UNIVERSITI KEBANGSAAN MALAYSIA
The National University of Malaysia

The Future of Educational, Scientific & Technological Ecologies in the Industrial Revolution 4.0

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Universiti Kebangsaan Malaysia

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The 3rd International Conference of Education, Science & Technology 2019

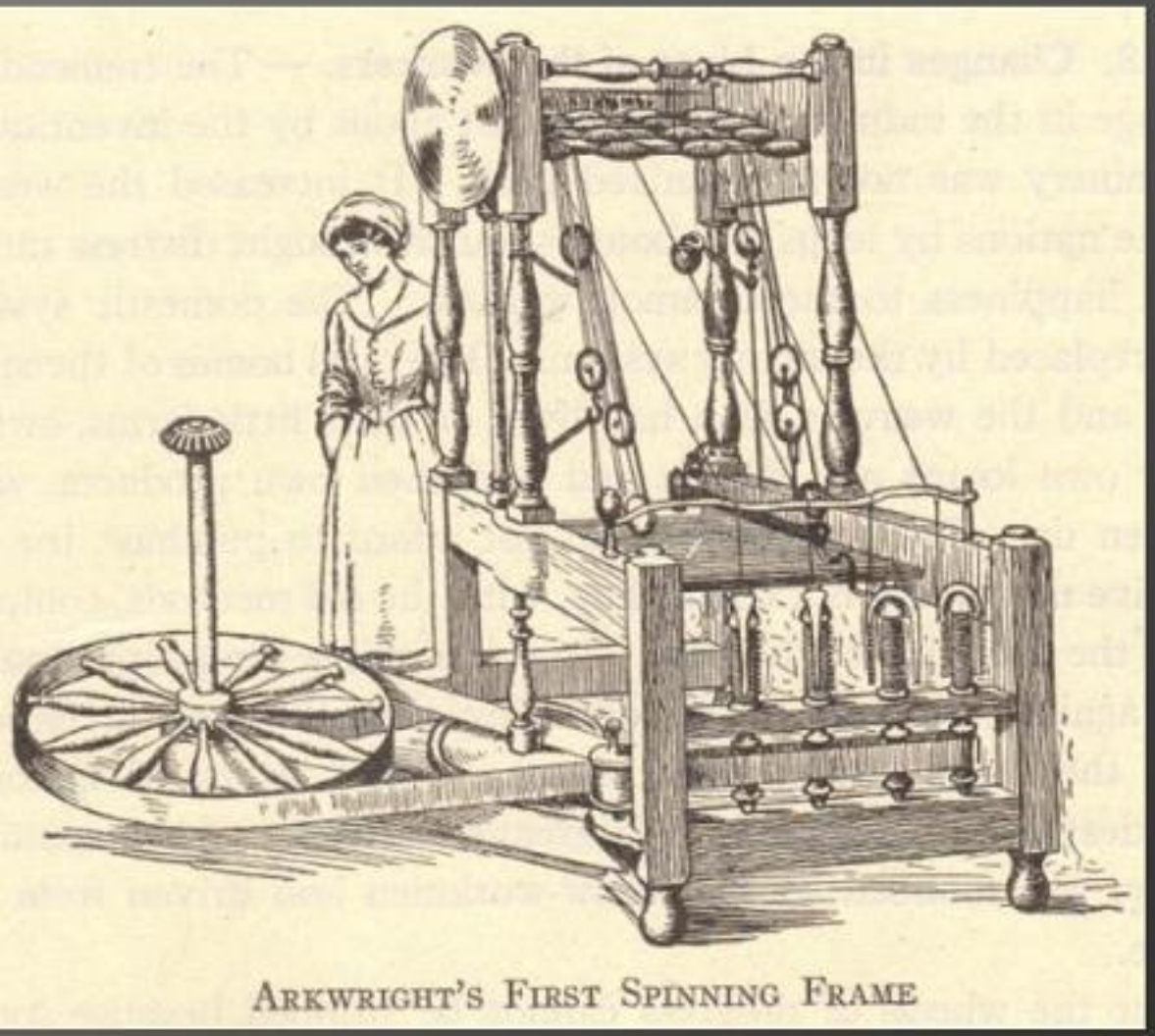
UN's Sustainable Development Goals

THE GLOBAL GOALS
For Sustainable Development

SDG 4
calls for countries to '**ensure inclusive and equitable quality education**, and promote lifelong learning opportunities for all'

UNESCO (2017)

