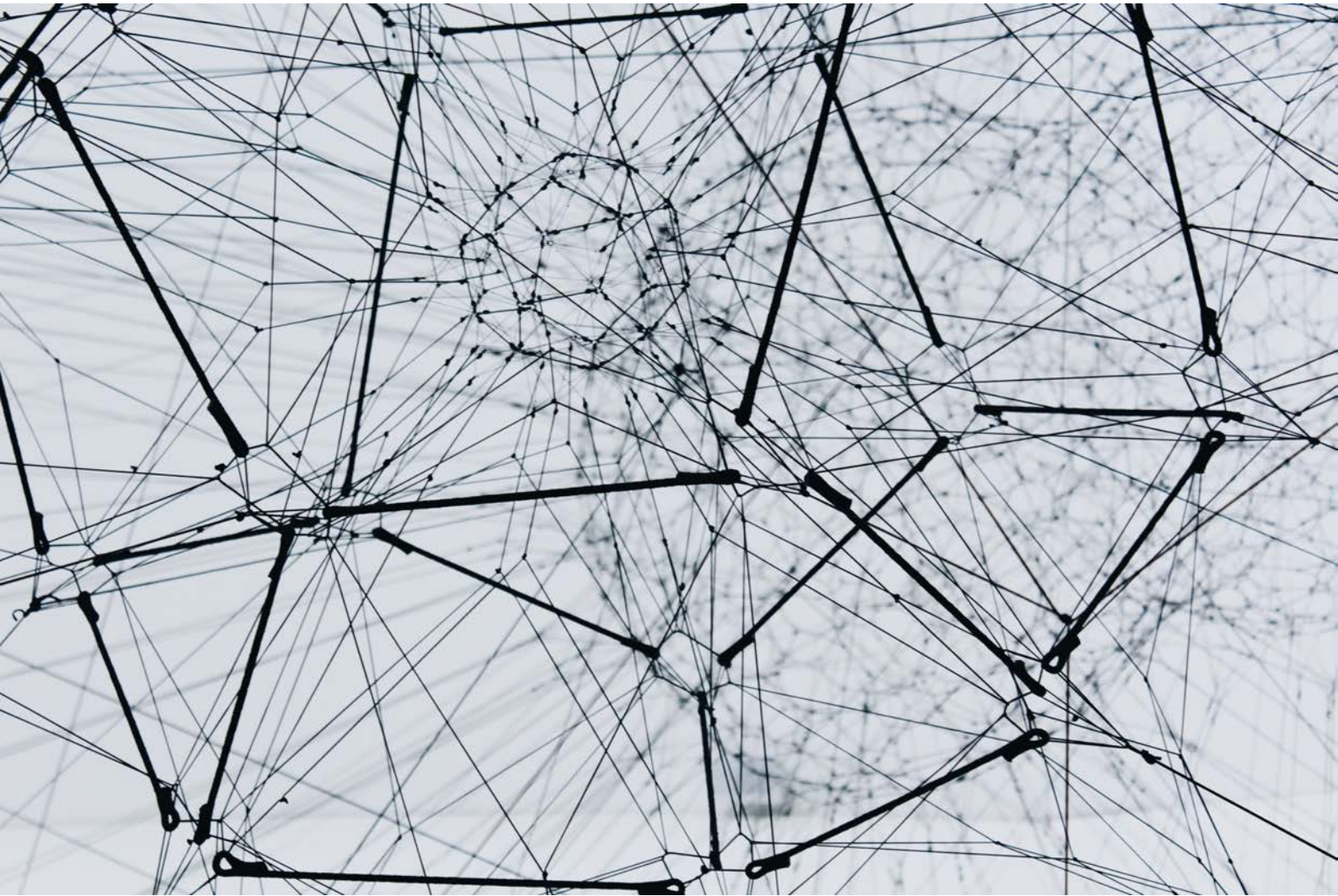


VISION 2030+ SCENARIOS

Sustainable Development and Tomorrow's Engineers



Celebrating World Engineering Day 2022

Produced by

Kjaer Global 

for **Association of Nordic Engineers (ANE)**

March 2022

IMAGINING THE FUTURE

As a global society we face challenges that require us to ACT now! Climate change, loss of biodiversity, poverty and uneven access to education and opportunities are some of the challenges that call for us to re-imagine the road ahead and ask what we can do today to effect positive change.

