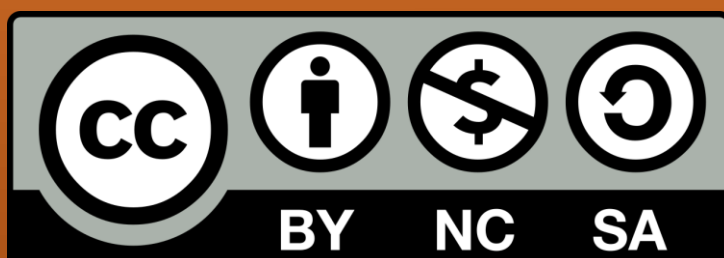


HIGHER ENGINEERING EDUCATION FOR THE DIGITAL AND SUSTAINABLE SOCIETY AND WORKPLACE

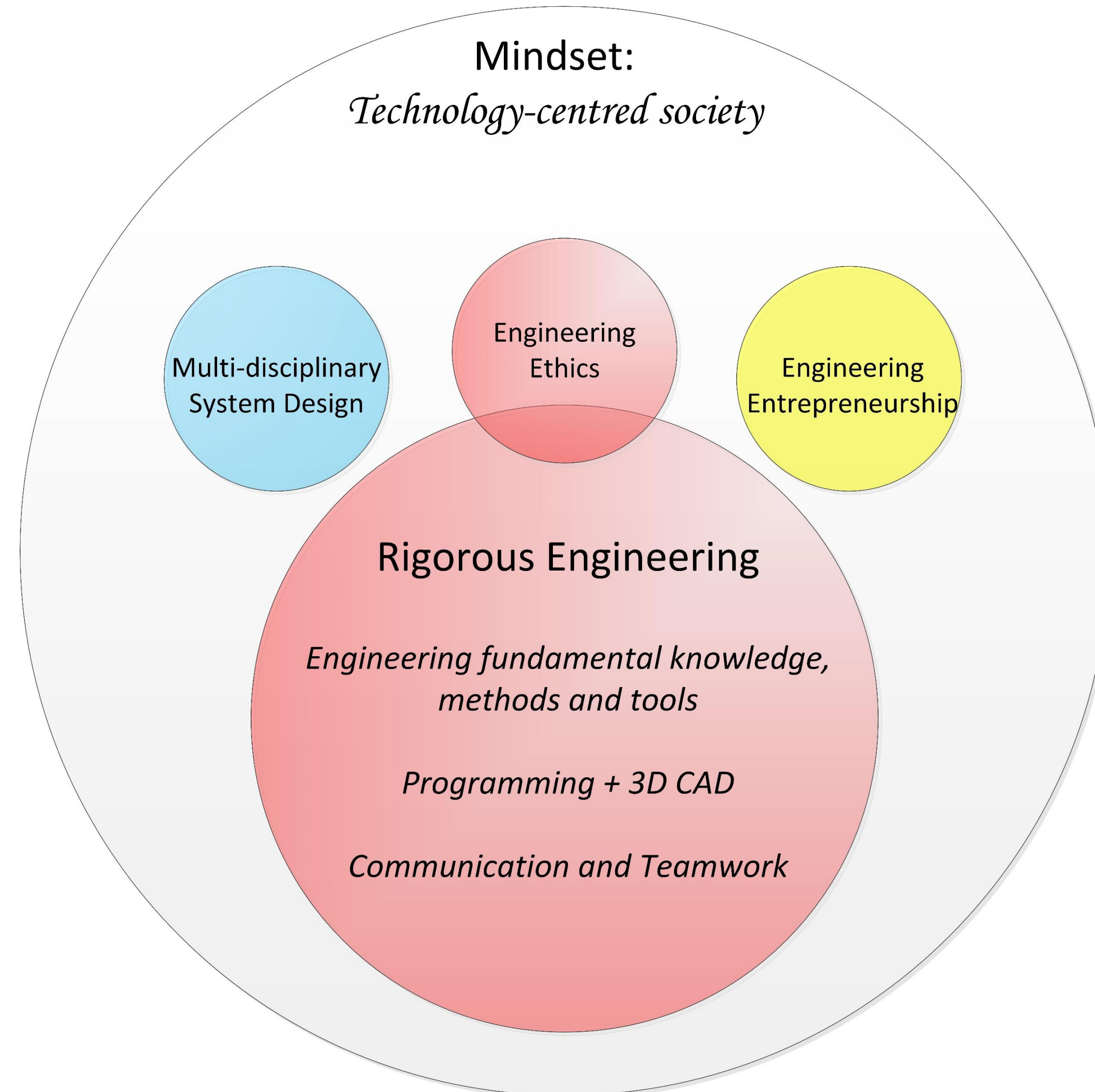
Aldert Kamp | ECED | University of Twente | May 25, 2023



