



4th International Conference on
Quality Engineering and Management

*Digital transformation
for intelligent quality assurance*

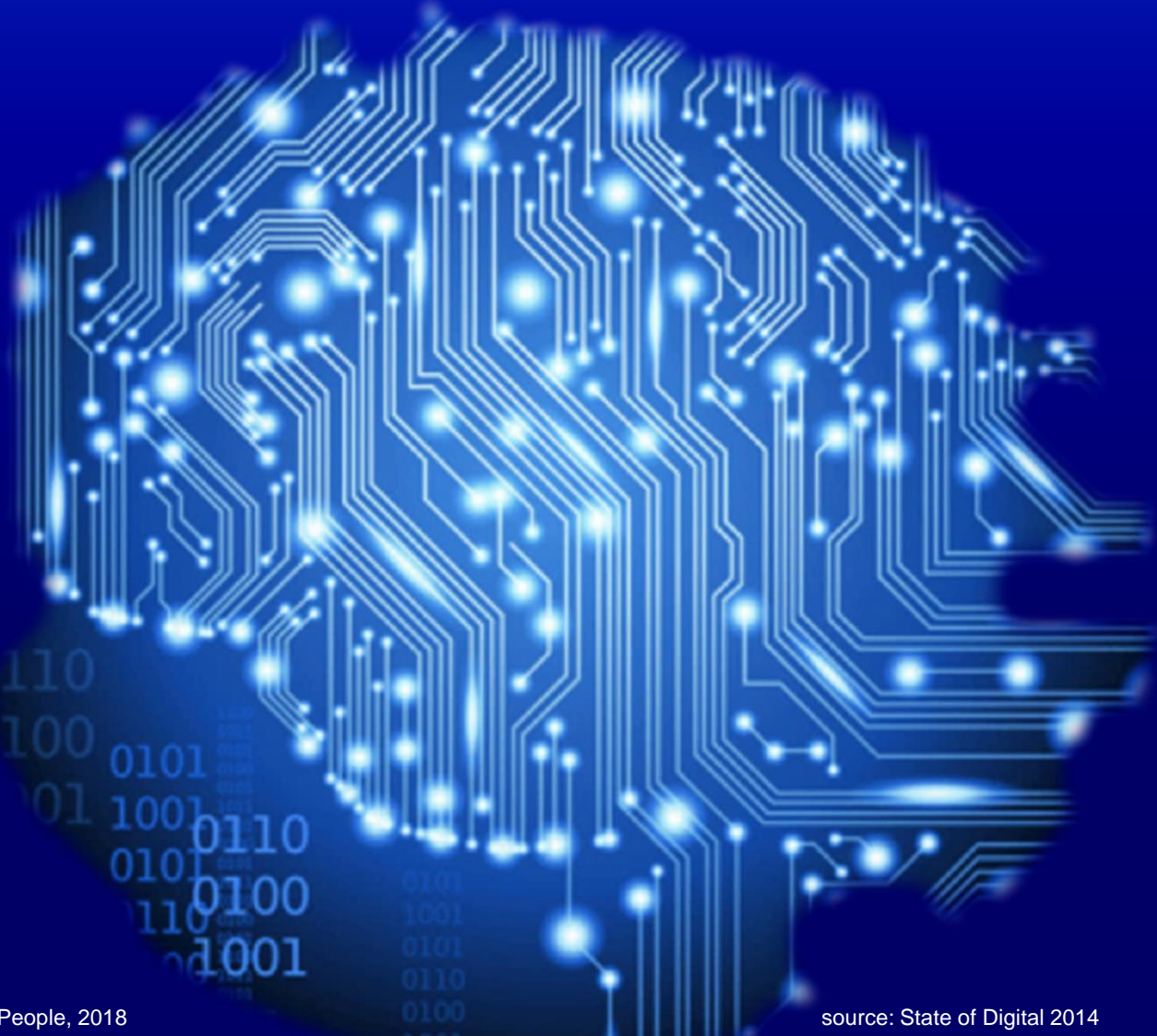
António M. Cunha
University of Minho and DTx-CoLab