The Fourth Industrial Revolution

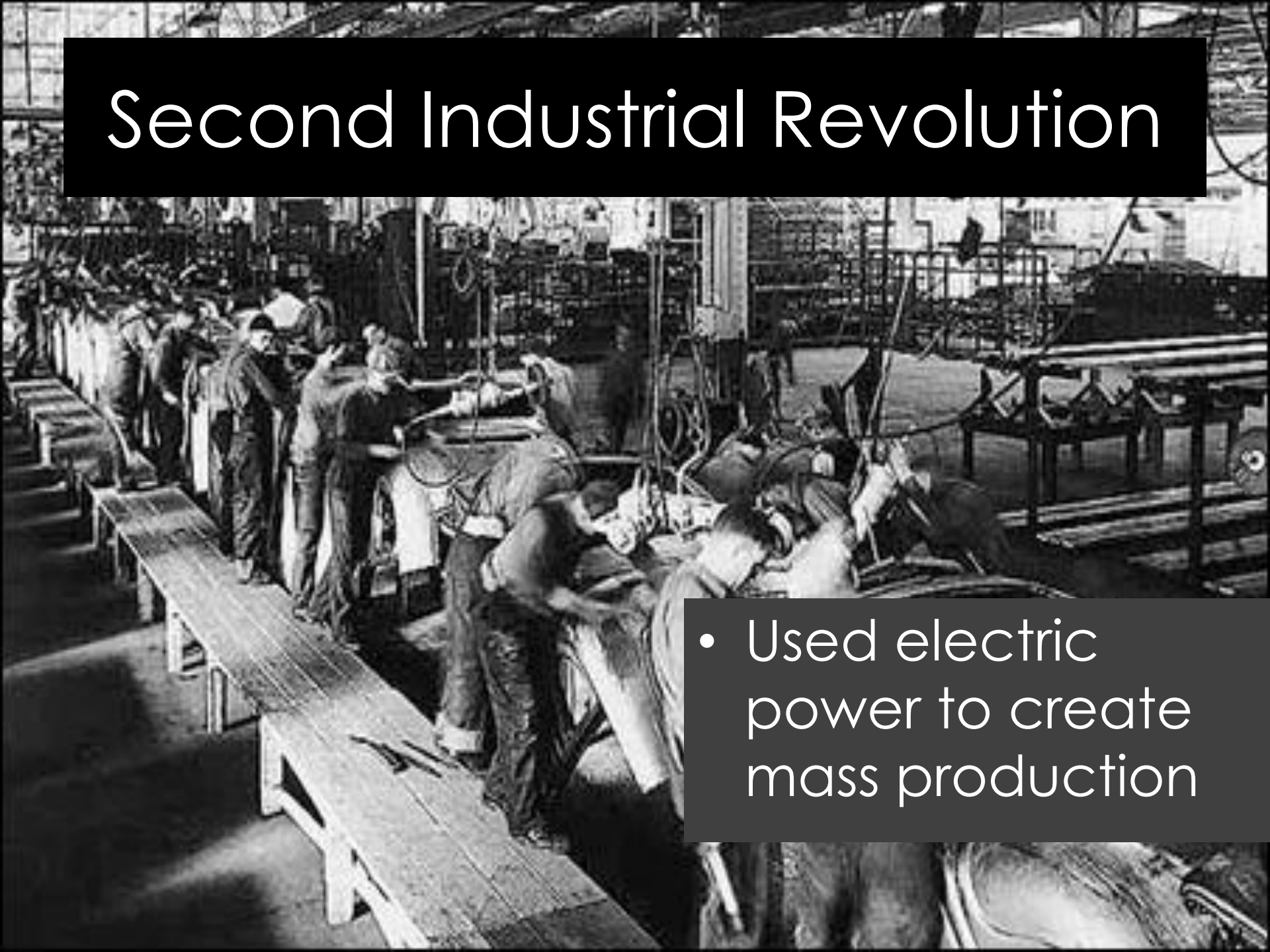


ARKWRIGHT'S FIRST SPINNING FRAME

Used water and steam power to mechanize production

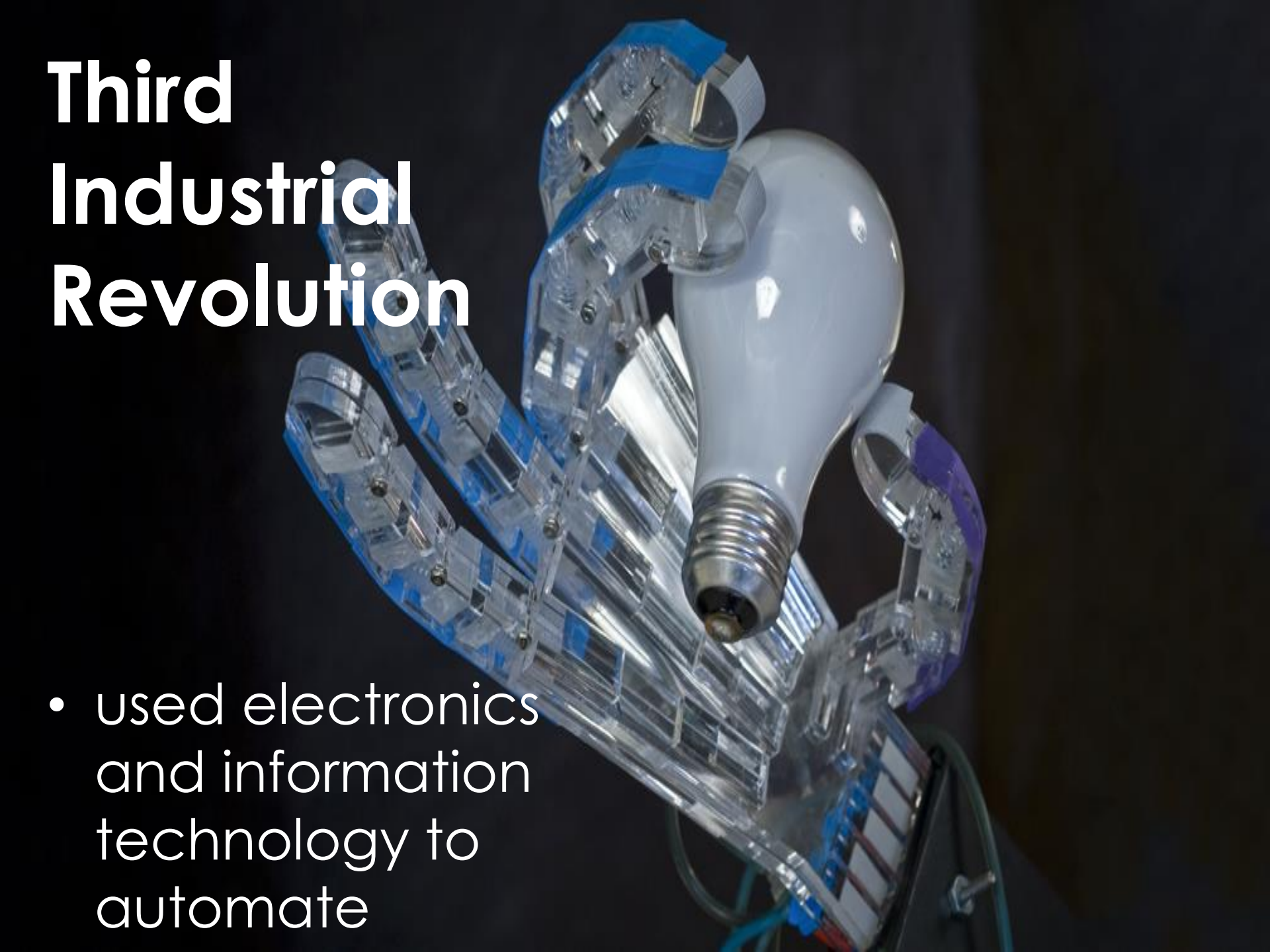
THE FIRST INDUSTRIAL REVOLUTION

Second Industrial Revolution



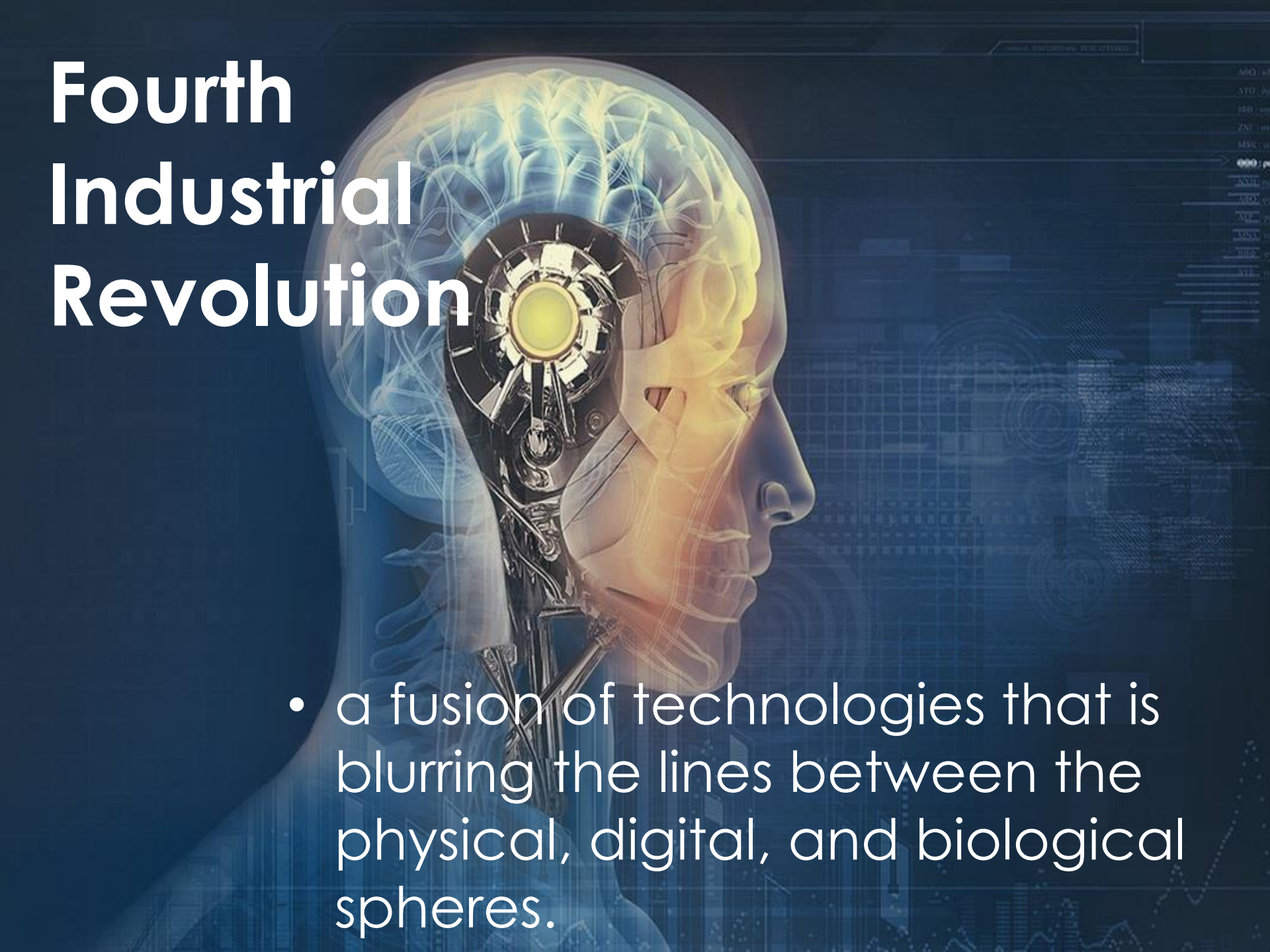
- Used electric power to create mass production

Third Industrial Revolution

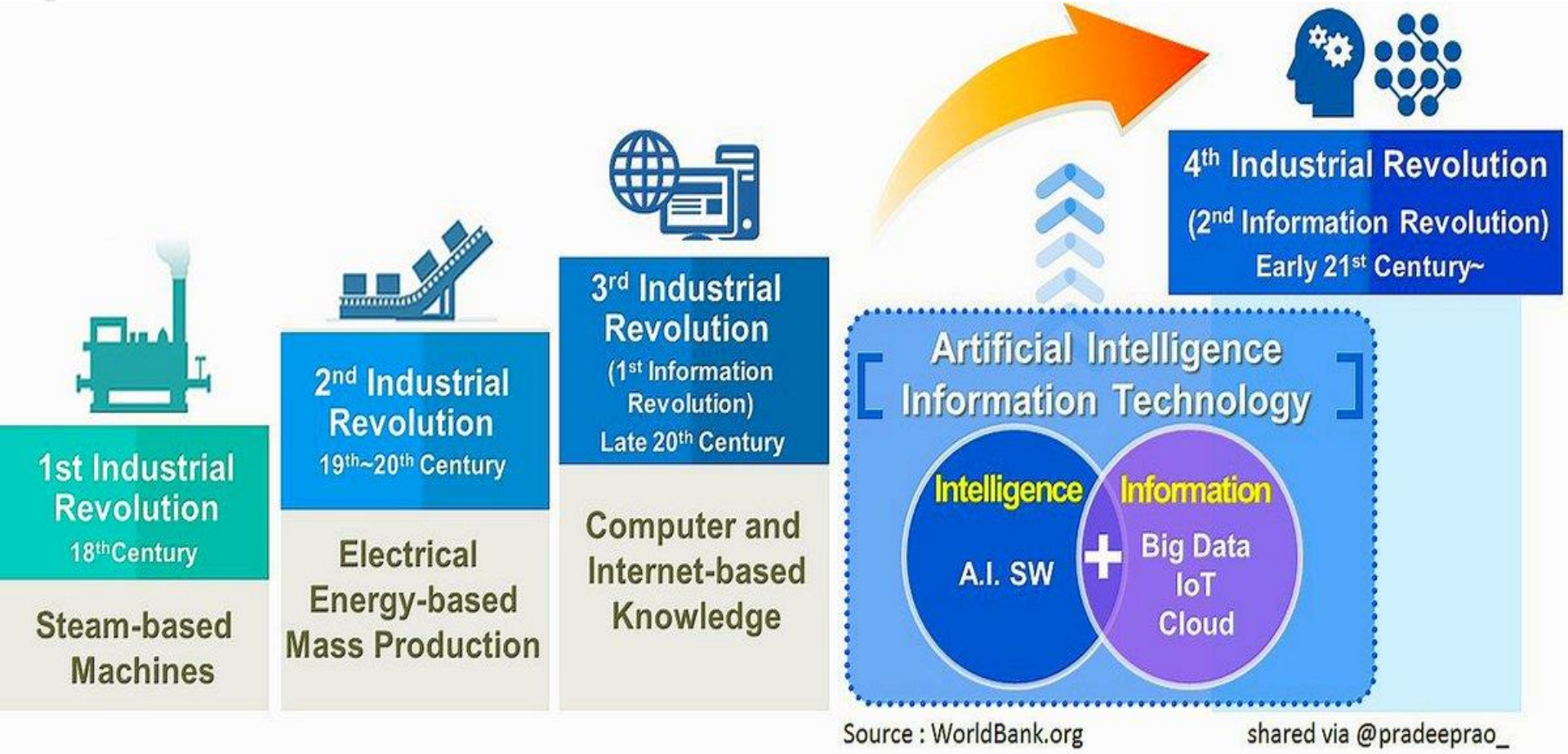


- used electronics and information technology to automate

Fourth Industrial Revolution



- a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

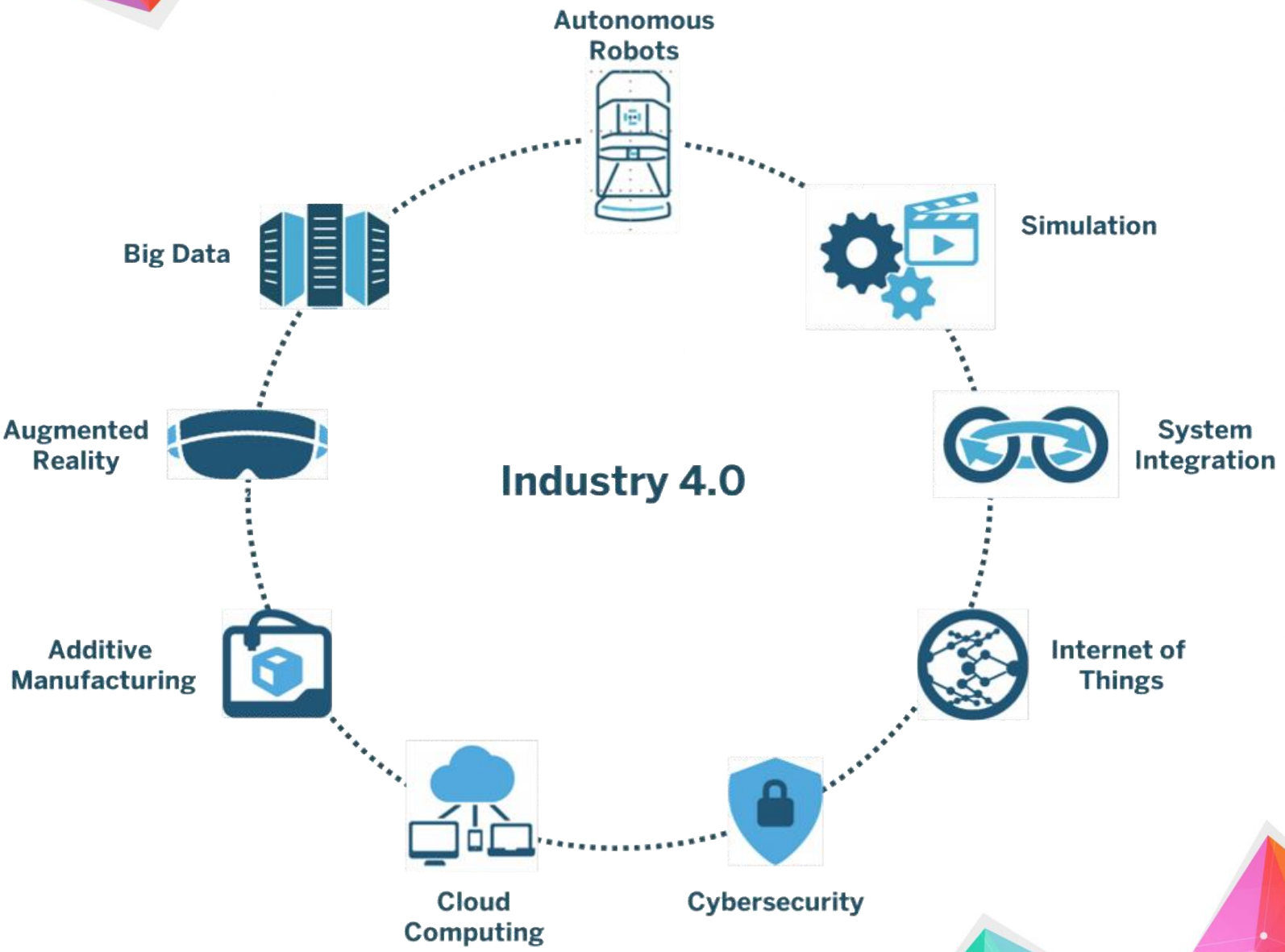

1st Industrial Revolution
18th Century
Steam-based Machines
2nd Industrial Revolution
19th~20th Century
Electrical Energy-based Mass Production
3rd Industrial Revolution
(1st Information Revolution)
Late 20th Century
Computer and Internet-based Knowledge
4th Industrial Revolution
(2nd Information Revolution)
Early 21st Century~
Artificial Intelligence
Information Technology
Intelligence
A.I. SW
Information
Big Data
IoT
Cloud
Source : WorldBank.org
shared via @pradeeprao_

Physical

Digital

Biological

MEGATRENDS


Autonomous Robots
Simulation
System Integration
Internet of Things
Cybersecurity
Cloud Computing
Additive Manufacturing
Augmented Reality
Big Data
Industry 4.0

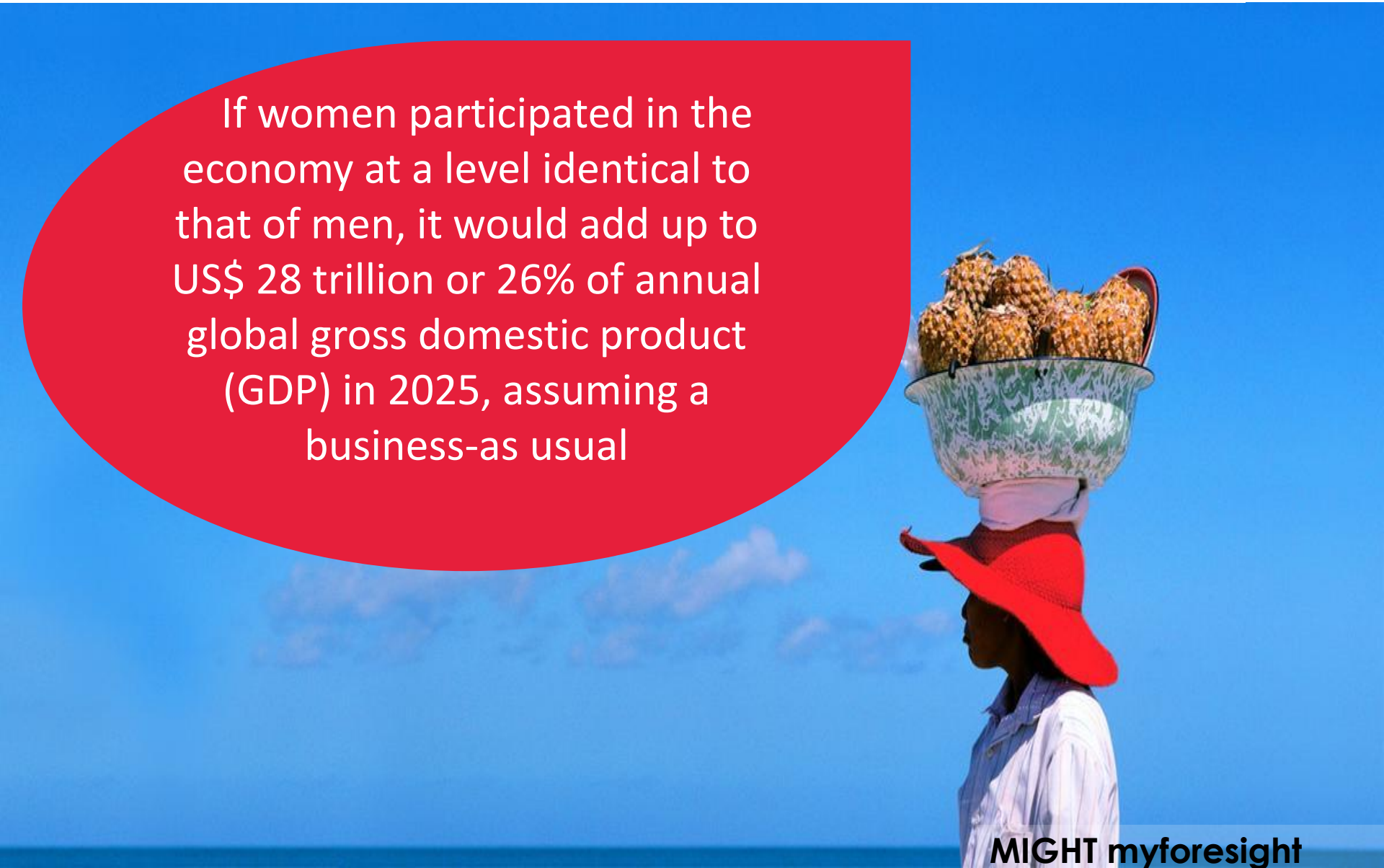

World Changing Trends

Trend 1: Aging World

By 2050, the global population of older persons is projected to be more than double its size in 2015, reaching nearly 2.1 billion

