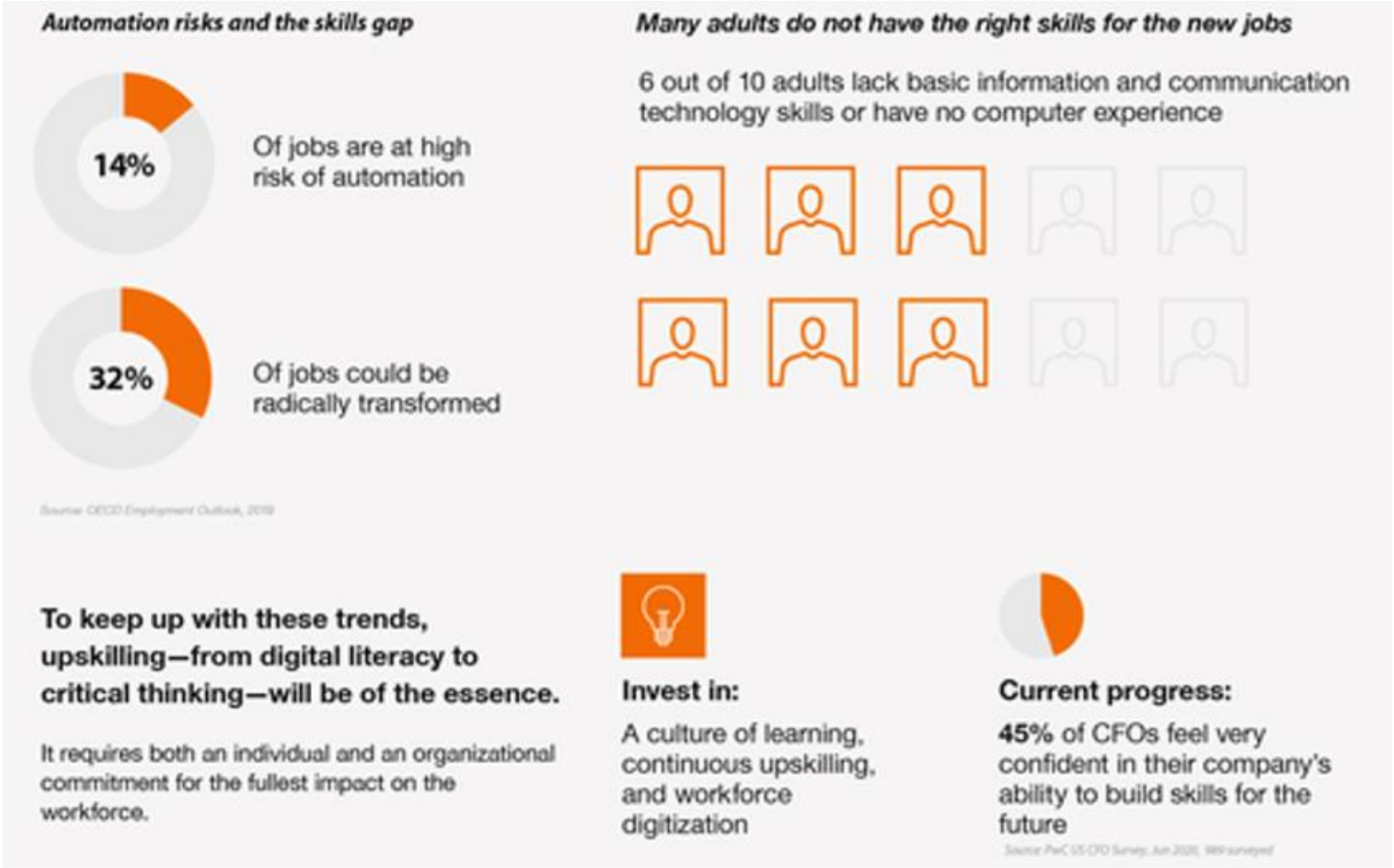
The future of labs and the future of work