digital transformation



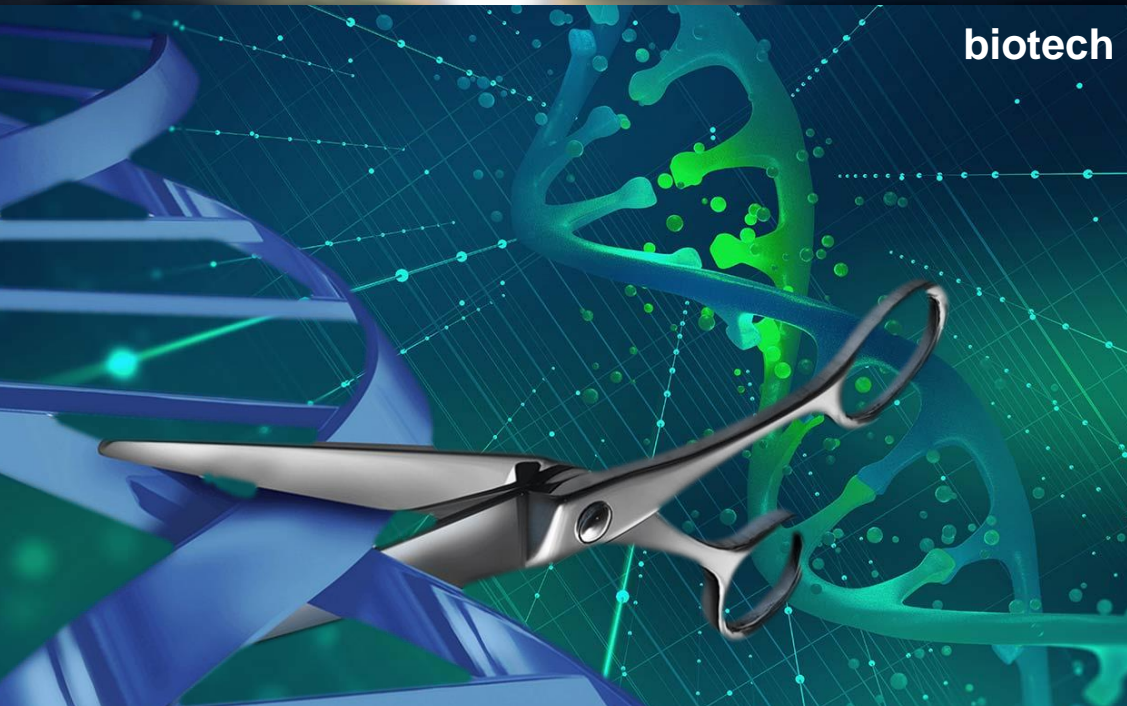
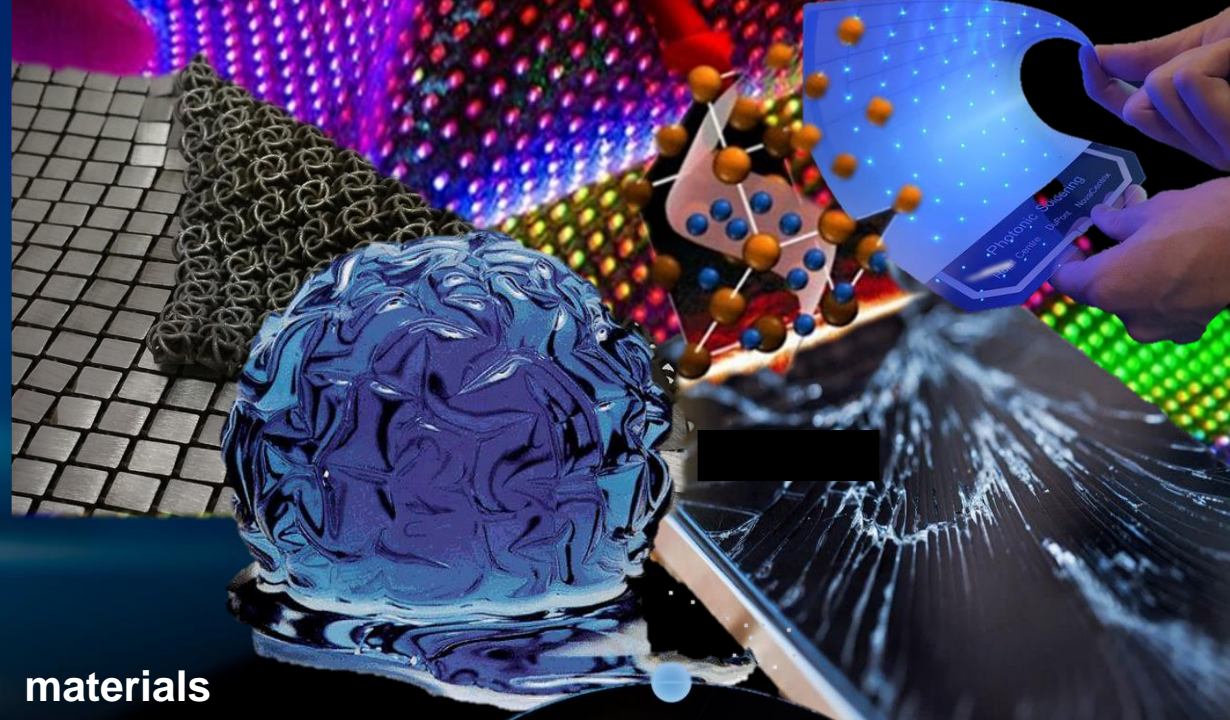
source: The Digital Transformation People, 2018