Trend 2: Woman Empowerment

If women participated in the economy at a level identical to that of men, it would add up to US$ 28 trillion or 26% of annual global gross domestic product (GDP) in 2025, assuming a business-as usual



Trend 3: Digital Natives

Millennials are a powerful generation in the making, being born during the time of the digital revolution, growing up with perks, such as broadband, smartphones, and social networks

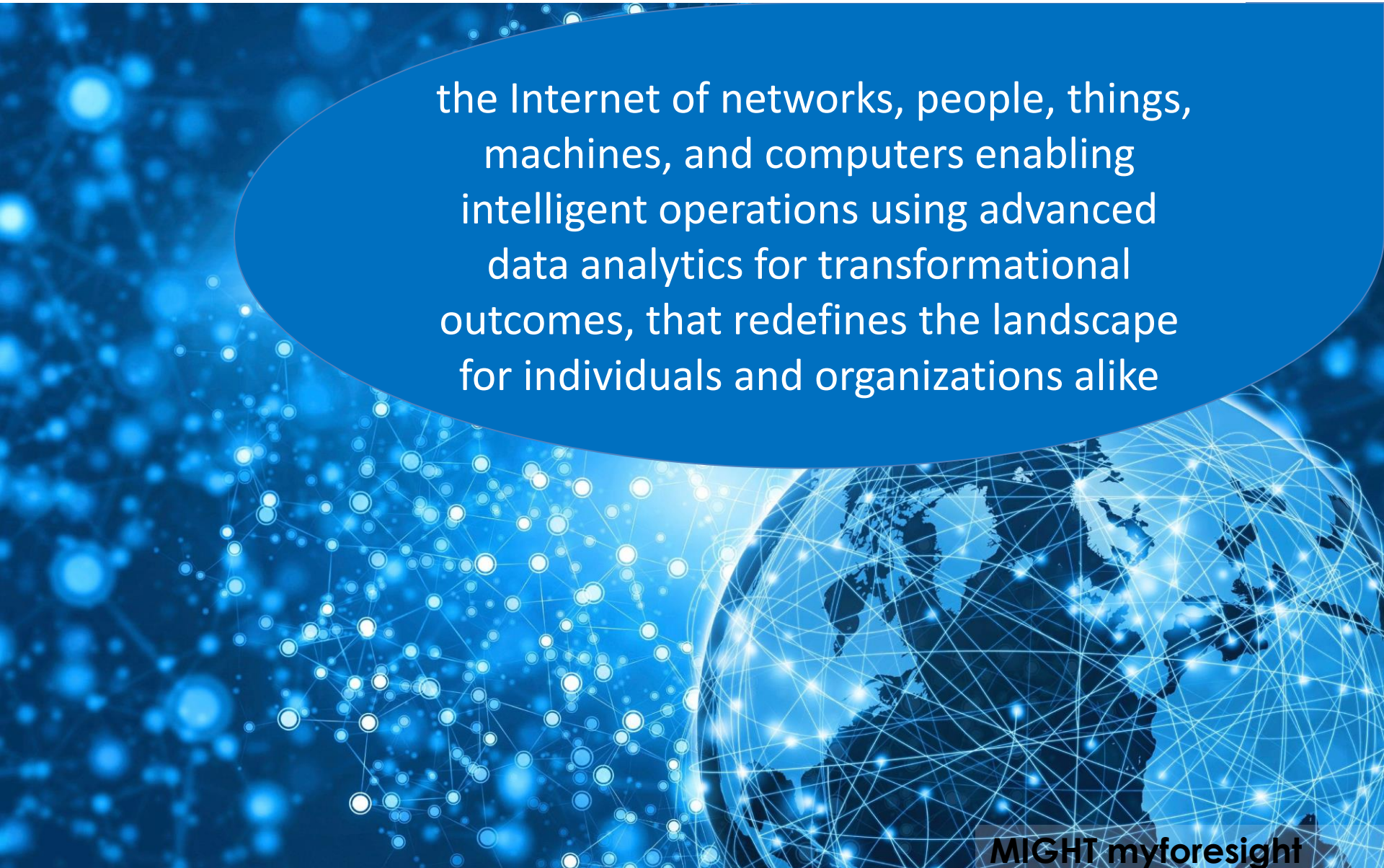
Trend 4: Migrations and Cultural Diversity

Trend 5: Urbanization

By 2030, two-thirds of the world's population will reside in cities. The number of megacities with more than 10 million people is expected to grow to over 40

Trend 6: Blurring Boundaries of Traditional Sectors

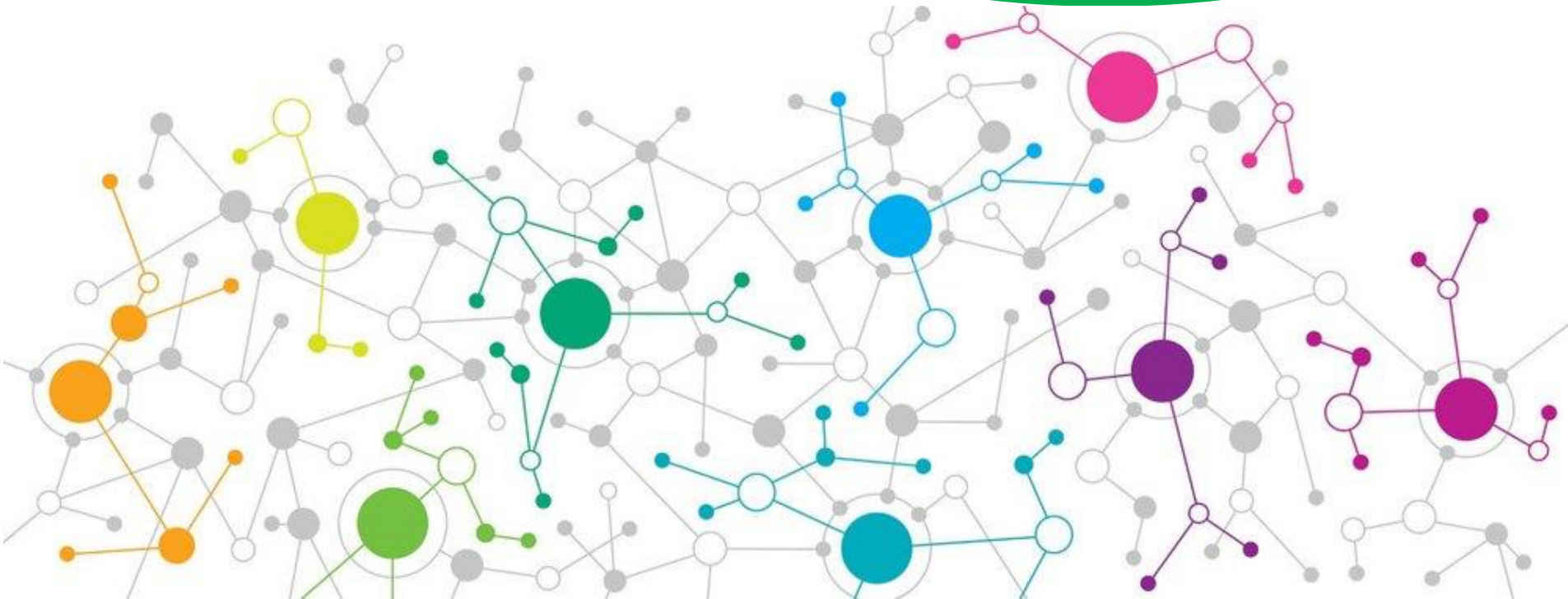
Trend 7: Hyper-Connectivity



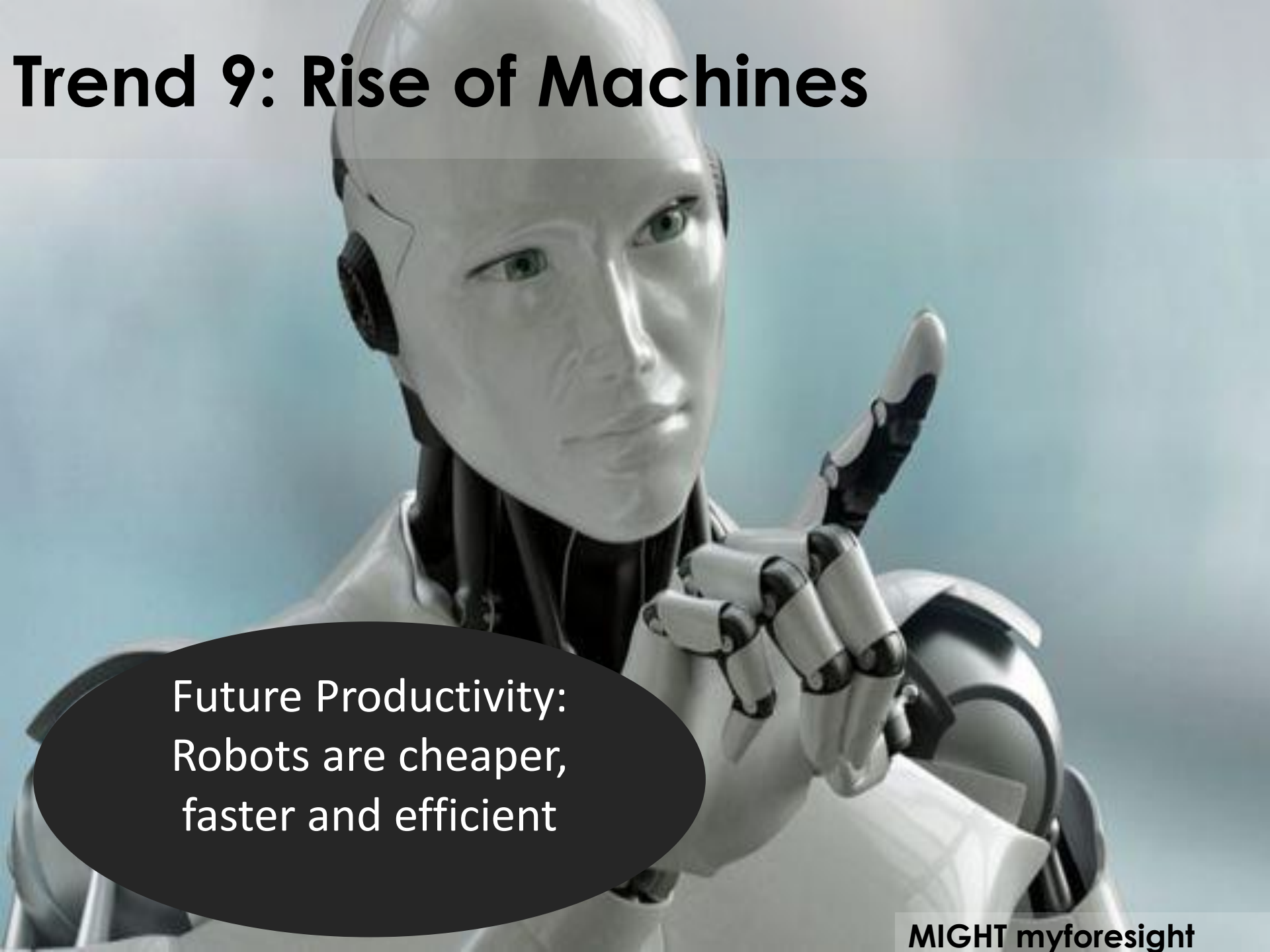
the Internet of networks, people, things, machines, and computers enabling intelligent operations using advanced data analytics for transformational outcomes, that redefines the landscape for individuals and organizations alike

Trend 8: Globalisation & Decentralisation

Decentralized economic system defined by collaboration between individuals and the sharing of resources



Trend 9: Rise of Machines



Future Productivity:
Robots are cheaper,
faster and efficient

Trend 10: Green & Sustainability

"Smart" is the new "green" - Mega Trend of the past decade—green products—will be replaced in this decade by Smart products and services


Where are we now?
http://photos.jeremybrooks.net/?p=68

The future…?