Learning & Innovation:
Digital and human skills demand



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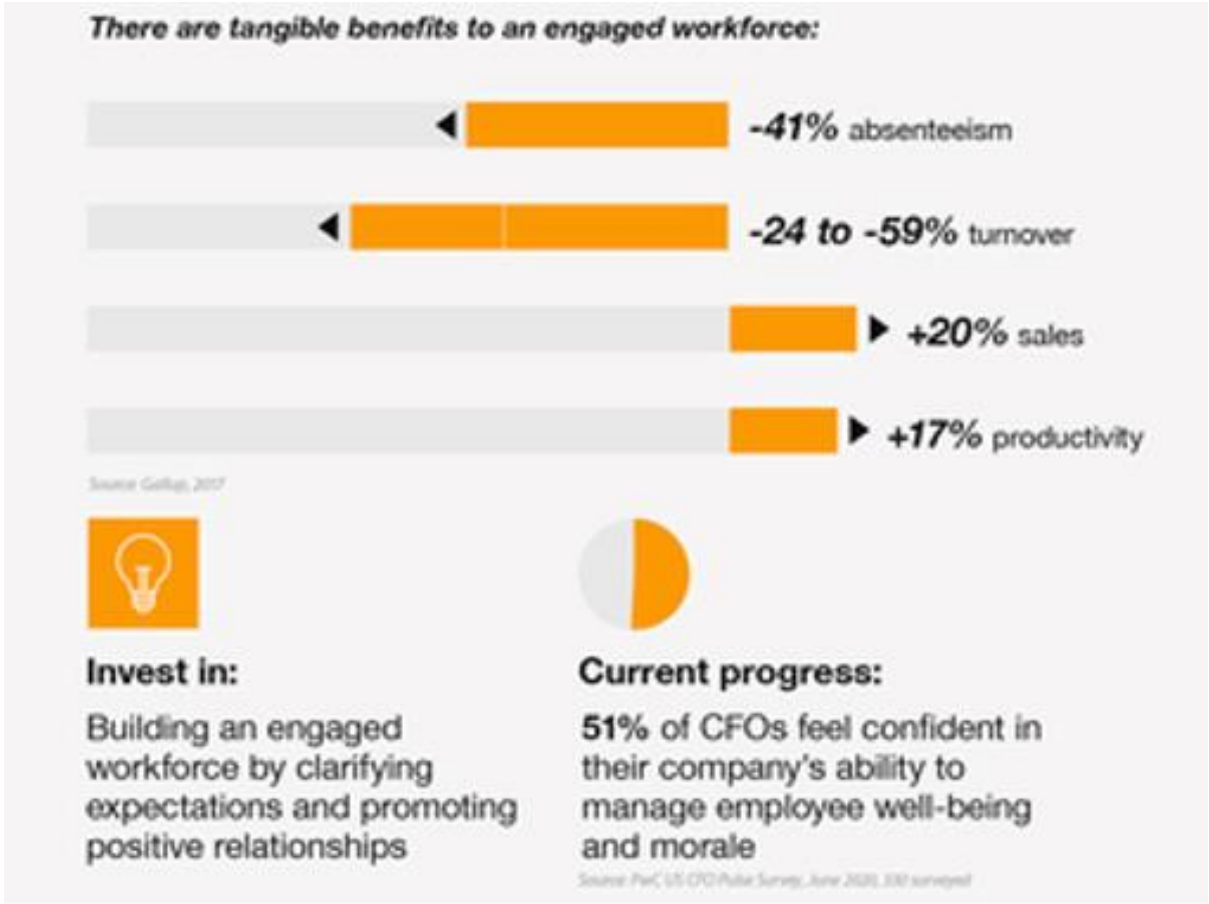
The future of labs and the future of work

Employee experience:
Seek meaningful work,
relationships and experiences.