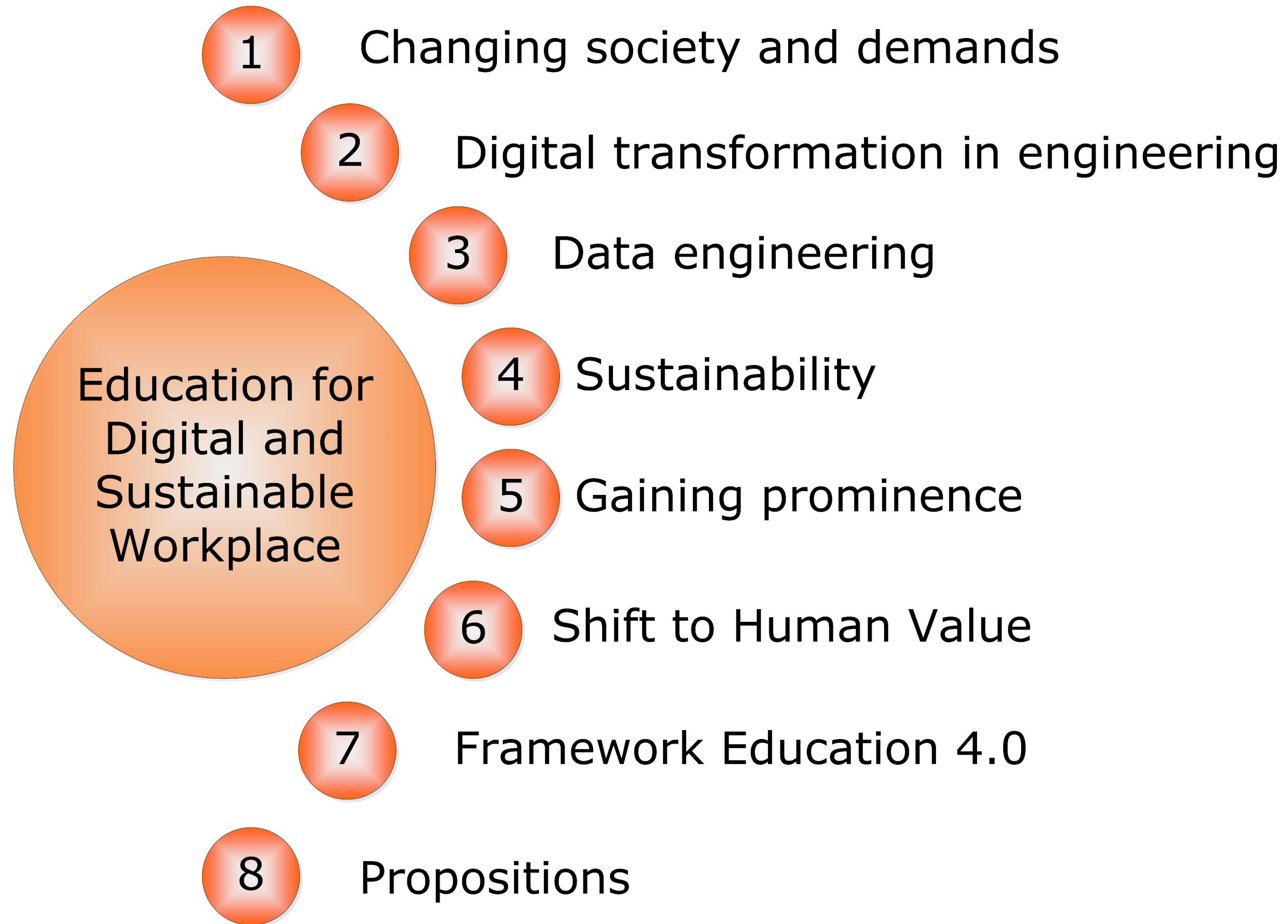
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Conventional S&T

Body of Knowledge and Skills



Agenda



Stuck in a rut?

*It is so much easier to educate students for our past
than for their future*

*What do we want our engineers doing tomorrow,
that they aren't doing today?*

Adapt to trends and changes?

We should not adapt the curriculum to ongoing trends and changes in society in the sense of 'your wish is our command'.

