### Saddling up Engineering Education for a Rapidly Changing World

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# Rate of technology adoption







# Today's changing world

- Accelerating change
- Faster communication
- Hyperconnectedness
- Blurring boundaries
- Less hierarchy
- Infinite speed access to infinite amount of data
- Emerging technologies (Industry 4.0,...)
- Open-sourced networks
- Shorter innovation cycles



### Megatrends in engineering and society







# Volatile Uncertain VUCA world Complex Ambiguous



### Educating for future needs

invented...



### How can we educate students for jobs that don't yet exist...

### ...using technologies that have not been

# ...to solve problems we don't even know are problems yet?



Rational problem solving Deep disciplinary knowledge Analysis, optimisation Understanding certainty **Developing order** Anticipation

#### **EXPLOITATION**

TOICS

How and When mindset "how we've always done"

Chance that context in engineering, and society changes technology





#### **EXPLORATION**

What and Why mindset "new ways of working"





### Gaining prominence in engineering

- agility and resilience algorithmic thinking and programming business acumen
- creativity and innovation employability and lifelong learning
- <u>engineering</u> ethics
- entrepreneurial behaviour intercultural collaboration • mobility
- multi- and interdisciplinary thinking
   systems and holistic thinking

Source: Kamp A; Engineering Education in a Rapidly Changing World, 2<sup>nd</sup> rev. ed. Delft, 2016

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### 21<sup>st</sup> century curriculum

Creativity and Collaborative Design Thinking



Innovation and Entrepreneurial Behaviour

Interdisciplinary Thinking

**Rigorous Engineering** 

# Most wanted professional roles in future engineering (>2030)

### Specialist

System Integrator

Front-end Innovator

**Contextual Engineer** 







### Profile: FRONT-END INNOVATOR

"How can I apply knowledge and use technology to develop out-of-the-box solutions that cross disciplinary boundaries and <u>create value for society</u>?"

Broad knowledge in engineering and socio-economic factors
 Entrepreneurial attitude; value creation
 Interdisciplinary teams of specialists, engineers, stakeholders
 Good social and empathetic listening skills

Intellectual property rights at higher TRL levels
 Fast decision making due to short innovation cycles





### Profile: CONTEXTUAL ENGINEER

"How can I exploit diversity-in-thought in developing realistic and acceptable solutions that <u>create value in different cultures and contexts</u>?"

Technically adept and understanding different realms
Helicopter view, open mind
Local and global thinking
Good intercultural communication and collaboration skills Global engineering ethics
 Agility and perseverance

•Moral dilemmas when maneuvering between personal and local cultural habits, norms, ethics and regulations









### Key attributes in future engineering

- Algorithmic thinking
- Systems thinking
- Knowledge sharing
- Lifelong Learning
- Global engineering ethics
- Entrepreneurial behaviour



Fundamentals in math, science, engineering and technology