The UN global goals have been created to guide us towards social and planetary progress in the decade ahead. To meet the goals, there is no doubt that engineers play a central role as active changemakers, but what exactly will that role be?

To celebrate World Engineering Day, ANE has partnered with futurist Anne Lise Kjaer to create four scenarios for engineering leading up to 2030, to open an open dialogue about the future role of engineers.

The scenarios provide a framework – a means to consider various trajectories and their potential impact on the engineering sector and education. While the scenarios do not describe specific actions, they help us to identify and visualise how engineering may evolve in the important decade ahead.

Our scenarios are intended to inspire critical thinking about what kind of world we want to live in. They invite us to think and ask informed questions – in particular: *“What is the role and responsibility of engineers in shaping the future?”*

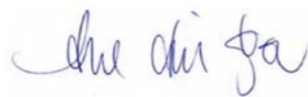
How the scenarios were created
We used Kjaer Global’s methodologies and trend toolkit to filter our research and insights – featured in the Trend & Scenario Navigator 2030+ in the appendix of this document.

Our 4P model of People, Planet, Purpose and Performance – is a holistic framework for synthesising and contextualise research. The 4Ps are relevant across *all* scenarios, but *one* will be dominant in each of the future narratives.

To narrate four plausible scenarios, we summarised our research topline into 8 key Macro Trends. We clustered them with Society Drivers and Value Markers to consider their impact on engineering alongside new Opportunities & Challenges.

The scenarios are exaggerated to represent differences and provoke fresh thinking and ideas. The worlds they portray are not mutually exclusive but exist in parallel, and some concepts overlap according to context.

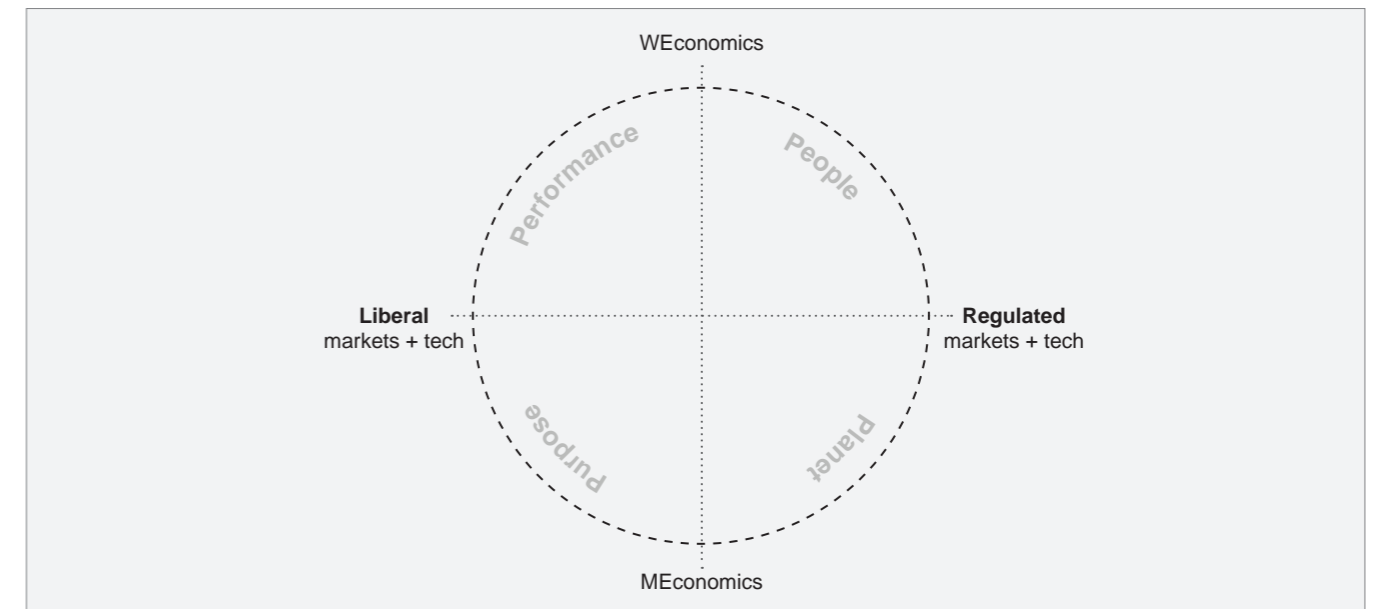
Enjoy the read – and plotting the road ahead.