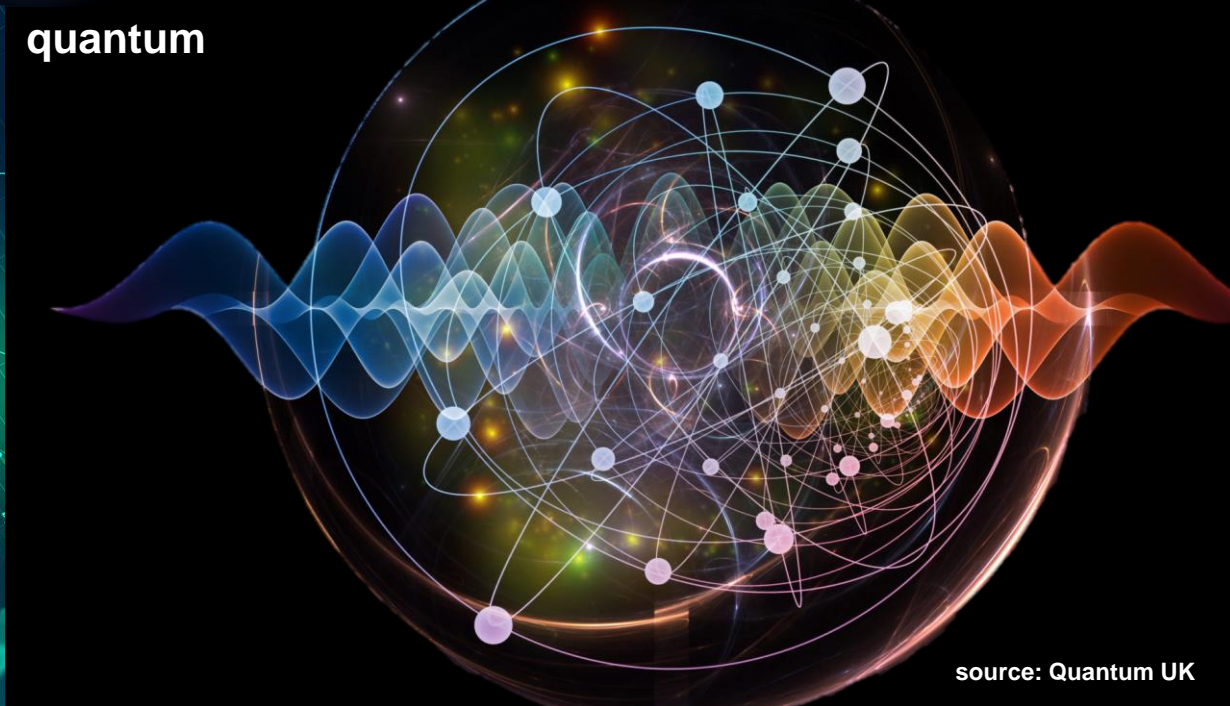
source: State of Digital 2014



digital materials



biotech quantum



source: Quantum UK

scientific revolution

a world ... in risk



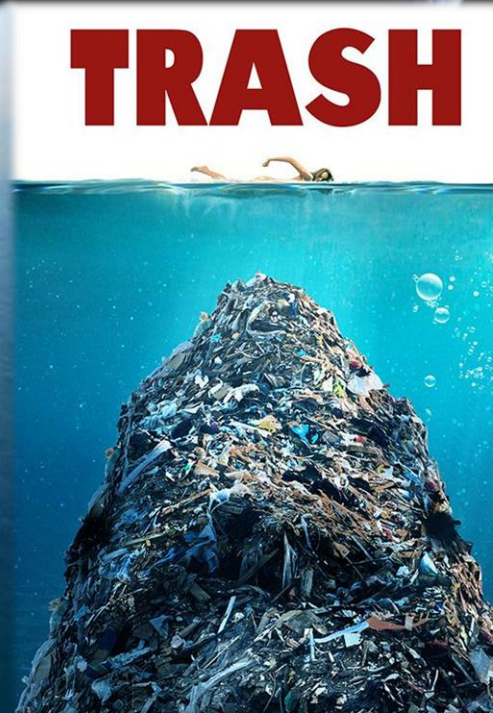
1970



2016



2030



TRASH

a world ... in risk



... digital omnipresence



**DATA
INTELLIGENCE**



01001100
10000110
01001100
01101100
01001001
10001100
01001100
01001100
01001100
01001100