1989: ‘The future is Multimedia’

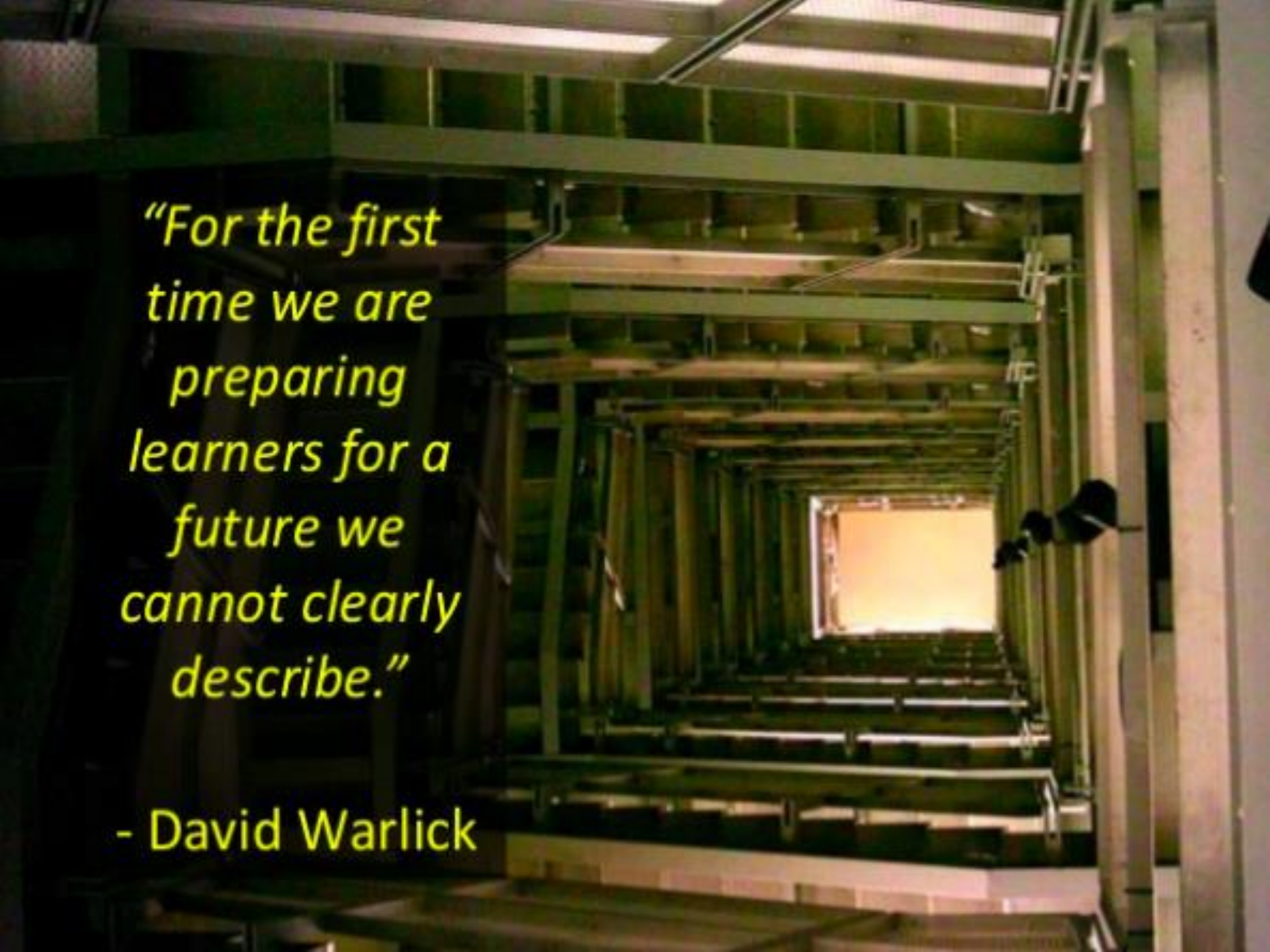
1999: ‘The future is the Web’

2009: ‘The future is smart mobile’

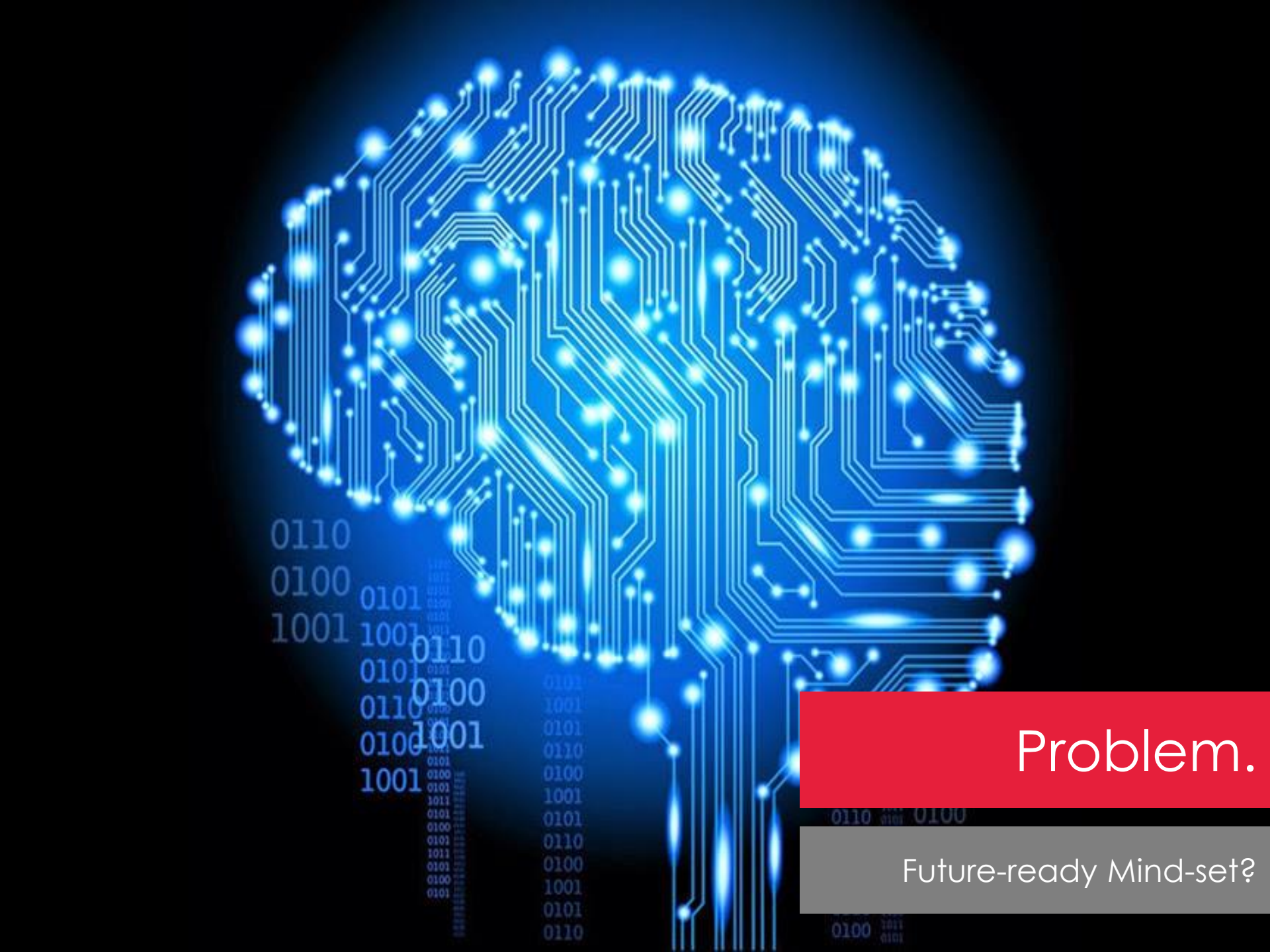
2019: ‘the future …

Can we predict the Future…?

http://westernfrontierblog.wordpress.com/

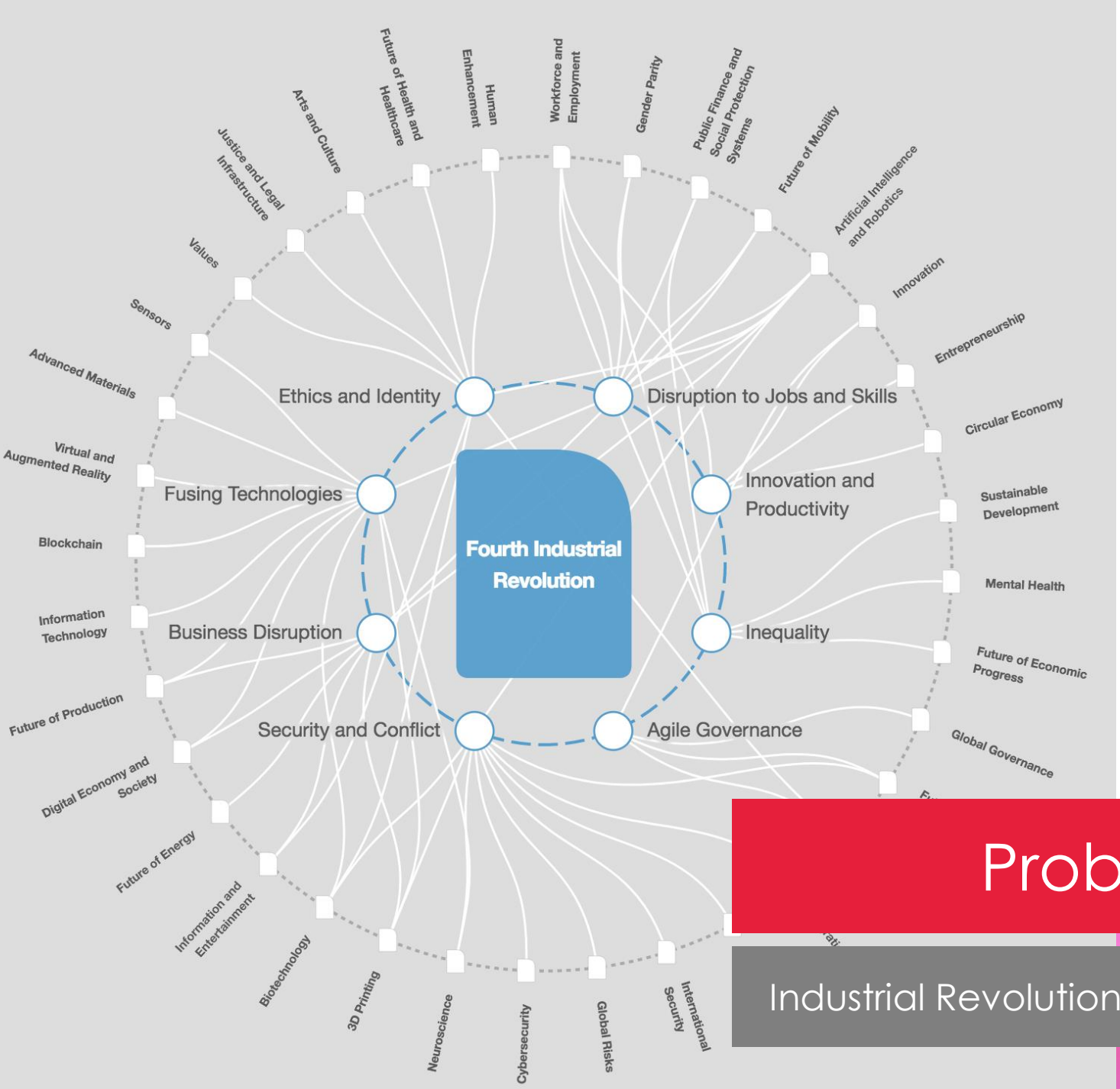

"For the first time we are preparing learners for a future we cannot clearly describe."
- David Warlick


Problem.
Future-ready Institution?



Problem.

Future-ready Mind-set?



Problem.

Industrial Revolution-ready?

Problem.

Educator 4.0 ready?

Problem.

Skills for non-existing future jobs of graduates

Problem.