Anne Lise Kjaer

Futurist and founder, Kjaer Global

Scenario Matrix & Summaries



The matrix

The Scenario Matrix above was used to develop four distinct scenarios. Vertical Axis: **WEconomics** (global outlook & community) <--> **MEconomics** (local focus & the individual). Horizontal Axis: **Liberal** (low regulation) <--> **High Regulation** (of markets + technology).

Scenario summaries

Edutopia (People) Regulated technology with focus on the global community

In Edutopia equitable progress is valued over private interests. Collaboration is seen as a necessity for solving global challenges, and emerging technologies are firmly regulated.

Practopia (Planet) Regulated markets and technology, and a focus on local

The Practopian economy focuses on building thriving regions and local communities. The goal is sovereignty in relation to infrastructure, energy, health and food supply.

Superhuman (Purpose) Low Regulation of technology with focus on personal autonomy

Superhuman societies prioritise efficiency, economic growth and autonomy. This is a hybrid world, where technology is perceived to enhance human capabilities.

Techtopia (Performance) Unregulated markets and technology with a global outlook

In this scenario society is in the hands of ‘Big Tech’ and its engineers. This enables fast action, but also carries the risk of replicating mistakes and biased social structures.

ANE ENGINEERING SCENARIOS

Sustainable Development 2030+

WEconomics (global outlook)

TECHTOPIA

PERFORMANCE

- A world driven by technological performance
- Business as usual approach
- Digital inclusion for global progress



EDUTOPIA

PEOPLE

- A world driven by global collaborative innovation
- People and diversity are key to positive progress
- Lifelong learning and 'curiosity culture'

LIBERAL (Technology + Markets)

REGULATED (Technology + Markets)

SUPERHUMAN

PURPOSE

- Driven by purpose and personal development
- Radical solutions for radical challenges
- Technology enhances human capabilities



PRACTOPIA

PLANET

- A world driven by local communities
- Bottom-up innovation for the planet
- Focus on transparency and simplicity

MEconomics (local focus)



EDUTOPIA



A world driven by global collaborative innovation

How to Spot

TECHNOLOGY

- Human centric - a tool, not an end goal
- Regulated and transparent
- Relatively slow developments

ENGINEERS

- Social strategies to promote diversity
- Constant reevaluating 'status quo'
- Strong influence on the agenda

GLOBAL CHALLENGES

- Global collaboration
- Circular Economy Strategies
- When communities thrive, the planet thrive

LEARNING

- Lifelong learning and soft skills focus
- STEM has developed fully to STEAM
- Environmental science is mandatory

Edutopia is defined by regulated technology with focus on the global community and democratic processes.

In Edutopia, fair progress is valued over private interests. Collaboration is seen as a necessity for solving global challenges, while emerging technologies and 'Big Tech' are firmly regulated.

Macro Trends

LEARNING SOCIETIES

LIVING LABS

Secondary driver

NEW MODELS

Engineering

Diversity strategy

A social diversity strategy integrated into industry and society has led to a vibrant innovation culture, continually challenging the status quo. Lifelong learning and soft skills are prioritised as STEM evolved to STE(A)M, integrating Arts, as part of a strategy to foster a more innovative engineering ecosystem.

Deep engagement

The engineering profession nurtures deep engagement with public and private organisations and stakeholders, locally and globally. This society seeks solutions combining the concept of planetary boundaries with social sustainability in order to deliver positive progress. Engineers and educational institutions lead a collaborative effort across sectors to establish viable frameworks for standards, skills and learning.