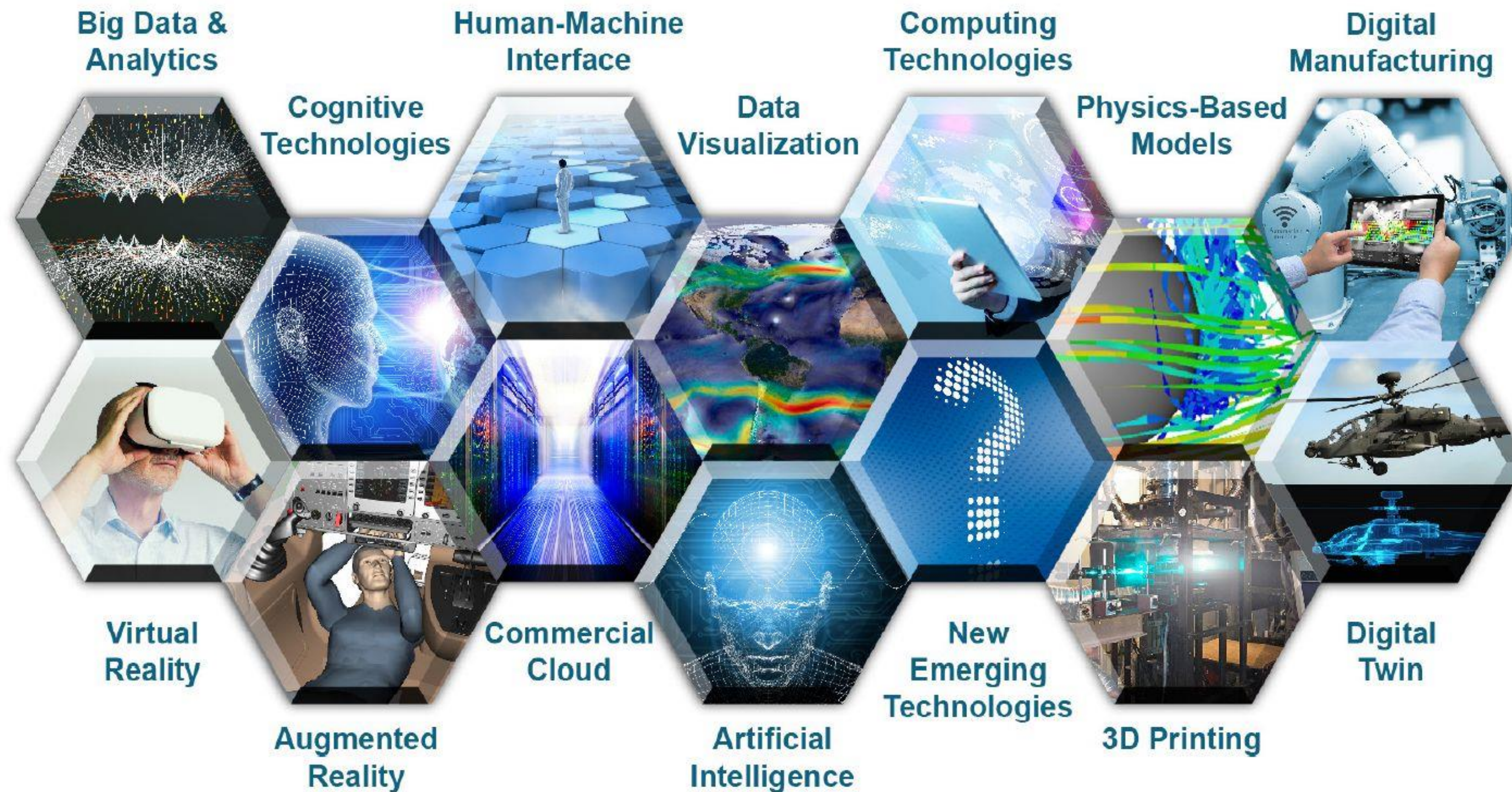
Our education programmes should give students the stable, high quality, foundation on which graduates can learn and adapt themselves when they join the workforce

PROPOSITION

Today's changing society

- Accelerating change
- Blurring boundaries
- Hyperconnectedness
- Less hierarchy, more power of customers
- Infinite speed access to infinite amounts of data
- Open-sourced networks
- Short innovation cycles
- Emerging technologies (Big Data, robotics, IoT, AI,...)