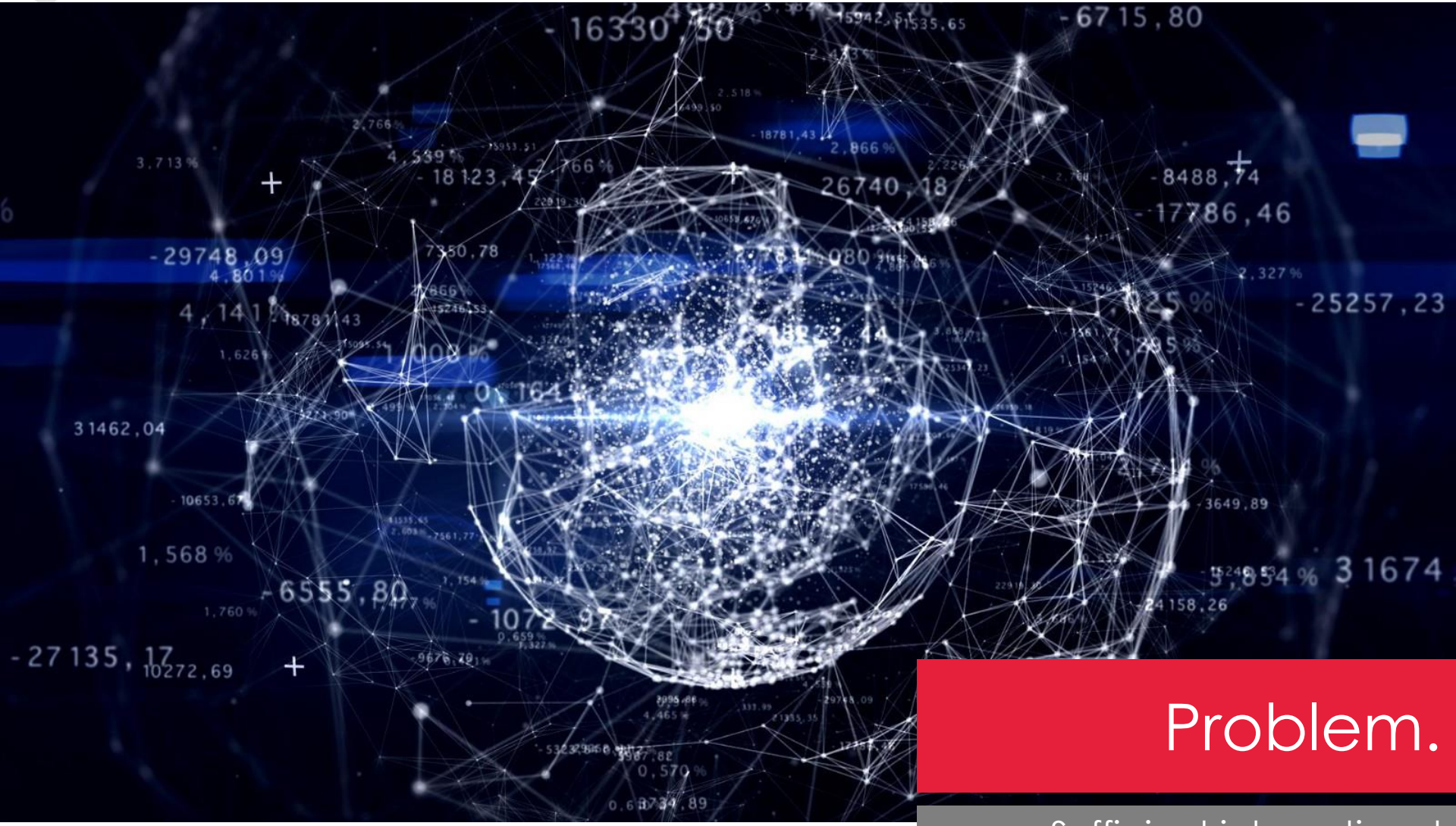
Transdisciplinary knowledge of graduates?

Problem.

Existing learning space future-ready?

Problem.

Sufficient expert mobility?

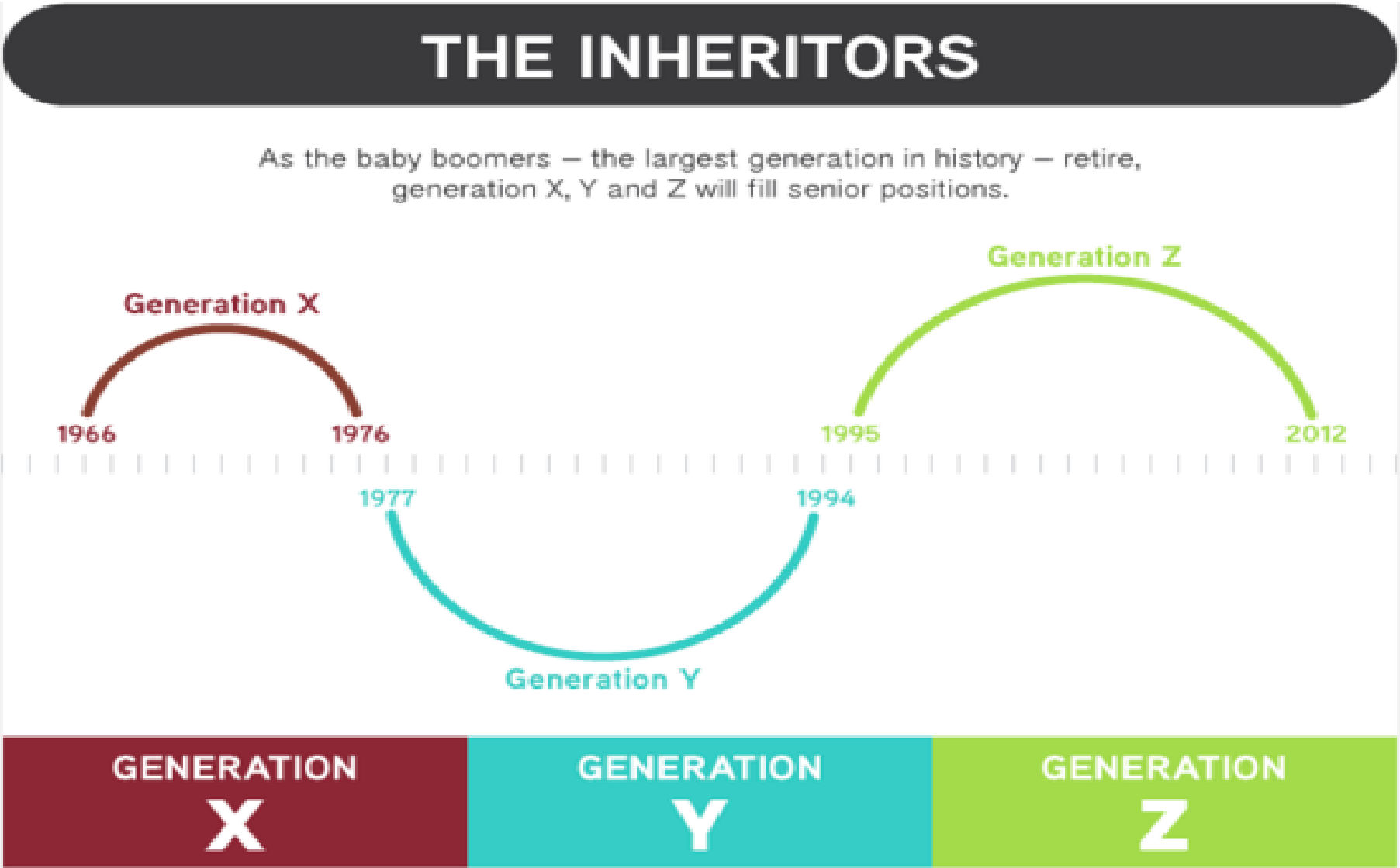


Problem.

Sufficient international exposure?


What should we do?

Our Generation



Which Generation are You?

Generation Name	Births Start	Births End	Youngest Age Today*	Oldest Age Today*
The Lost Generation The Generation of 1914	1890	1915	103	128
The Interbellum Generation	1901	1913	105	117
The Greatest Generation	1910	1924	94	108
The Silent Generation	1925	1945	73	93
Baby Boomer Generation	1946	1964	54	72
Generation X (Baby Bust)	1965	1979	39	53
Xennials	1975	1985	33	43
Millennials Generation Y, Gen Next	1980	1994	24	38
iGen / Gen Z	1995	2012	6	23
Gen Alpha	2013	2025	1	5

GENERATION

X vs Y vs Z

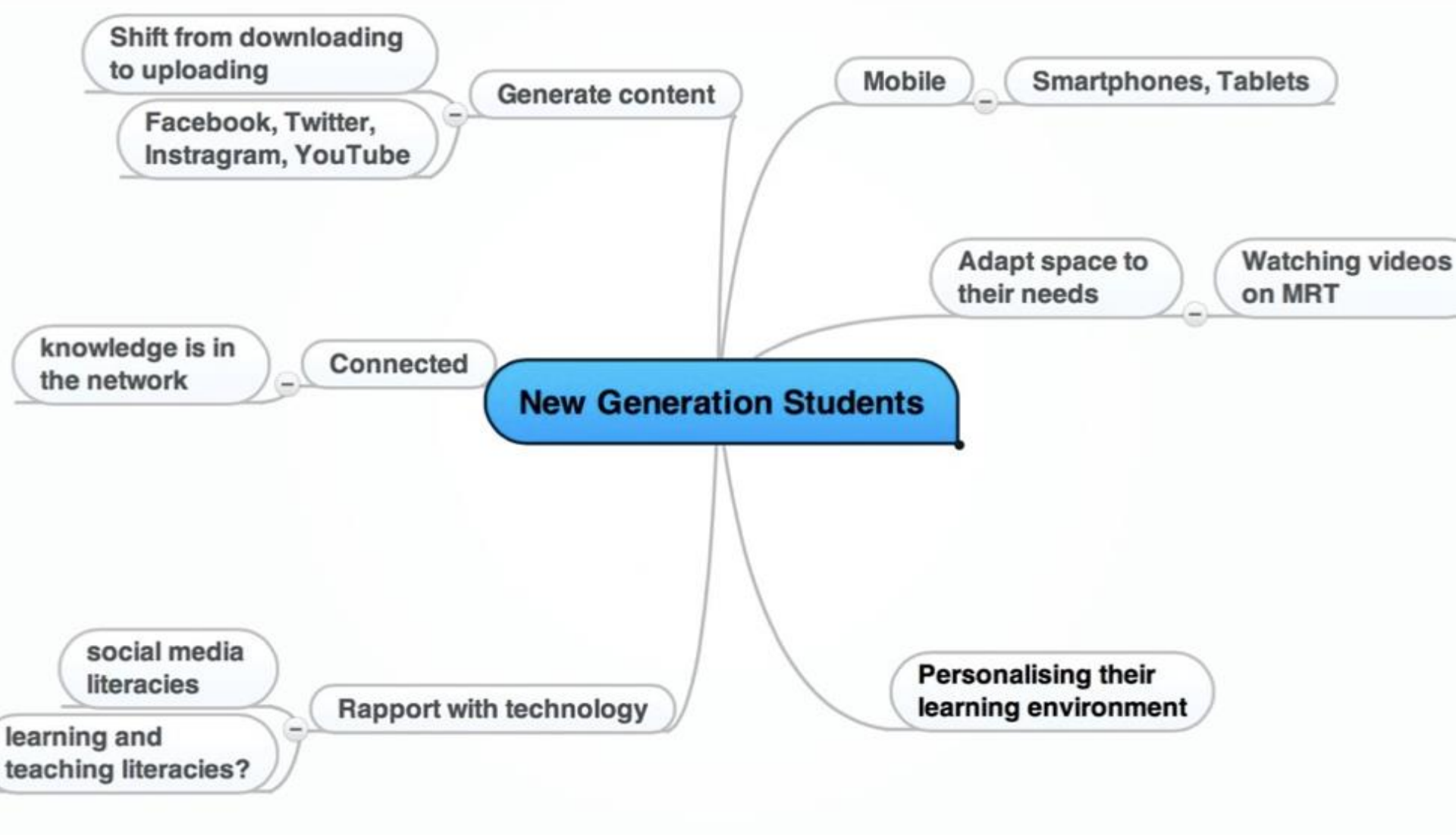
WORKPLACE EDITION

HOW TO MARKET A PRODUCT/SERVICE TO A

GENERATION Z TEENAGER:

Gen Alpha

Gen Alpha doesn't just use technology, they integrate it into their lives flawlessly. Flickr/Paul Mayne


New Generation Students
Generate content
Shift from downloading to uploading
Facebook, Twitter, Instragram, YouTube
Mobile
Smartphones, Tablets
Adapt space to their needs
Watching videos on MRT
Personalising their learning environment
Rapport with technology
social media literacies
learning and teaching literacies?
Connected
knowledge is in the network

(Riddle, 2014)