THE INTERNET of
THINGS



Digital

DATA
INTELLIGENCE

Cyber

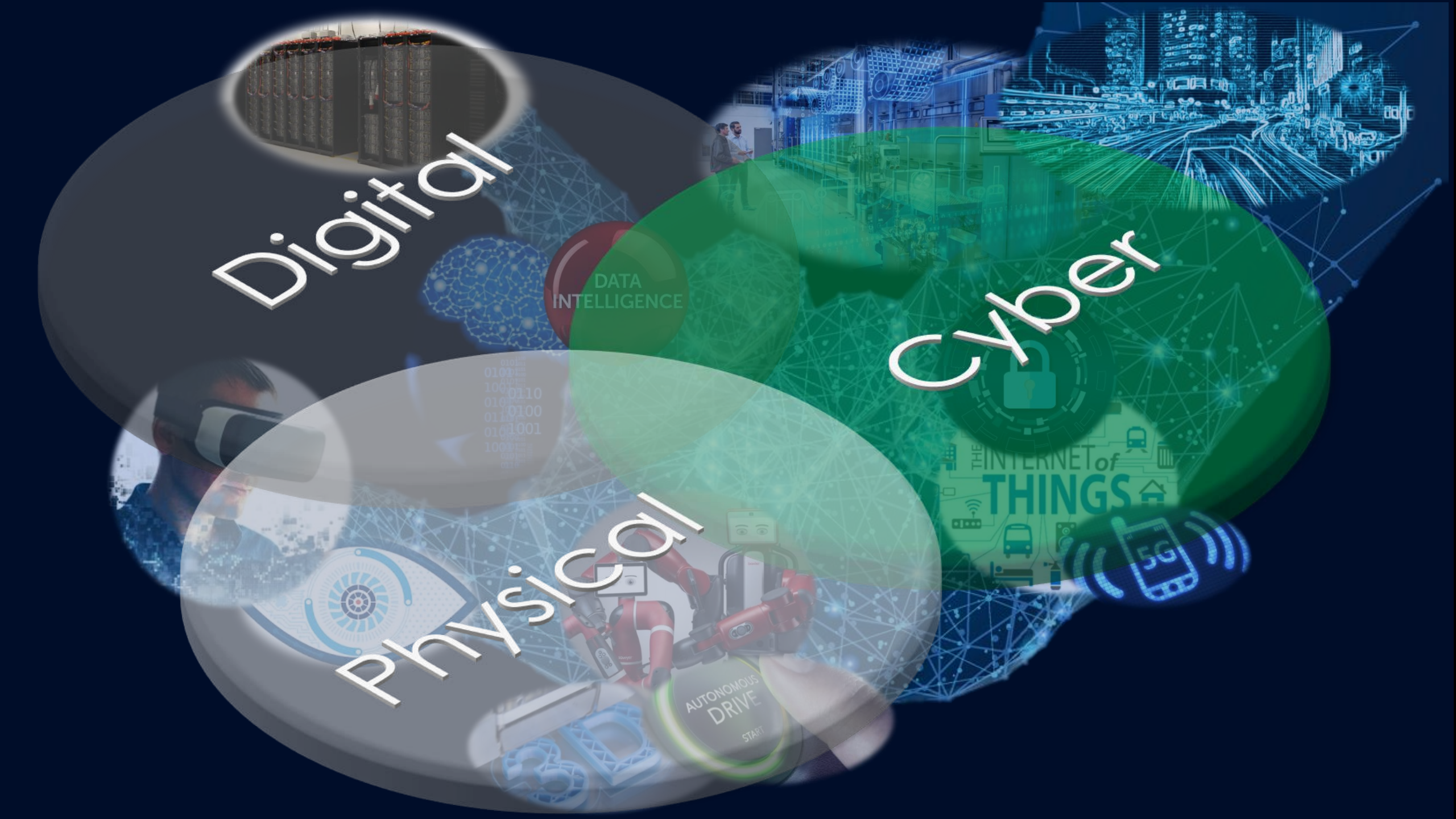
Physical

AUTONOMOUS
DRIVE

START

THE INTERNET of
THINGS

5G