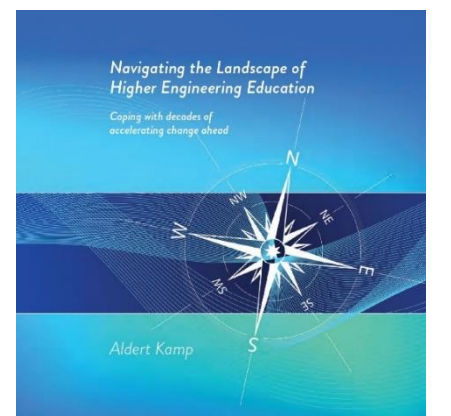
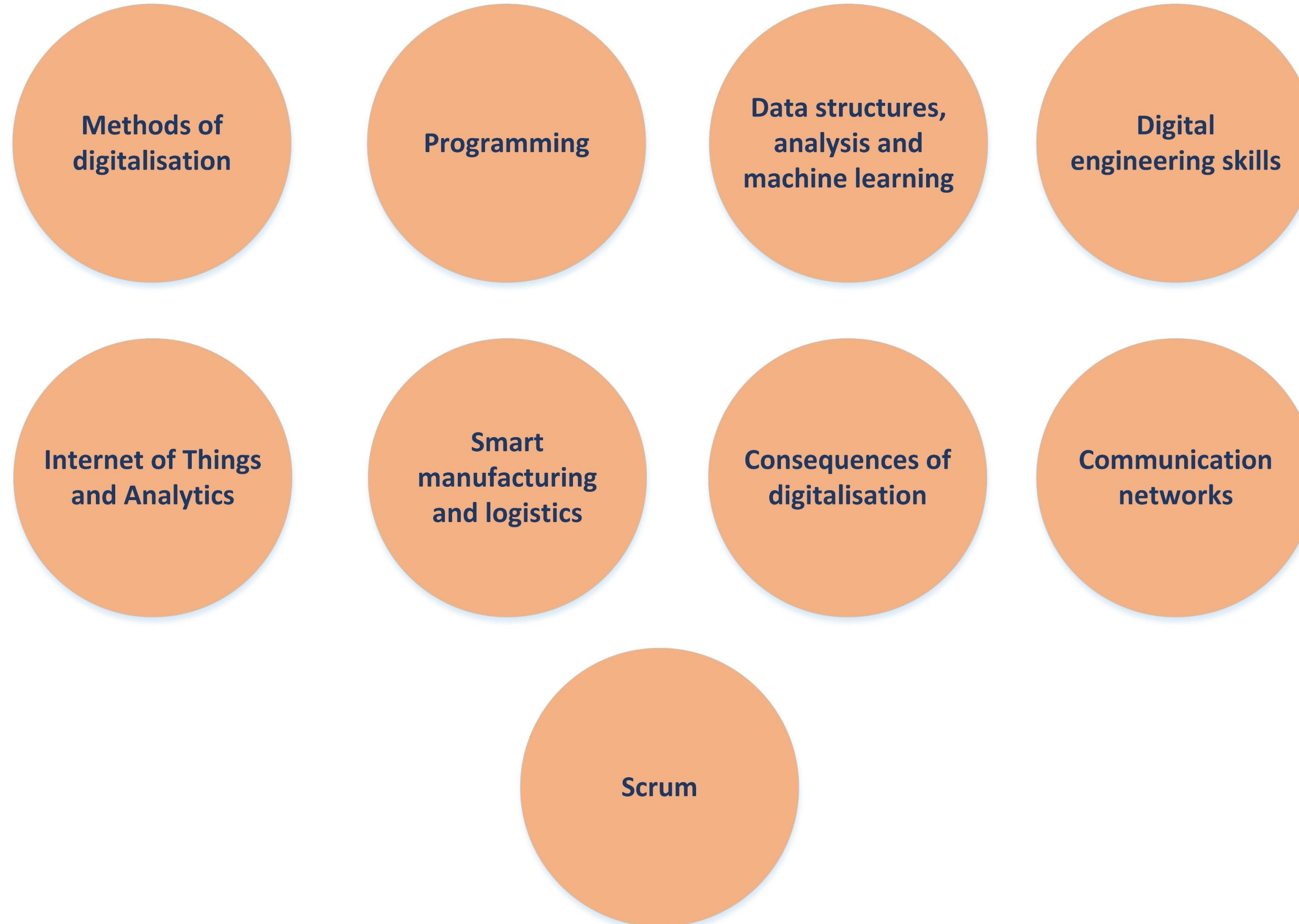
The digital transformation ...massive and intense...



Source: DoD Digital Engineering Strategy, 2017

Big Data and Analytics – Cognitive Technologies – Computing Technologies - Digital-to-Physical Fusion Technologies

Digital literacy elements for an engineering curriculum



Kamp 2020, p.27

Digital transformation in engineering

Engineers increasingly work in an environment that races on with the fuzz about big data and analytics, cognitive technologies, computing technologies and digital-to-physical fusion technologies.

We need to prepare our students for this challenging and exciting workplace

It's essential that curricula address the issue of the digital transformation in engineering at scale

Data Engineers or Data Scientists

hype vs need

*'There are **70% more open roles** at companies in data engineering as compared to data sciences. As we train the next generation of data and machine learning practitioners, let's place more emphasis on engineering skills'*

- Scientific engineering curricula tend to prepare mainly for machine learning, deep learning, and making Bayesian simulations (modelling data)
- *Data engineering* is about annotating, cleaning and shaping data, moving it from place to place, and doing this as quickly as possible

UN Sustainable Development Goals



Key competencies for sustainability

- INDEPENDENT CRITICAL THINKING
- VALUES THINKING
- RANGE (interdisciplinary, holistic, systems thinking)
- COLLABORATION AND PARTNERING
- SELF-LEADERSHIP
- FUTURES THINKING
- DESIGN SKILLS FOR SUSTAINABILITY