"I store my knowledge
with my friends"
Connectivism
Paragogy
Wisdom of Crowds

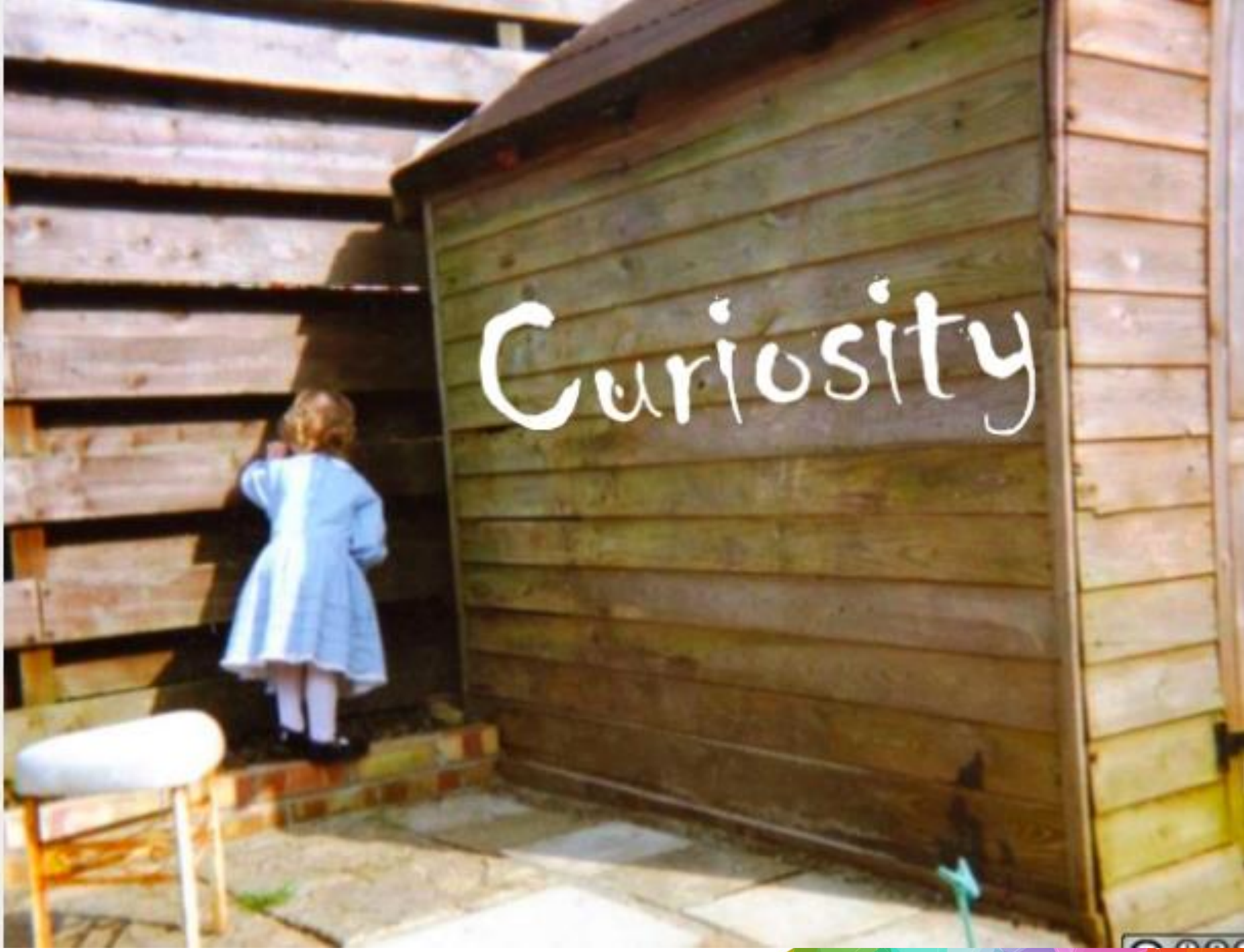
HOW DO YOU GRAB ONTO AN AUDIENCE THAT WON'T STAY STILL?

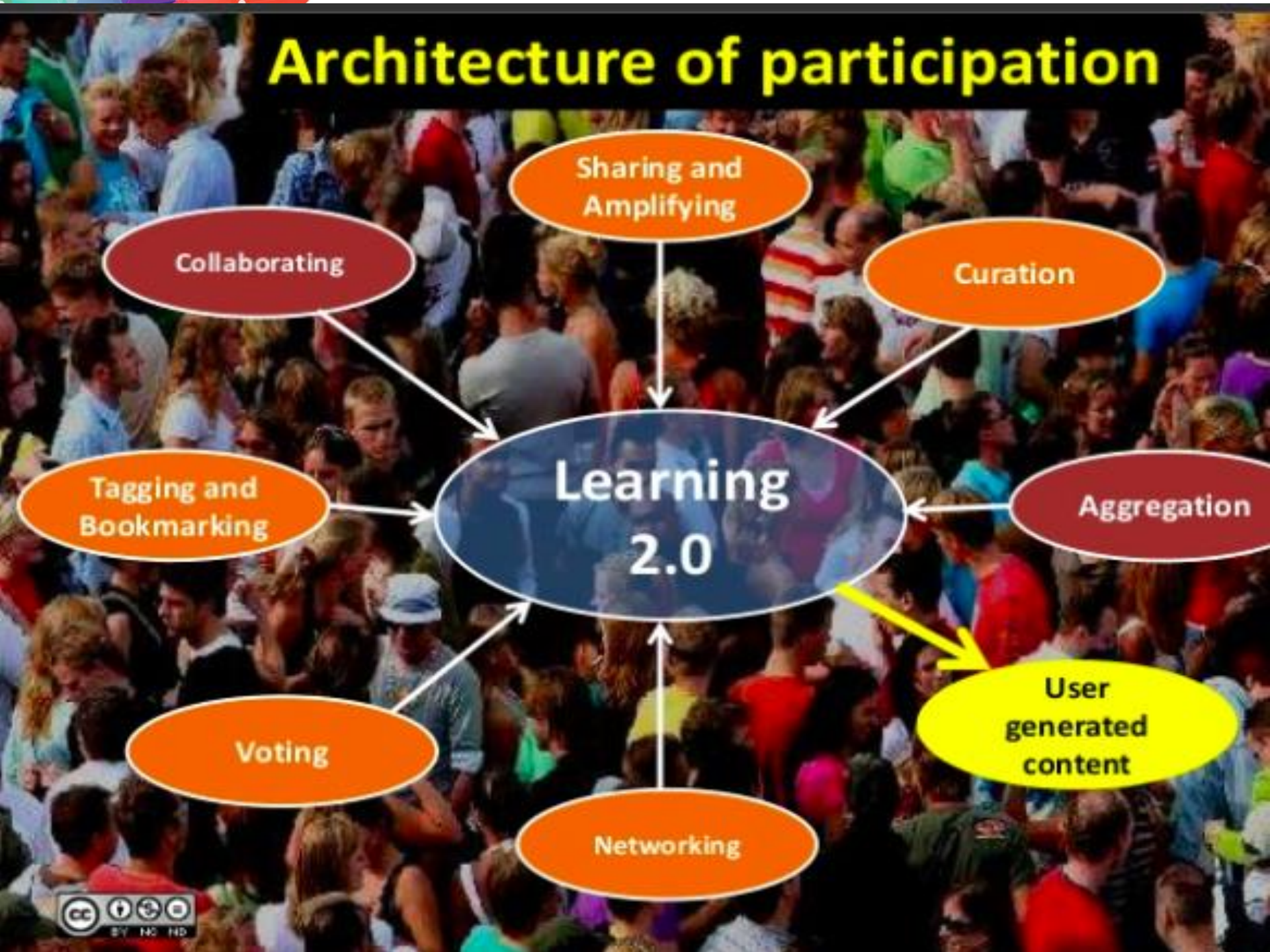
Millennials and Gen Z* have several screens and platforms at their disposal, quickly adopt new technologies and are abandoning conventional media. Vision Critical, the world's leading customer intelligence platform, conducted an exclusive study of the shifting media consumption habits of young consumers, and the results are startling.

Law of Disruption

Social, political, and economic systems change incrementally, but technology changes exponentially.

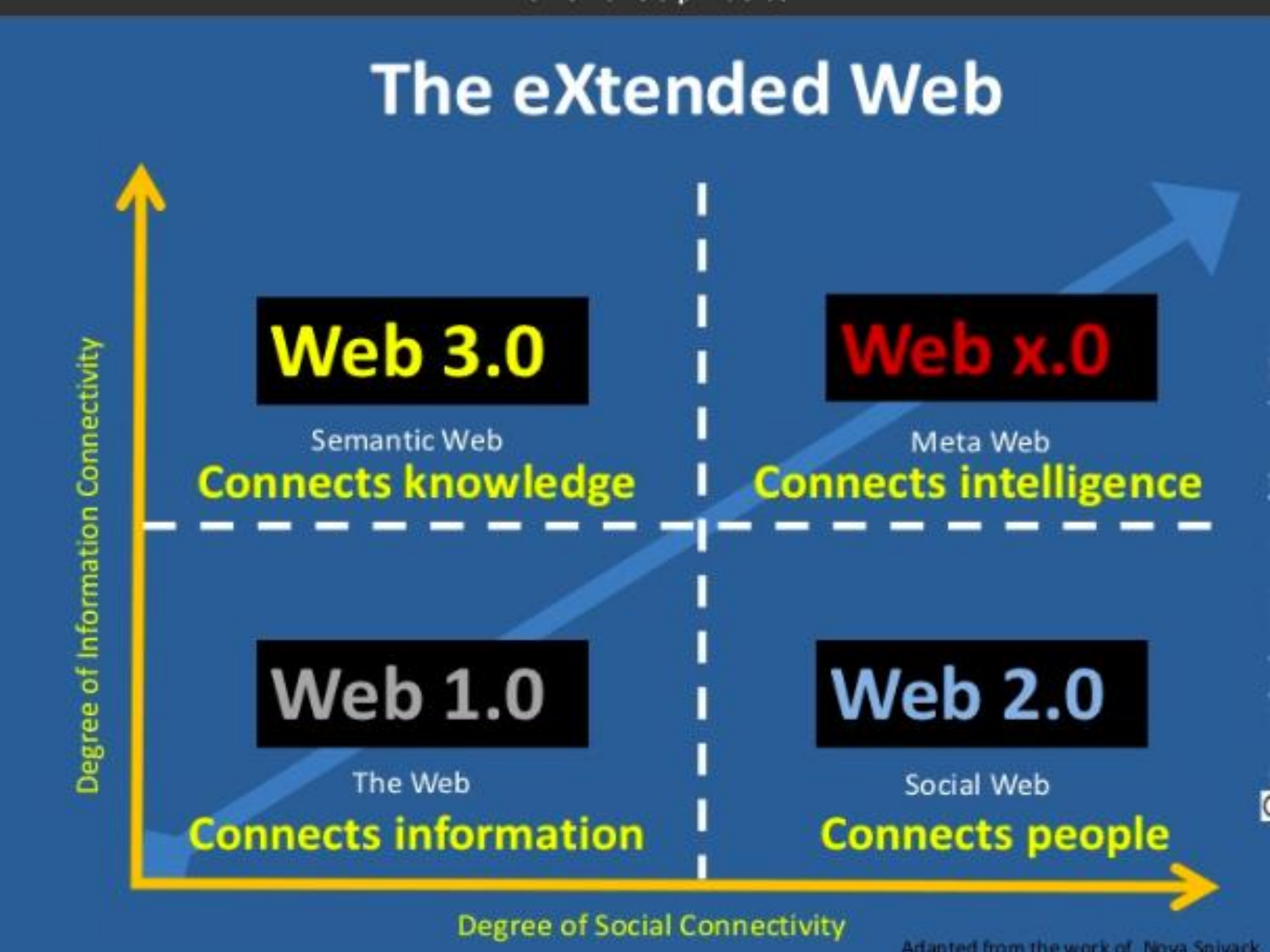
Larry Downes


Curiosity


Architecture of participation
Sharing and Amplifying
Collaborating
Curation
Learning 2.0
Tagging and Bookmarking
Aggregation
User generated content
Voting
Networking


Learning 3.0
Distributed (Cloud) computing
Extended smart mobile technology
Collaborative intelligent filtering
3D visualisation and interaction

Source: Kelly Hodgkins http://gizmodo.com/5813875/what-happens-in-60-seconds-on-the-internet


The eXtended Web
Web 3.0
Semantic Web
Connects knowledge
Web x.0
Meta Web
Connects intelligence
Web 1.0
The Web
Connects information
Web 2.0
Social Web
Connects people
Degree of Information Connectivity
Degree of Social Connectivity


Open
or
closed?

Self Organising Learning Spaces

The Emergence of 21st Century Globalized Online Learning Environments

Photo: Steve Wheeler

Crowdsourcing Knowledge

"Community as curriculum"

Personalized Learning Network

‘New’ learners are…

- more self-directed
- better equipped to capture information
- more reliant on feedback from peers
- more inclined to collaborate
- more oriented toward being their own “nodes of production”.

‘New’ learners are…

- more self-directed
- better equipped to capture information
- more reliant on feedback f
- more inclined t
- m

But they need much more…

Educati… …ured News
John K. … *– 13 December 2011*

Refocus our skills! Top skills in 2020 shift to critical thinking, creativity and Emotional Intelligence...

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

Source: Future of Jobs Report, World Economic Forum, 2017

THE FUTURE MAY BE CLOSER THAN YOU THINK

ELEVATE YOUR SIGHT FOR TOMORROW

65% OF YOUR CHILDREN IN SCHOOLS TODAY WILL END UP WORKING IN COMPLETELY NEW JOB TYPES THAT DON'T YET EXIST

Source: Future of Jobs Report, WEF2016

THE FUTURE MAY BE CLOSER THAN YOU THINK
ELEVATE YOUR SIGHT FOR TOMORROW

2022 SKILLS OUTLOOK

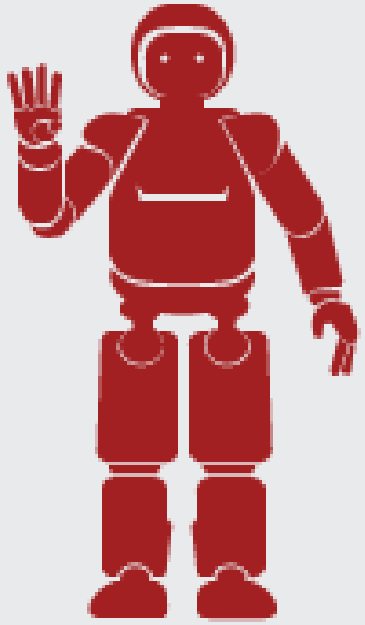
GROWING

1. Analytical Thinking & Innovation
2. Active learning & learning strategies
3. Creativity, originality & initiative
4. Technology design & programming
5. Critical thinking & analysis
6. Complex problem-solving
7. Leadership & social influence
8. Emotional intelligence
9. Reasoning, problem-solving & ideation
10. System analysis & evaluation

Source: Future of Jobs Report 2018, WEF

Robots: Jobs taker or jobs maker?