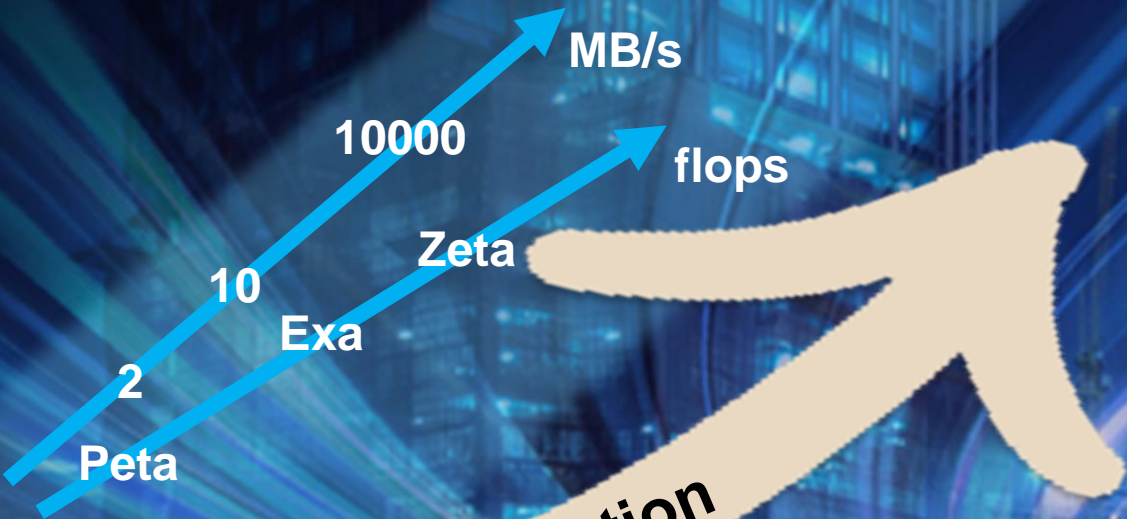
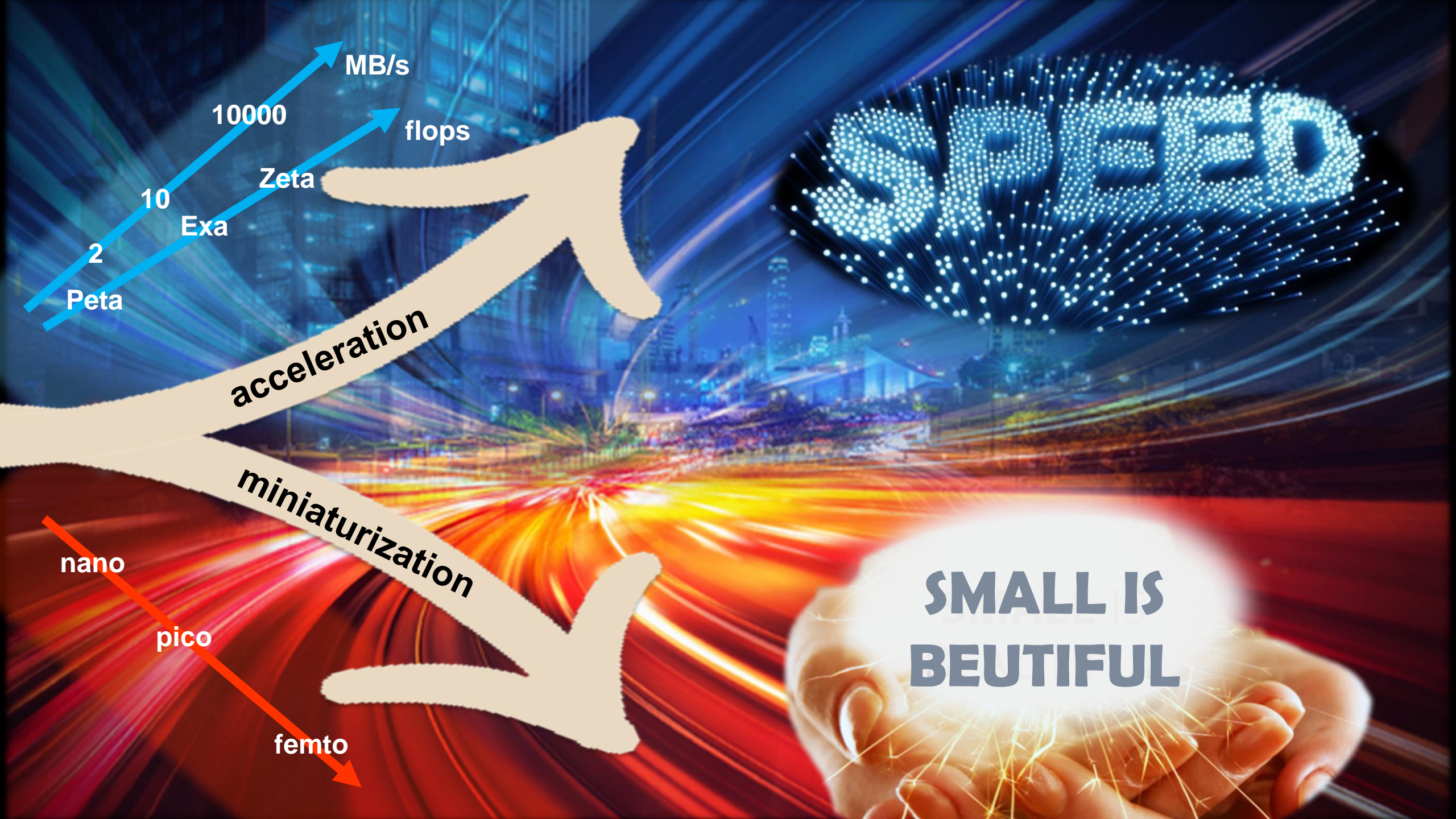


artificial intelligence

- cognitive computing
- *deep learning*
- *machine learning*
- *cloud machine learning*
- ...