The Cs in Lifelong Learning

The Cs for curiosity, creativity, collaboration, and circularity are embedded into learning and work, while environmental science is mandatory from early school years. Reimagining society while fostering ecological resilience can be slow in this highly regulated society, and there are voices of concern that, with so much talk, we risk missing the window to act.

Towards a Digital Constitution

Engineers play a vital role in Edutopia, and the profession is highly regarded. A worldwide coalition of engineering organisations has created a Digital Constitution – a manifesto for software development, data integrity and bioengineering. Long-term and systems thinking from a global perspective become core requirements, while interdisciplinary competencies collaborate to continually review and update the ethics framework.

Imagine the Edutopian engineer

"How could engineers take action to create a Digital Constitution?"

"Is regulation a barrier or an enabler of innovation?"

Data Points



* 95% of respondents believe that global cooperation is vital to solving global challenges, only 1-in-4 feel confident that the world can achieve this.

The world in 2030: public survey report – UNESCO 2021

* 80% of global GDP is generated in cities, but they also consume ¾ of the world's energy.

The World Bank 2020



PRACTOPIA



A world driven by local communities

How to Spot

TECHNOLOGY

- A mean to independence
- Bottom-up innovation
- Scaling solutions can be a challenge

ENGINEERS

- Self-reflective, re-appraising own role
- High degree of specialists
- Independent nodes in a global 'system'

GLOBAL CHALLENGES

- Lean, local and circular economy
- Social and environmental sustainability
- Local solutions before global

LEARNING

- Try to bring clarity to complex designs
- Re-appraising own role
- Trust through transparency

Practopia is defined by strictly regulated markets and technology, and a focus on local communities.

The Practopian economy focuses on building thriving regions and local communities. The goal is sovereignty in relation to infrastructure, energy, health, and food supply.

Macro Trends

THE (RE)GENERATION
NEW MODELS

Secondary driver

INTELLIGENT REDUCTION

Engineering

Lean and specialised

To see the Practopian strategy through, education and up-skilling is prioritised and well-financed, causing an increasing demand for specialist engineers. The power of the global market economy is reduced through national regulation. The plan is to reduce waste and be more sustainable by nurturing a lean, circular, and local economy.

Social and environmental sustainability

This highly regulated and purpose-driven society still enables an entrepreneurial culture, with easy access to funds and support. This reshapes the engineering sector, now largely made up of small-scale start-ups, contract workers and specialist freelancers. Ethical business models are dominant and often have a clear element of both social and environmental sustainability – with local interests at heart.

Independent nodes

The Practopian engineer is humanistic, responsible and caring, prioritising self-development, family units, local community, and then wider society. Engineers see themselves as independent nodes in a global 'system', and their big challenge is to ensure local small-scale solutions will gain momentum and contribute effectively to solve global problems.

Simplexity engineering

A degree in Intelligent Reduction Engineering is established. This is a bid to bring greater transparency to complex systems and technologies, while enabling engineers to evaluate the potential for risk. As complexity grows, this is perceived as critical to building trust across society – engineers constantly re-appraise their individual role, responsibility, and potential as changemakers.

Imagine the Practopian engineer

“Are simplicity and transparency realistic goals in an increasingly complex world?”

“Can a local focus and effective participation in the global society co-exist?”

Data Points



* Only 1 in 4 people believe we can solve our global problems.
The G20 Peoples' Climate Vote – UNDP 2021

* 8.6% of the global economy is circular — just two years ago, it was 9.1%.
Circularity Gap Report 2020



SUPERHUMAN



A world driven by purpose and personal development

How to Spot

TECHNOLOGY

- Low regulation of transformative tech
- Human + Technology = hybrid everything
- Data is the 'great enabler'

ENGINEERS

- Social Shaping own norms and ethics
- Engineering for a non-physical world
- High status and influential

GLOBAL CHALLENGES

- Results driven, no solution is too radical
- Pushing frontier tech
- Accountability through technology

LEARNING

- Real-time interactive environments
- Seeking to cultivate critical thinking
- Preparing students for individual success

The Superhuman society is defined by low regulation of technology and a focus on personal autonomy.

Superhuman societies prioritise efficiency, economic growth, and autonomy. This is a hybrid world, where technology is perceived to enhance human capabilities.