How technologies affect jobs has been perennial question ever since the first Industrial Revolution. A PwC survey of US manufacturers finds that US manufacturers see robotics technology as generating new high-skilled jobs while at the same time displacing workers.



Biggest impact of robots

New job opportunities to engineer advanced robots and systems

35%

28%

Replacement of workers

Source: PwC and Zpryme survey and analysis, "2014 Disruptive Manufacturing Innovations Survey," conducted in February 2014. Q: What will be the biggest impact of robots on the US manufacturing workforce in the next 3–5 years? Number of respondents: 105.

tip1

Take them **seriously**. They aren't just teenagers – they are consumers. Gen Z teens have access to **serious cash**.

Spending will reach
$200billion
by 2018

Gen Z population will reach
80million
people

9.7% of adults say that their children influence **100%** of what they buy (up from **7.6%** in 2014)

Understand **user persona.** They are go-getters, activists, and **dream big.**

tip2

75% of teens want to convert hobbies to full time jobs

72% of high school students want to start a business someday

61% would rather be an entrepreneur than an employee when they graduate college

tip3

Identify correct **social platforms** with market research before you begin promoting and marketing your product.

Develop **unique** products & campaigns and provide visual **depth.**

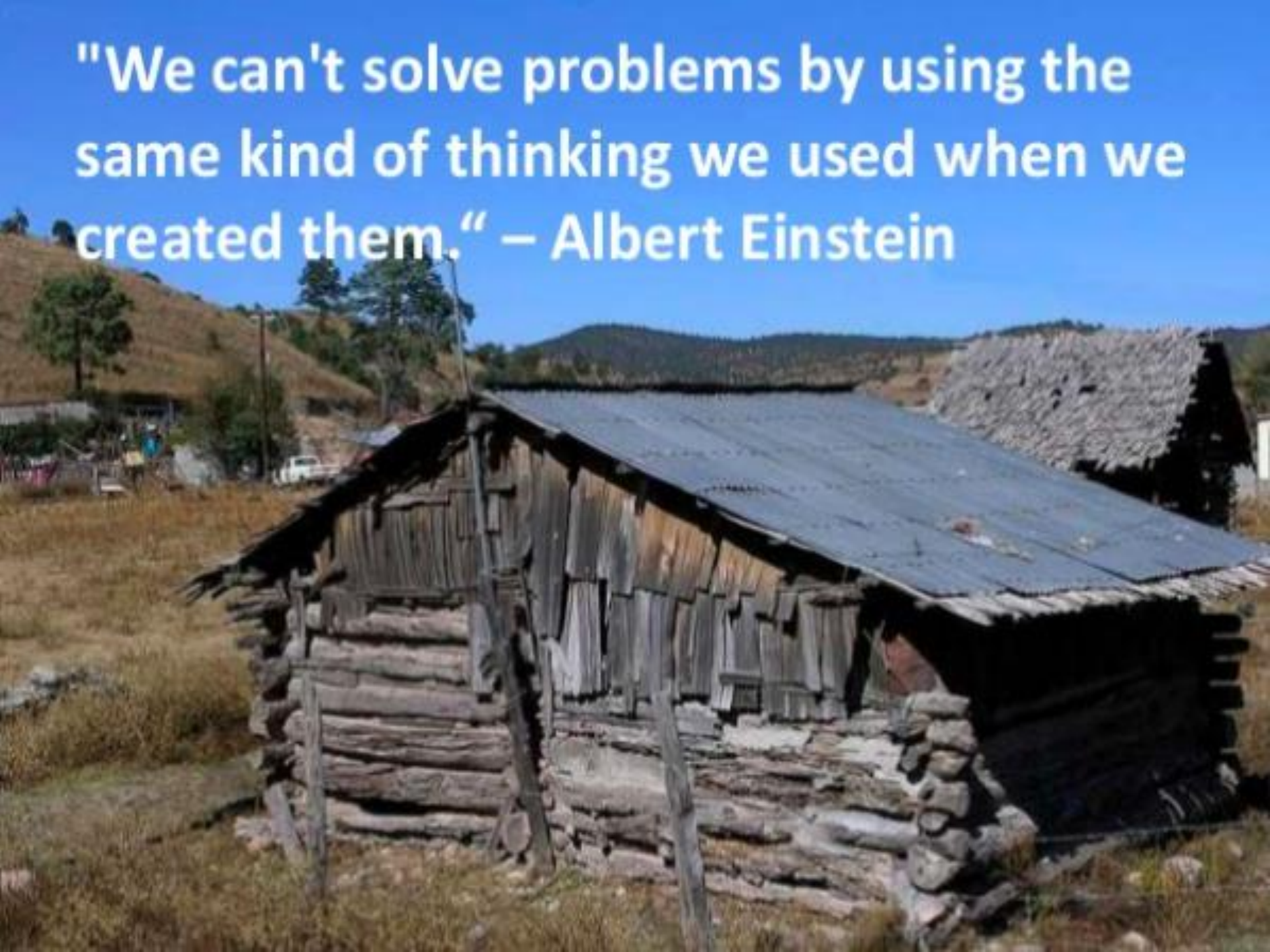
tip8

Gen Z shuns conformity and tradition.

They like **storytelling** and **visual displays**.

The future….

- The future is unpredictable
- The future can be found in the past
- We can invent our own future


"We can't solve problems by using the same kind of thinking we used when we created them." – Albert Einstein

Skills You Need Now to Land the Jobs of the Future

(Crimson 2018)

Future Skills

- Mental Elasticity and Complex Problem Solving
- Critical Thinking
- Creativity
- People Skills
- STEM (Science, Technology, Engineering, Mathematics)
- SMAC (Social, Mobile, Analytic, Cloud)
- Interdisciplinary Knowledge

(Crimson, 2018)

(Crimson 2018)

Top 10 Jobs in 2030

- Trash Engineer
- Alternative Energy Consultant
- Earthquake Forecaster
- Medical Mentor
- Organ/Body Part Creator
- Memory Surgeon
- Personal Productivity Person
- Personal Internet of Things (IoT) Security Repair Person
- Flight Instructor
- Commercial Space Pilot

(Crimson, 2018)

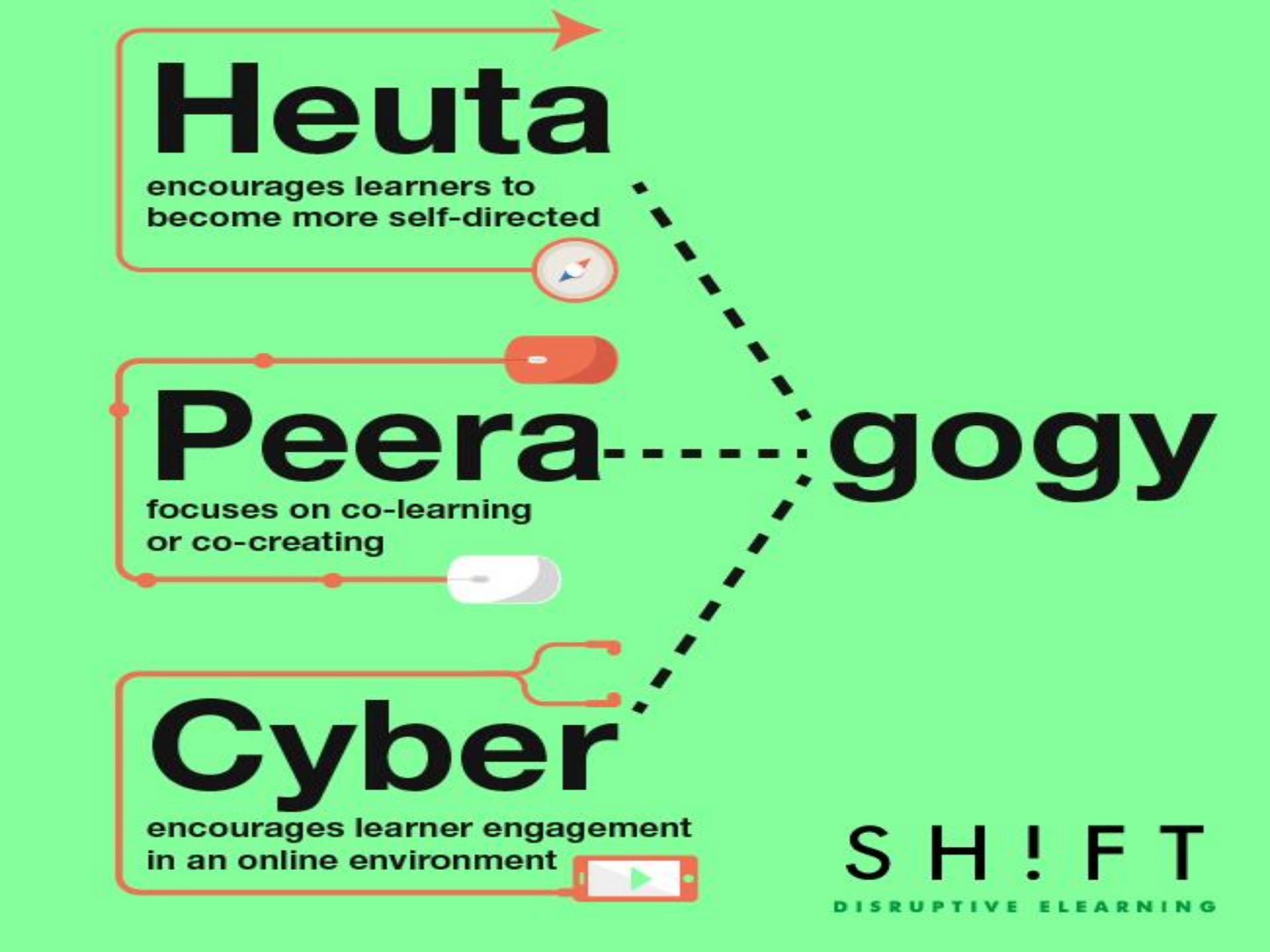

HOW?

Four Concepts shaping the Futuristic Learning

- Andragogy
- Heutagogy
- Peeragogy
- Cybergogy

Andragogy

- Self-concept
- Experience
- Readiness to learn
- Orientation to learning
- Motivation to learn


Heuta
encourages learners to become more self-directed
Peera
gogy
focuses on co-learning or co-creating
Cyber
encourages learner engagement in an online environment
SHIFT
DISRUPTIVE ELEARNING

Teaching and Learning 4.0

A collaborative environment that connects to the creative community of learners to the world that serves as a learning laboratory