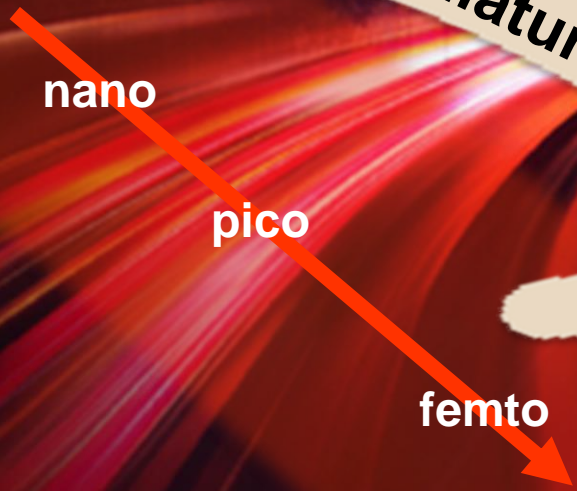
source: I know first

source: AutoDesk



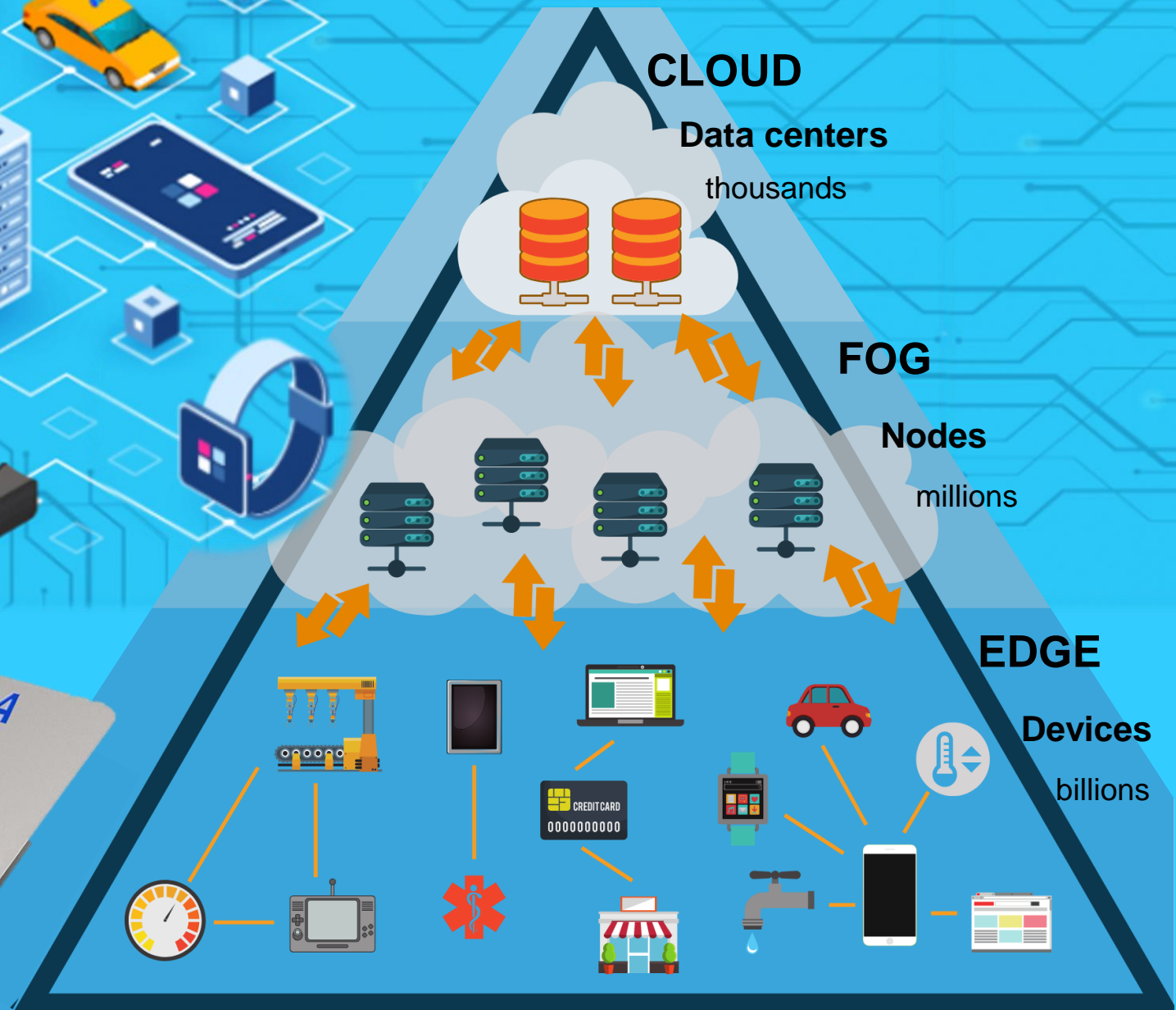
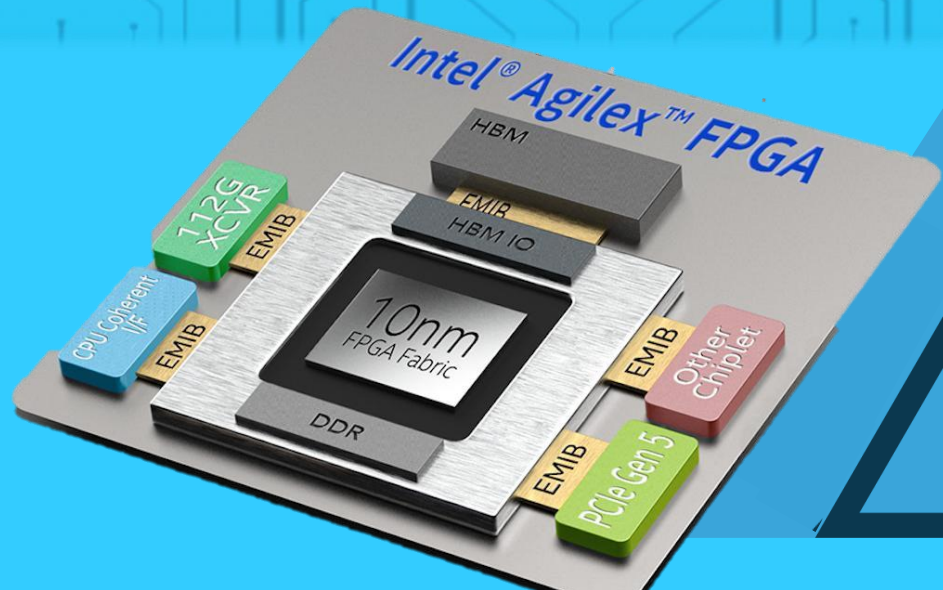
acceleration

miniaturization



**SMALL IS
BEUTIFUL**

Edge computing



towards the exascale computer (10^{18} flops)