Macro Trends

ECONOMICS FOR HUMANS
INTELLIGENT REDUCTION

Secondary driver

HUMAN INTERFACE

Engineering

Transformative Technology

The Internet of Things and Mixed Reality enable real-time interactive environments for learning, health, and wellbeing. These encourage self-development and 'deep' dialogue. Data is the great enabler and, while increased physical/digital convergence leads to ongoing debates around the ethics of what Superhumans call 'transformative' technologies, individuals are still left to shape their own norms.

Radical challenges need radical solutions

Superhumans tend to view geoengineering and nuclear energy as viable solutions to climate change, fields rapidly gaining traction, alongside meta-engineering. Start-ups and autonomous innovators make up the core ecosystem of this society. They pursue a strategy of self-governance, and no solution is too radical to consider in the effort to solve global challenges.

Accountability

Engineers are critical to the Superhuman society and have gained almost mythical status. To elevate frontier technology potential, educational institutions deploy diverse talent and cultivate critical thinking to address bias and inequalities, especially in hybrid health and social technologies. The challenge is to reconcile autonomy and community while fostering accountability and responsibility.

A 'smart' moral compass

A self-executing smart contract, based on a low carbon blockchain and represented as a physical ring, is given to graduate engineers. The idea is to cultivate personal accountability, and the concept builds on the Iron Ring given to Engineers in Canada, on which they pledge responsibility and diligence. The blockchain automatically updates during the engineer's working life, acting as a moral compass or meta-conscience.

Imagine the Superhuman engineer

"With technology a powerful source for innovation, how do we ensure human-centric solutions?"

"What can be done to foster more accountability?"

Data Points



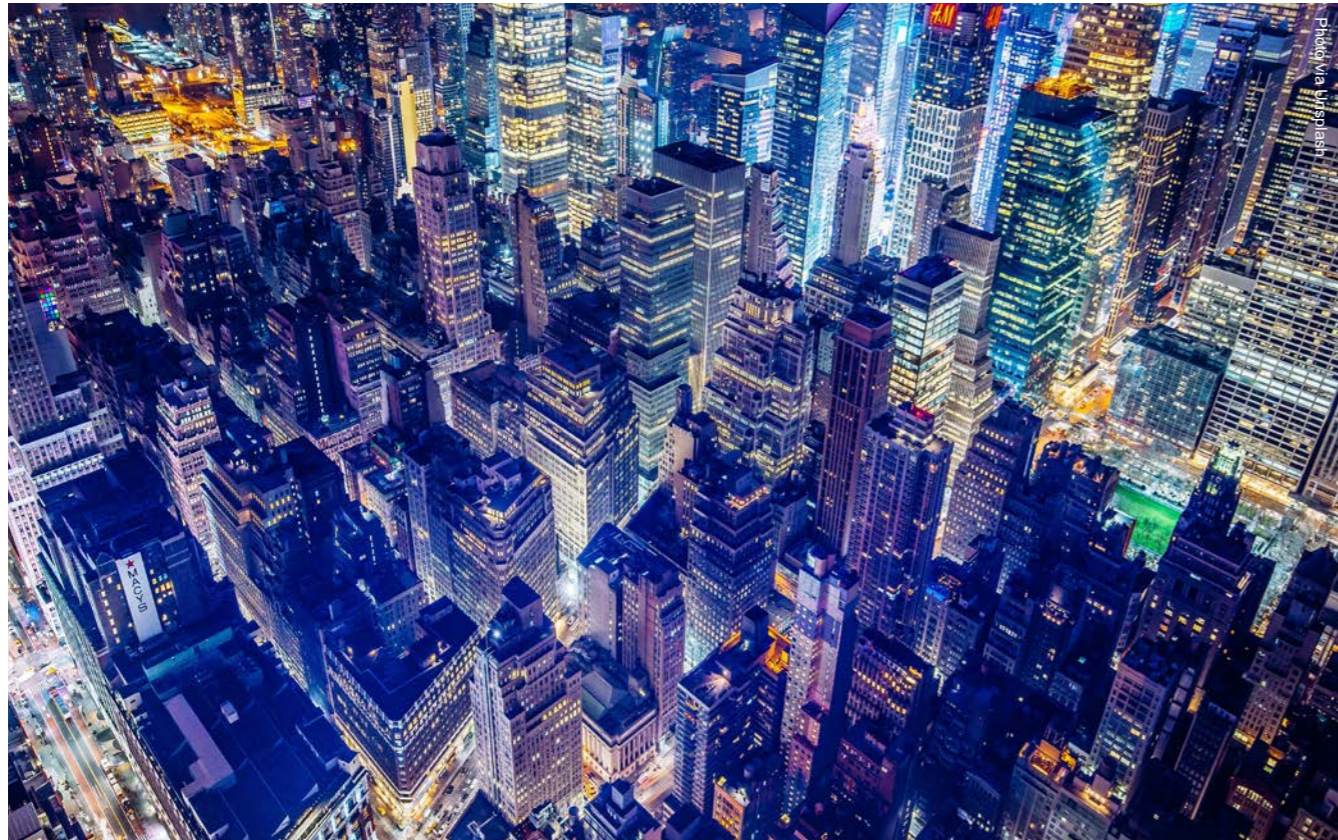
* 3 billions are still without access to the opportunities afforded by connectivity.
World Bank 2021