Shift in stakeholder's wishes and needs

- Systems, product and services to be:

Simple

Safe

Secure

Smart

Stable & predictable

Maintainable

Socially acceptable/sustainable

Affordable

Scalable

Adaptable

Gaining prominence

- agility and adaptability
- creativity and imagination
- developing relationships
(empathy, trust, humility, ...)
- digital literacy
- entrepreneurial behaviour
- ethical responsibility
- goals achievement
(ownership, ability to learn, coping with uncertainty, ...)
- interdisciplinary systems thinking
- self-awareness and self-management
(self-confidence, motivation, integrity, ...)
- teamwork effectiveness

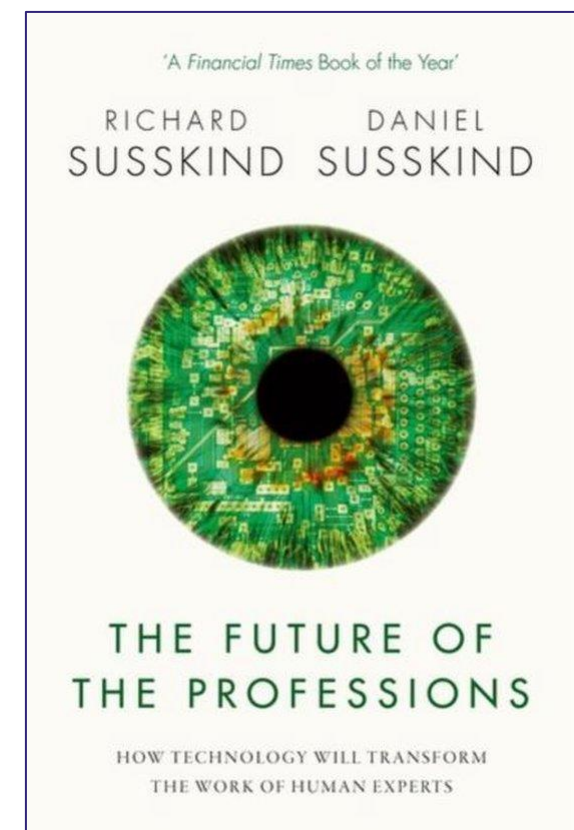
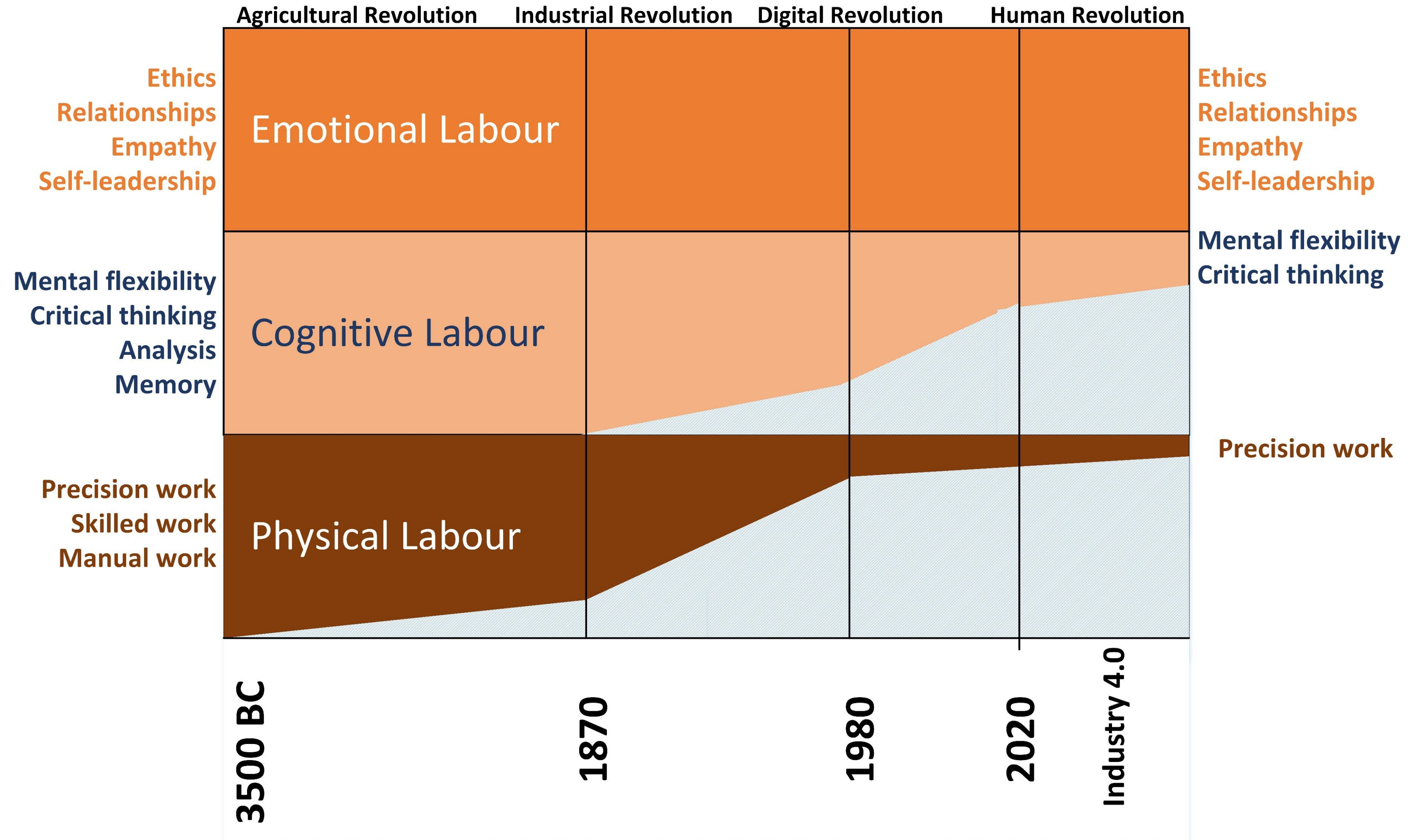
**IN ALPHABETICAL
ORDER**