Fogaku
Fujitsu
Japan
2020



Aurora
Intel / Cray
USA
2021

new paradigms in the economy ... and industry



industry / I4.0



digital medicine



finetech



precision agriculture



smart cities



social networks



automated & flexible



connected



intelligent & analytic



green



digital manufacturing





**digital transformation involves new paradigms,
in human-machine interface and business models**



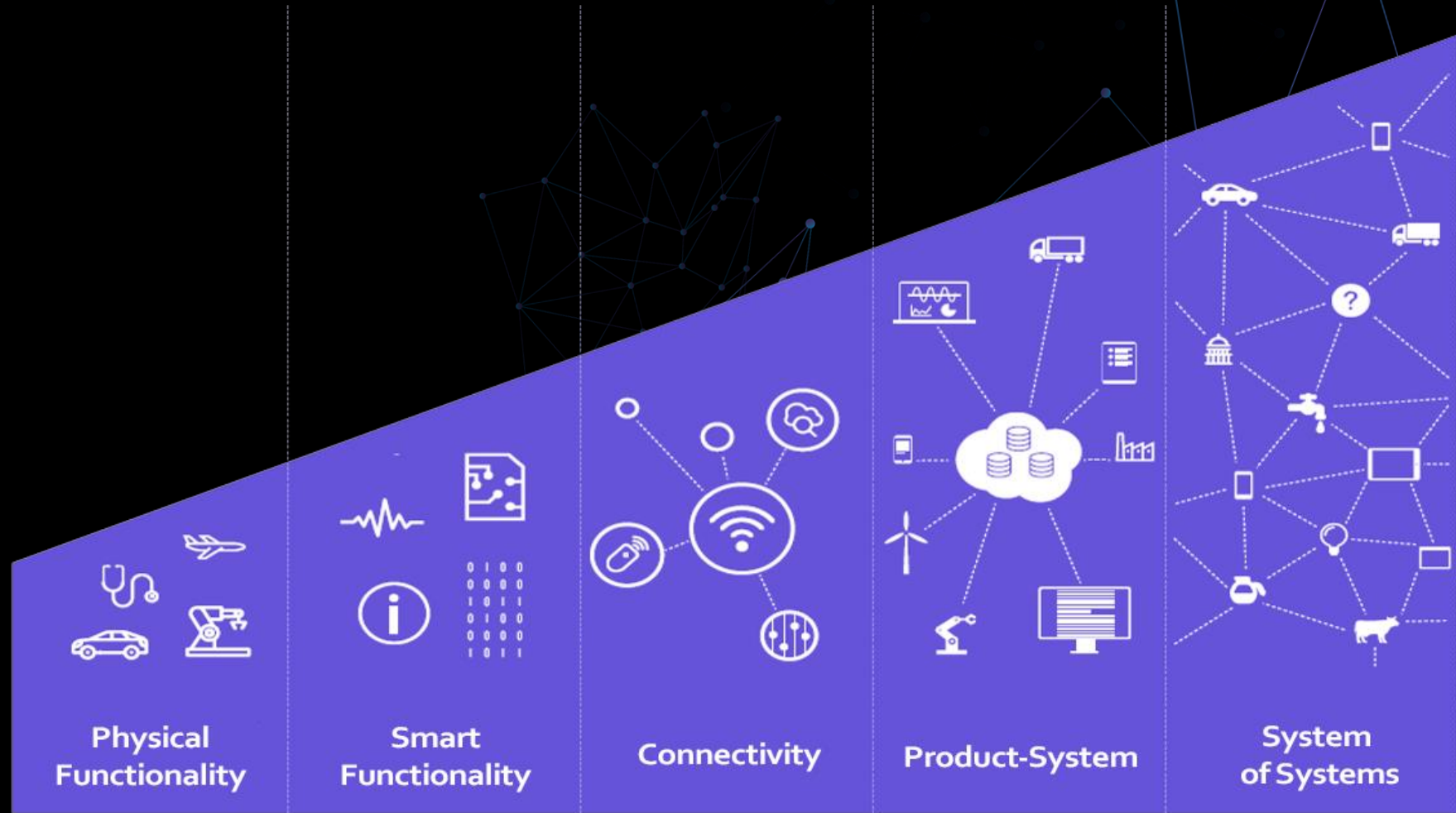


2020		2010	
Microsoft \$1 200 000 bln		Petro China \$329 260 bln	
Apple \$1 113 000 bln		Exxon Mobil \$316 231,65 bln	
Amazon \$970 590 bln		Microsoft \$256 865 bln	
Alphabet \$782,68 bln		ICBC \$246 920 bln	
Alibaba Group \$521 740 bln		Apple \$213 097 bln	
Facebook \$475 460 bln		BHP Billinton \$209 935 bln	
Tencent \$471 660 bln		Wall-Mart \$209 001 bln	
Bershire Hathaway \$440 830 bln		Bershire Hathaway \$200 621 bln	
Visa \$357 020 bln		General Electric \$194 246 bln	
Johnson & Johnson \$345 700 bln		China Mobile \$192 999 bln	