* 90% of executives recognise the importance of having a societal 'purpose'.
EY & Harvard Business Review Analytic Services survey

* It is estimated that 65%-85% of the jobs of 2030 have yet to be invented.
World Economic Forum, McKinsey and others



TECHTOPIA



A world driven by technological performance

How to Spot

TECHNOLOGY

- Global digital inclusion
- 'Big Tech' and private interests rule
- "Technology will save us"

ENGINEERS

- The efficient executors of 'Big Tech'
- Seek to shape their collective role
- Relying on individual agency and ethics

GLOBAL CHALLENGES

- Mitigation and adaption as strategy
- Access to technology is key
- Business as usual

LEARNING

- Educating 'fit for purpose' engineers
- Specialised - lacks diversity
- Shaped by private interests

Techtopia is a society defined by rapid unregulated technology developments and with a global outlook.

Techtopians have put everything in the hands of 'Big Tech' and its engineers. This enables fast action, but also carries the risk of replicating mistakes and biased social structures.

Macro Trends

DIGITAL FRONTIER
HUMAN INTERFACE

Secondary driver
LIVING LABS

Engineering

A fast digital transformation

A great shift has taken place, with frontier technologies now widely assimilated into the labour market, transforming millions of jobs. This has led to a reskilling revolution, based mainly in the metaverse – an immersive and globally accessible 3D virtual reality. Global digital inclusion is a given, so talent can be found and deployed anywhere in the world.

Business as usual

Faced with ongoing climate challenges, the engineering profession blooms – the world needs critical infrastructures, built at speed. The goal is to mitigate the consequences of climate change, optimise resources for economic growth, and to feed the world. Private companies lead in solving global challenges and have taken over many key functions in society. Engineers across specialisms are in high demand, and private interests are shaping education to create 'fit for purpose' engineers.

The enablers of corporate agendas

Despite free movement of global talent, there are significant skills bottlenecks, especially in the engineering ranks. Technological progress is happening exponentially, and governance frameworks are scattered and ill-defined where they exist. Engineers are well-regarded in society, but seen as the efficient executors of corporate agendas with only little influence.

Re-imagined unions and associations

With engineers as 'fall guys' when things go wrong, fresh interest and energy pour into trade unions and associations. These reimagined, purpose-driven alliances fight to protect whistleblowers and pave the way for greater engineer-led influence. They nurture global communities and networks where engineers push to shape their collective role rather than rely on individual agency and ethics.

Imagine the Techtopian engineer

"Will engineers be the executing soldiers or gatekeepers of values, such as trust?"







"What is the role of unions and associations?"