Competence proficiency outcomes



*Source: McKinsey (2021)
Future citizen skills*

Shift in the division of labour



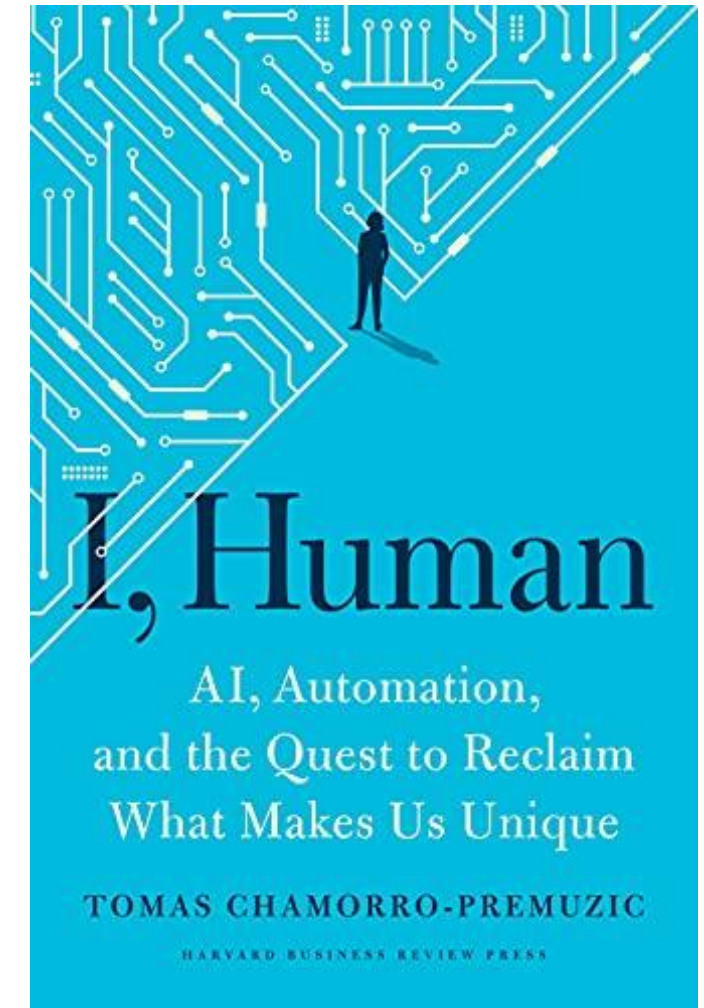
 Replaced/replaceable by Machines

In the age of AI

*We've known since Star Wars that intelligent machines
can easily do an engineer's work.*