DIGITAL TRANSFORMATION CoLAB
experiencing the future

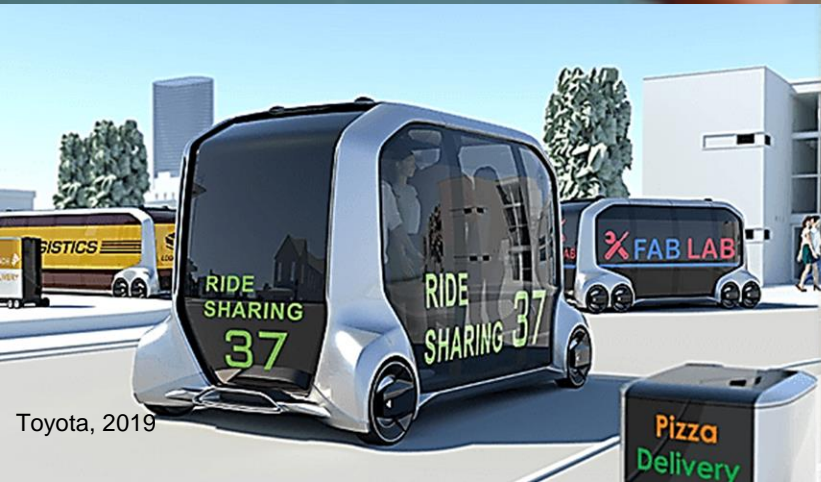
value chain



... and new business models



OnlineMarketplace, 2019



Toyota, 2019



Bosch, 2019



AsianWire, 2019

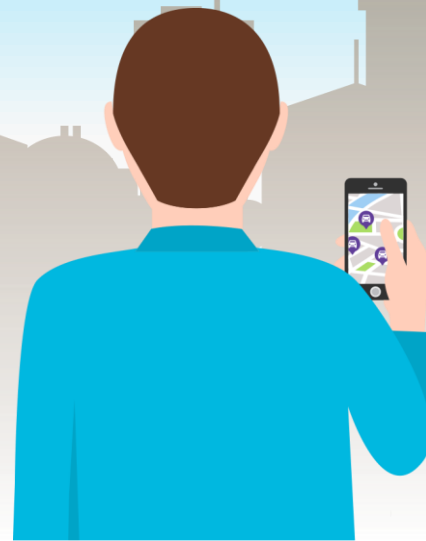
MOBILITY AS AN UTILITY



full mobility



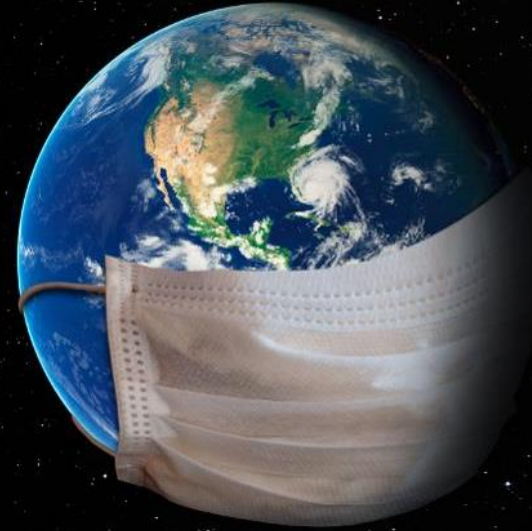
mobility invoice



... the post-COVID19 society and economy

Shifts in the Low Touch Economy

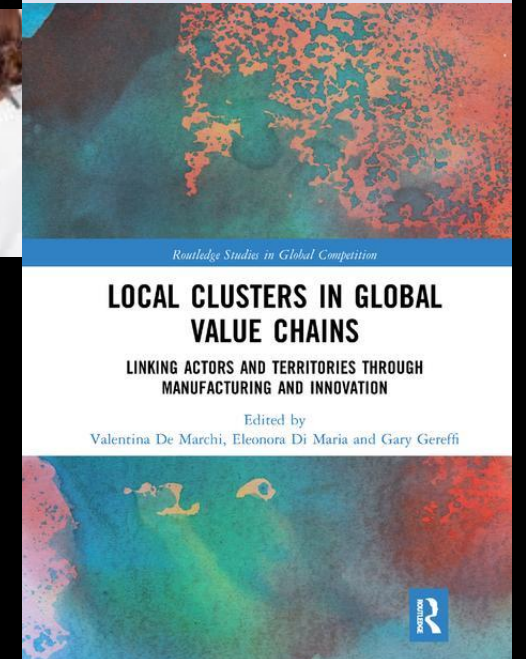
board of innovation updated reports and insights on boardofinnovation.com/low-touch-economy



Measuring the impact of COVID-19 with a view to reactivation



Video Conference



Some examples

Digital Quality applied to the foil & wrap process of particle boards



On-going work:

- ✓ Integration of state-of-the-art vision technologies at the production line
- ✓ Implementing computer algorithms to assist inspection and data acquisition
- ✓ Production line instrumentation and data gathering
- ✓ IoT infrastructure integration
- ✓ Prescriptive Quality Control on-the-fly

Digital Quality applied to Optical Bonding 4.0



On-going work:

- ✓ Development of an Automated Optical Inspection (AOI) device supporting the Optical Bonding process
- ✓ Implementation of an IoT platform responsible to orchestrate and process data originated by the production line
- ✓ Implementation of ML algorithms to unveil correlations between process variables and product non-conformances

... and about the future

connectivity ... human-machine