Data Points



- * 70% of the SDGs are achievable with the direct support of advanced tech. WEF & PwC 2020
- * 78% of the tech employees agreed that the tech industry is too powerful. Protocol for Politico 2021
- * 68% of people believe that 'Big Tech' has too much power and influence. PEW Survey 2021

APPENDIX: TREND & SCENARIO NAVIGATOR 2030+

The 4Ps	Macro Trends	Society Drivers	Value Markers	Engineering	Opportunities & Challenges
 PEOPLE	LIVING LABS	<ul style="list-style-type: none"> * Urban Futures * Era of Alliances * Experimental Living 	 Livable  Collaborative  Imaginative	<ul style="list-style-type: none"> - The big decade for (civil) engineering - Majority of people believe in global collaboration - Responsive environments 	<ul style="list-style-type: none"> Sustainable solutions start with the built environment Global alliances to solve global problems Agile environments, and re-imagined infrastructures
	LEARNING SOCIETIES	<ul style="list-style-type: none"> * Curiosity Culture * Diversity Factor * Talent Migration 	 Accessible  Diverse  Democratic	<ul style="list-style-type: none"> - Challenging biased social structures - Diversity of thought, skills & experiences - Talent flows freely across national borders 	<ul style="list-style-type: none"> Lifelong learning will be key to thriving Diversity and inclusive learning environments New talent dynamics and new talent hotspots
 PLANET	NEW MODELS	<ul style="list-style-type: none"> * Circular Economy * Deep Engagement * Social Sustainability 	 Meaningful  Caring  Integrated	<ul style="list-style-type: none"> - A collective mindset change - Decentralised and bottom-up value creation - Business models with a clear social element 	<ul style="list-style-type: none"> Re-thinking of production and consumption Interdisciplinary teams and innovation Supporting positive social change
	THE (RE)GENERATION	<ul style="list-style-type: none"> * Legacy Thinking * Deep Resilience * Social Capital 	 Resilient  Restorative  Community	<ul style="list-style-type: none"> - Short-termism is a threat to humanity - Half of the world's GDP is dependent on nature - Building strong local communities and resilience 	<ul style="list-style-type: none"> Long-term thinking driving actions/investments Restoring ecosystems to build deep resilience Reducing inequality to nurture sustainability
 PURPOSE	INTELLIGENT REDUCTION	<ul style="list-style-type: none"> * Well(Being) * Simplexity * Enoughism 	 Holistic  Transparent  Mindful	<ul style="list-style-type: none"> - Health and aging re-imagined - Focus on the high-touch aspect of technology - Personal ethics inform life choices 	<ul style="list-style-type: none"> Wellbeing factored into everything Transparency in complex systems 'Less but better' as the driver
	ECONOMICS FOR HUMANS	<ul style="list-style-type: none"> * Purpose-driven * Introspective * Ethical Tech 	 Purposeful  Balanced  Ethical	<ul style="list-style-type: none"> - Re-defining and shaping business models - Individual search for belonging in a global world - Anti-bias and digital accountability in focus 	<ul style="list-style-type: none"> Purpose beyond profit defines success Self-development and personal growth Distributed trust; towards a new ethical paradigm
 PERFORMANCE	HUMAN INTERFACE	<ul style="list-style-type: none"> * Metaverse * Humanity 2.0 * Radical Solutions 	 Immersive  Transformative  Radical	<ul style="list-style-type: none"> - (Meta) Engineering for a non-physical world - Technology enhancing human capabilities - Quick fix culture, or long-term impact 	<ul style="list-style-type: none"> Convergence of physical and digital life Exploring the future role of humans Tech-driven solutions to world problems
	DIGITAL FRONTIER	<ul style="list-style-type: none"> * Disruptive Innovation * Liquid Society * Digital Inclusion 	 Disruptive  Borderless  Inclusive	<ul style="list-style-type: none"> - Many jobs disappear – new jobs are created - Changing the meaning of life-stages - Democratisation of opportunity & knowledge 	<ul style="list-style-type: none"> Positive human-machine partnerships No boundaries between work, play, and living Digital inclusion and access to information

Association of Nordic Engineers (ANE)
consists of engineering trade union associations
from the five largest Nordic countries:

The Swedish Association of Graduate Engineers
The Danish Society of Engineers (IDA)
The Norwegian Society of Engineers and Technologists (NITO)
The Association of Chartered Engineers in Iceland (VFÍ)
Engineers Finland

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