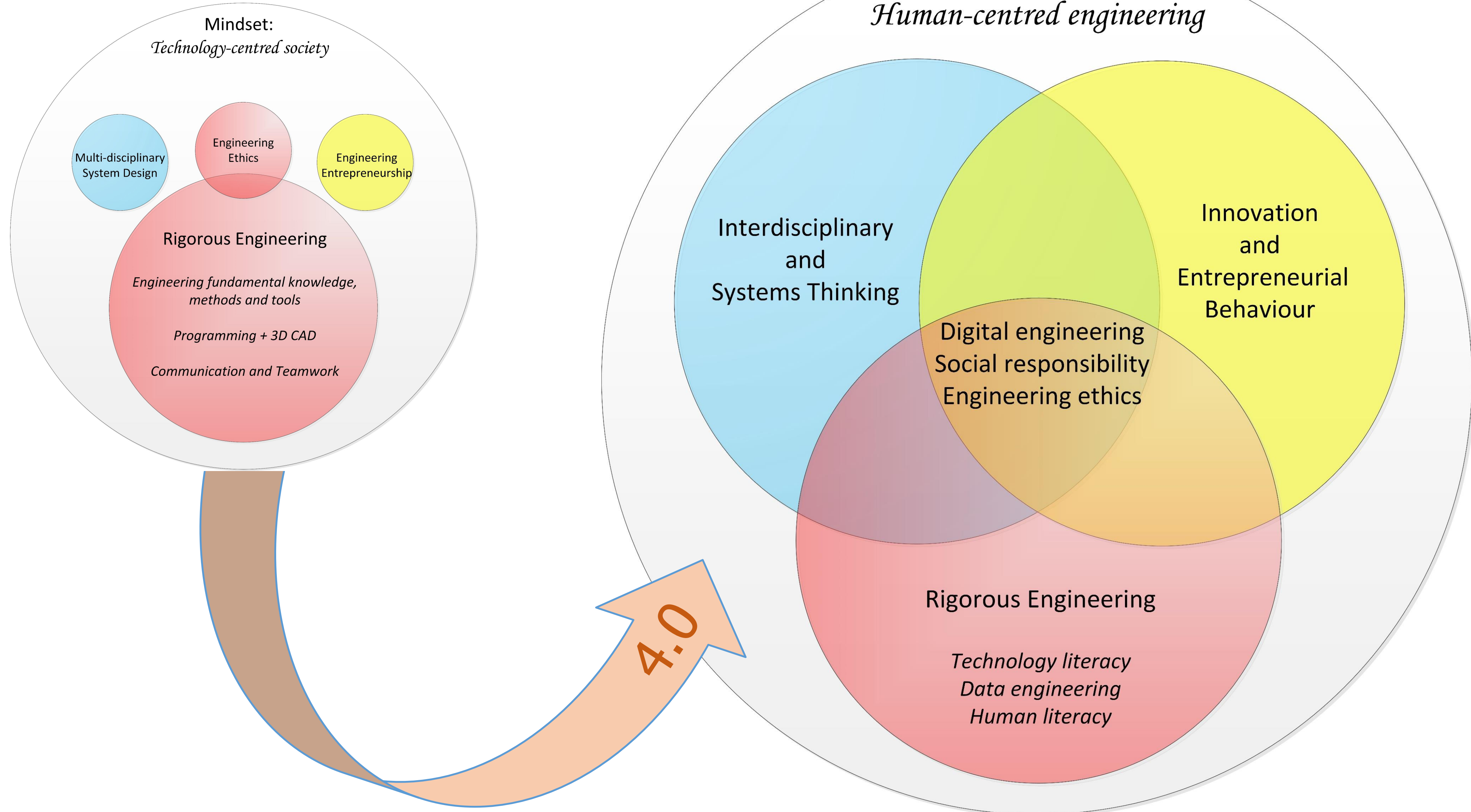
'The droids are on the verge'

*It's time to focus our education on what
human engineers can do better than AI*



PROPOSITION

S&T Education 4.0





*'What do you want your engineers doing tomorrow,
that they aren't doing today?'*



Digital transformation in engineering

Our education should give students the stable, high quality foundation, on which graduates can learn and adapt themselves to the digital transformation in the engineering workplace

It's essential that curricula address the issue of the digital transformation in engineering at scale