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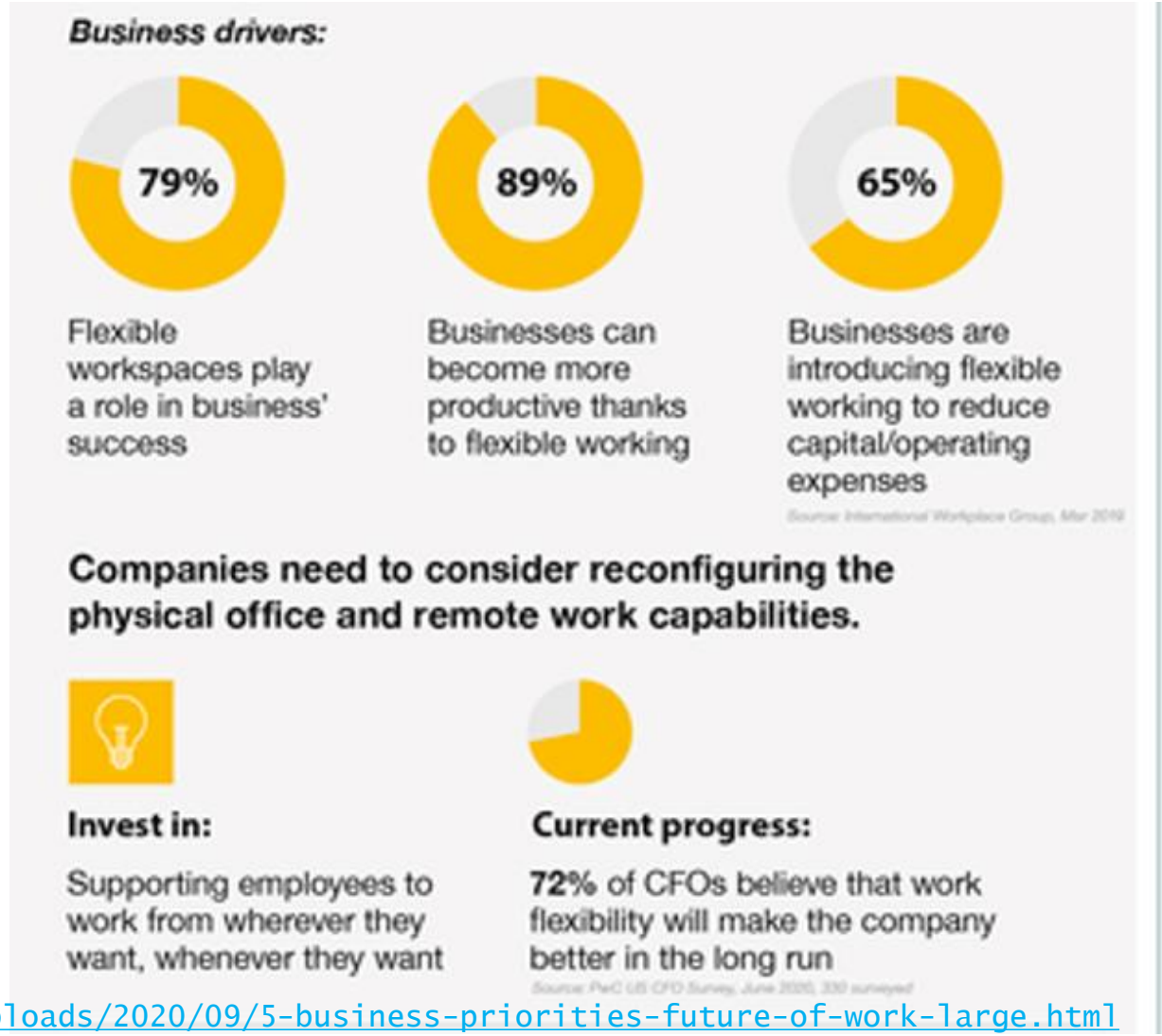
The future of labs and the future of work

Work environment:
Global and flexible working is essential for the new normal.



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IMEKO TC11 & TC24 Joint Hybrid Conference

IMEKO International Measurement Confederation — Technical Committee TC11 — Measurement in Testing, Inspection and Certification

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TC11 & TC24

TC-11 Measurement for a better life

Thank you for your kind attention!

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