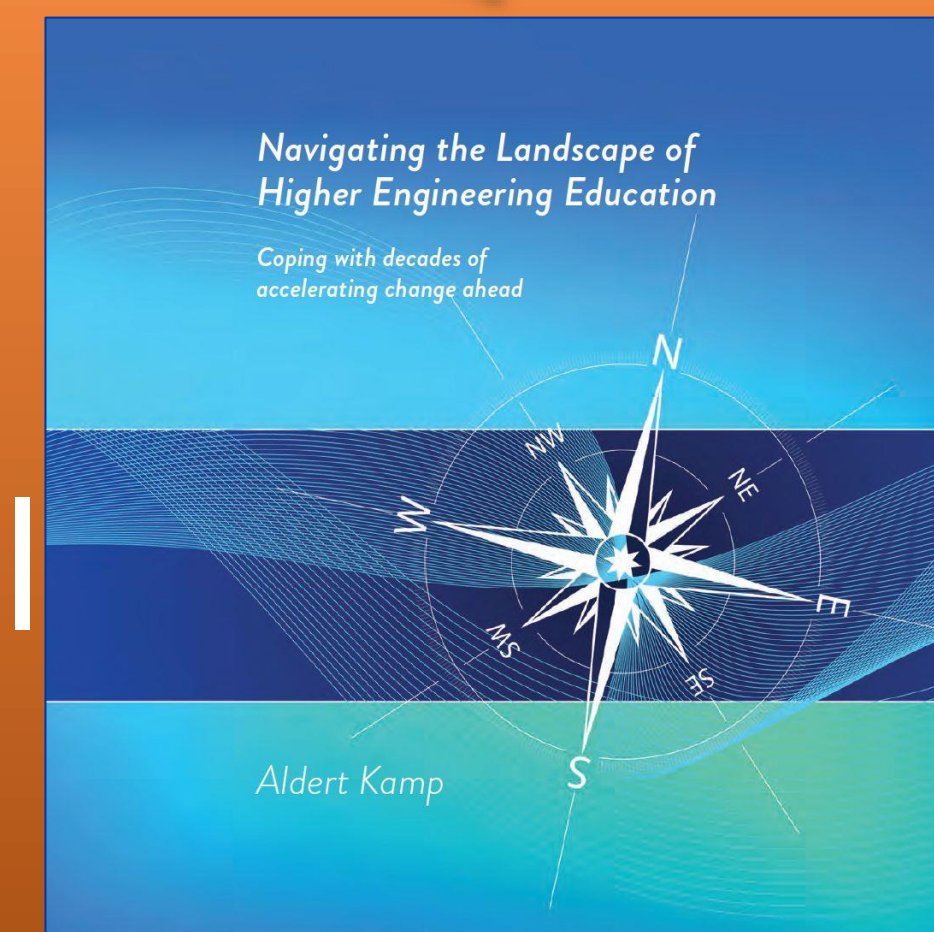
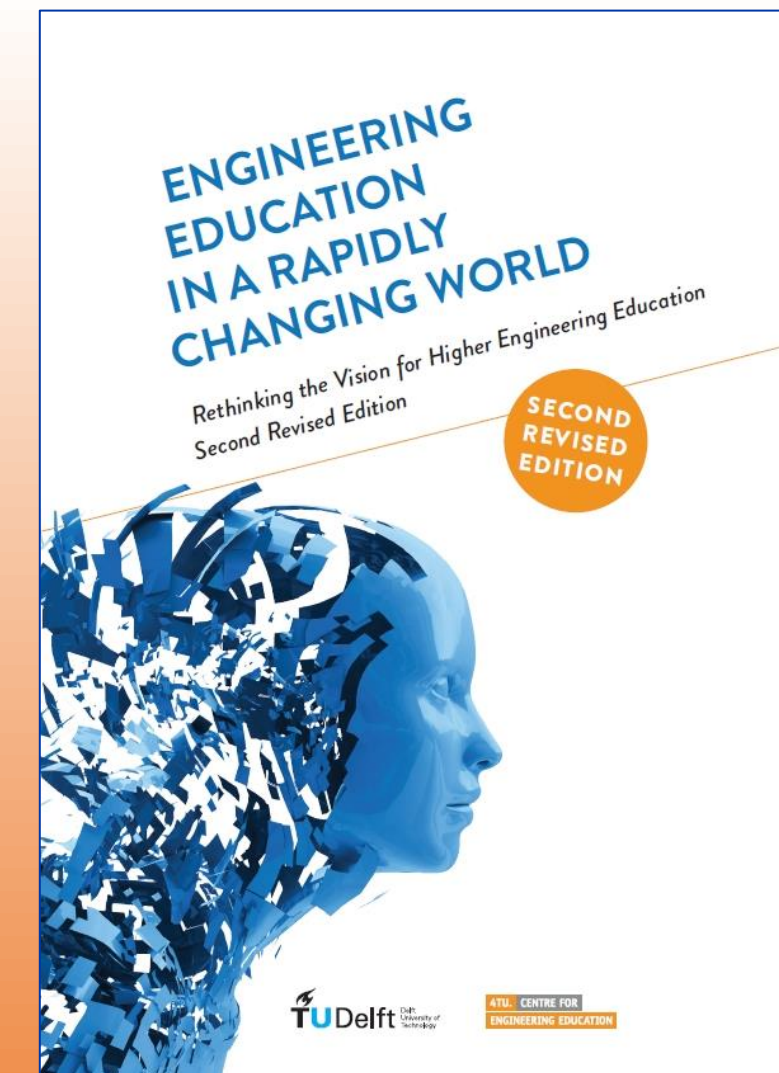
It's time to focus our education more on what human engineers can do better than AI

PROPOSITIONS

Read more about future higher education

www.aldertkamp.nl

- Free downloadable books
- Keynote video recordings
- PowerPoints (some with voice-over)
- Reports
- Papers
- Blogs



Email: me@aldertkamp.nl