Teaching & Learning 4.0

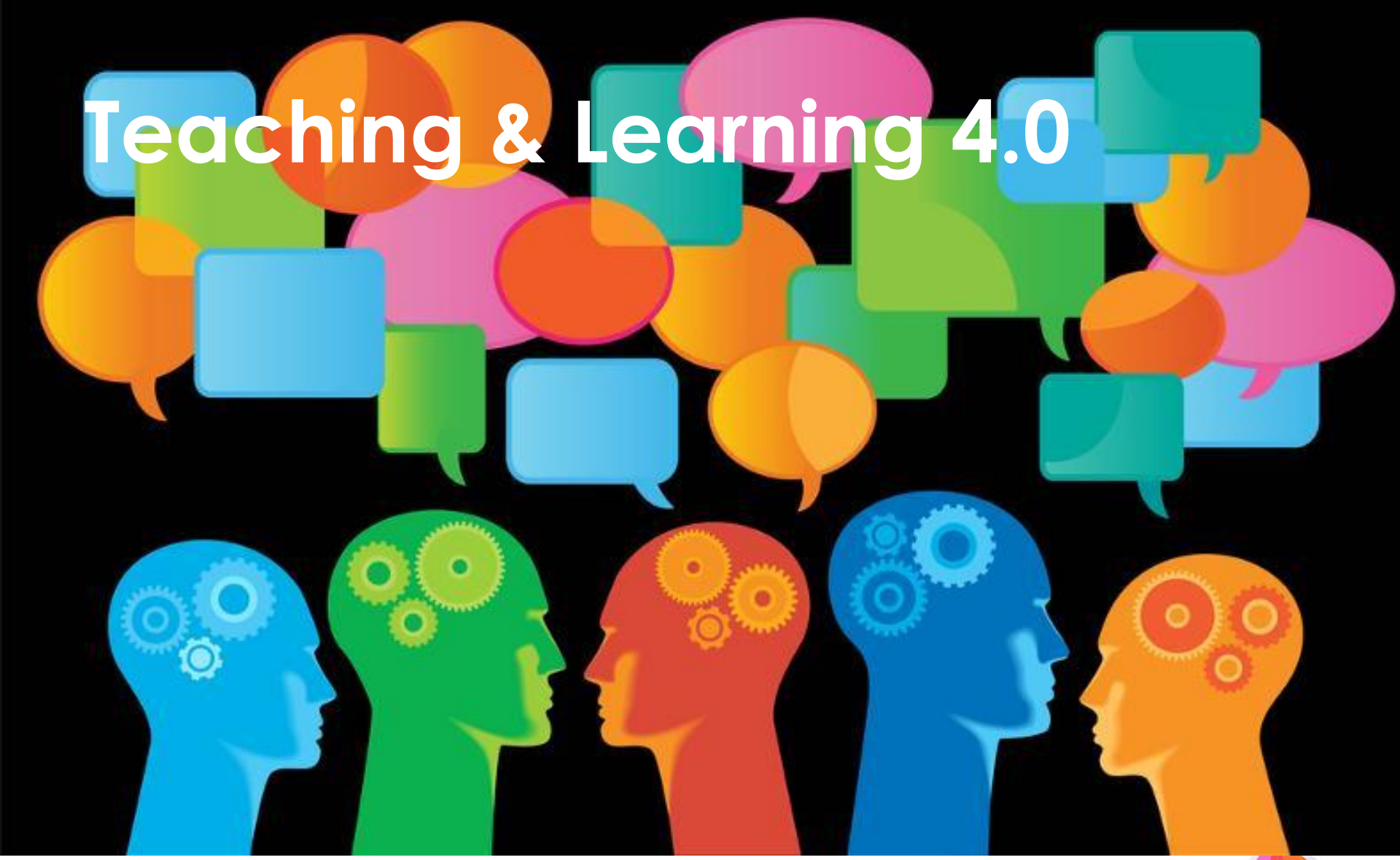
Anywhere Anytime

Teaching & Learning 4.0

Personal


Teaching & Learning 4.0
TELEPHONE
Flexible Delivery

Teaching & Learning 4.0



Peers and Mentors

Teaching & Learning 4.0

Why/Where NOT What/ How

Teaching & Learning 4.0

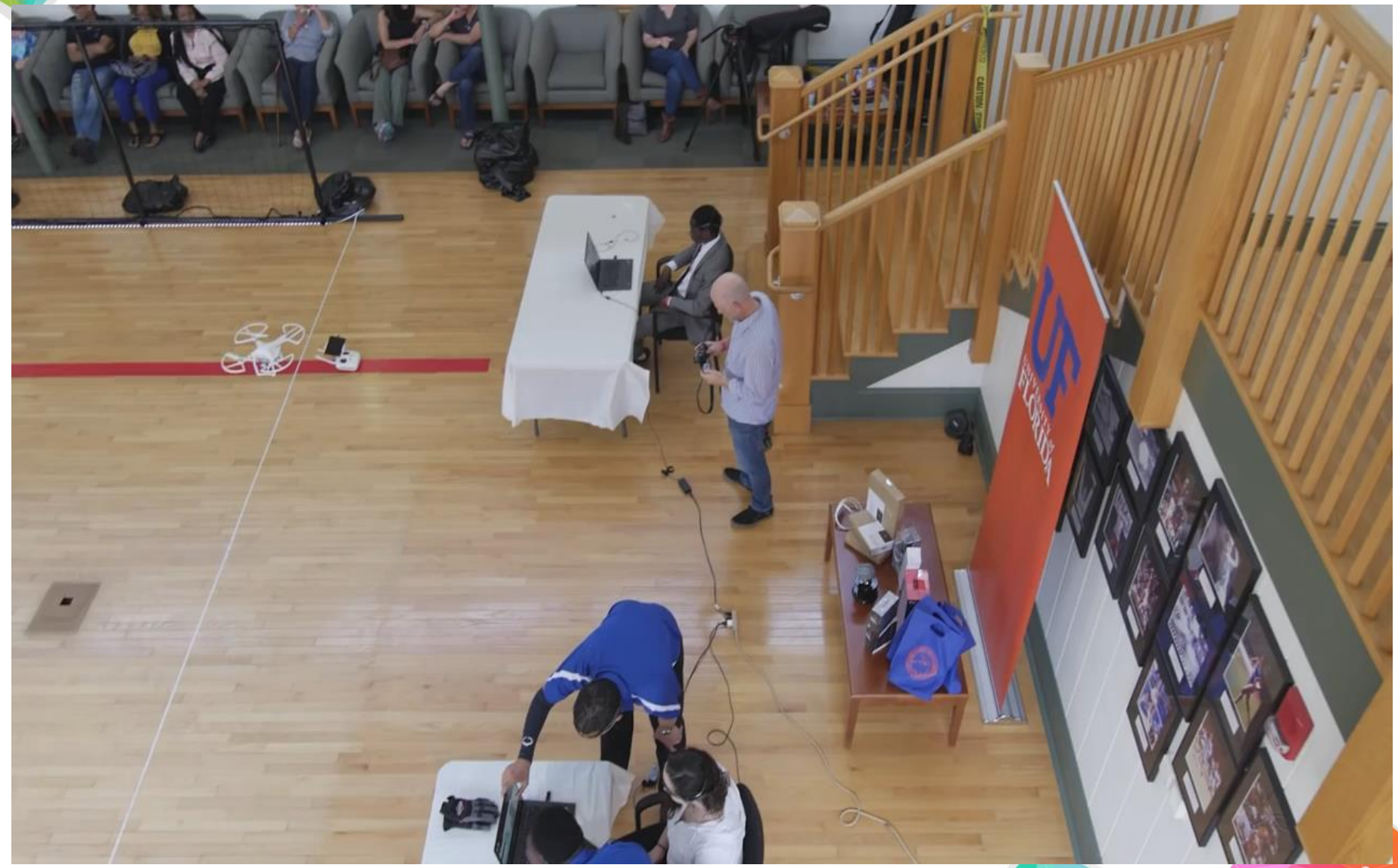
Practical Application

Teaching & Learning 4.0

Modular and Projects

Teaching & Learning 4.0

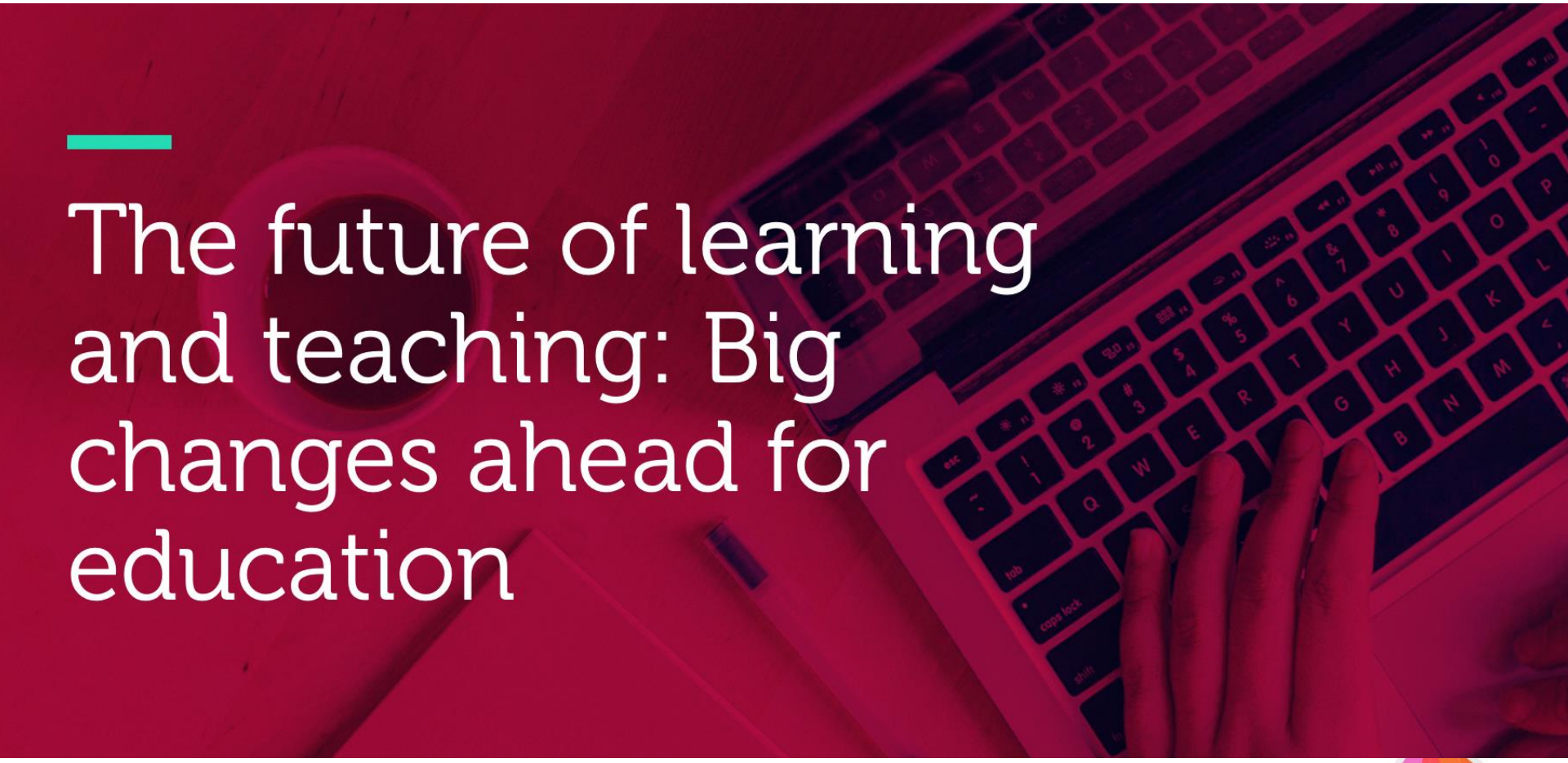
Student Ownership


UF
EXPLORATION

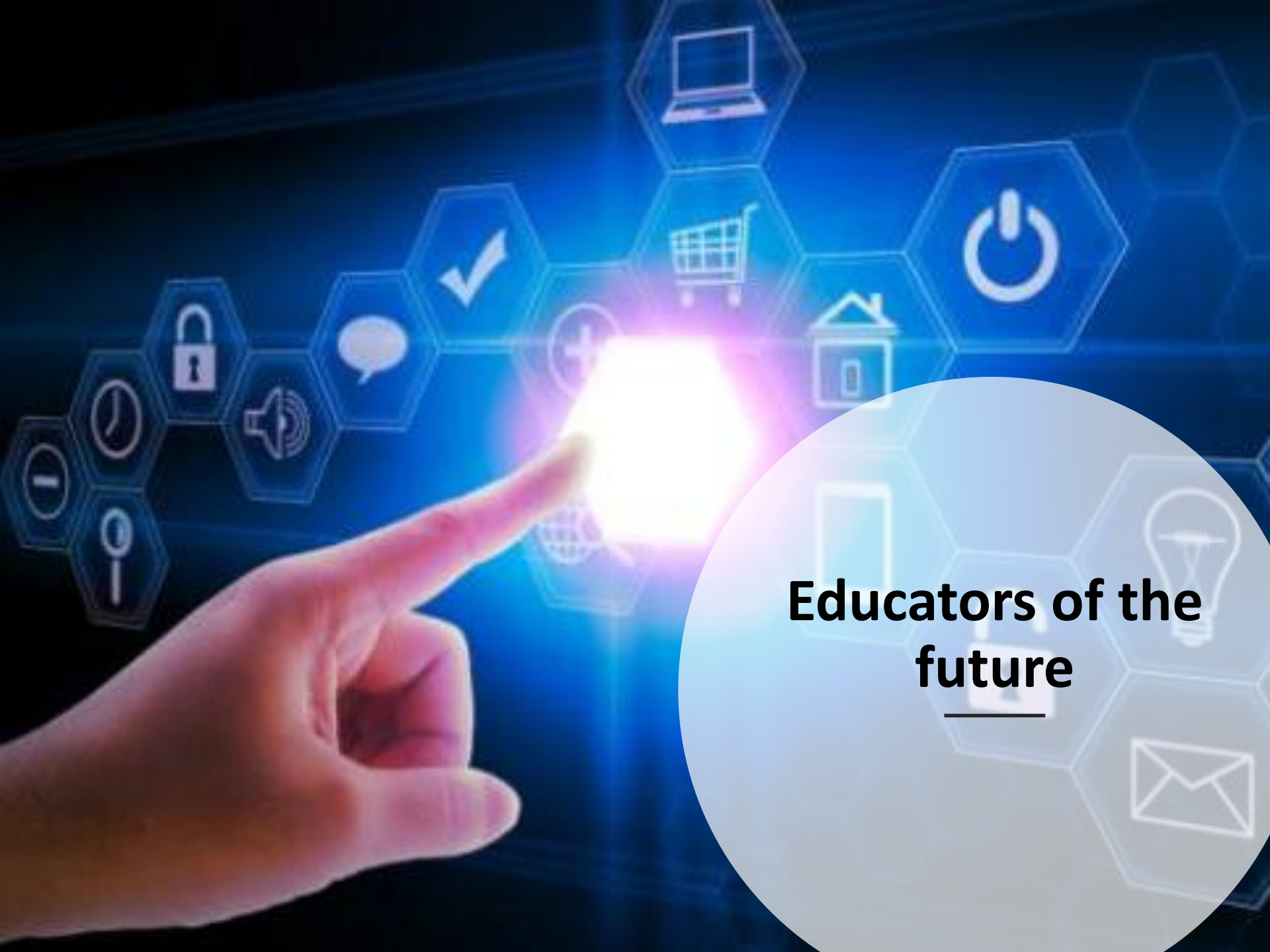
Teaching & Learning 4.0

Evaluated NOT Examined

The future of learning and teaching: Big changes ahead for education



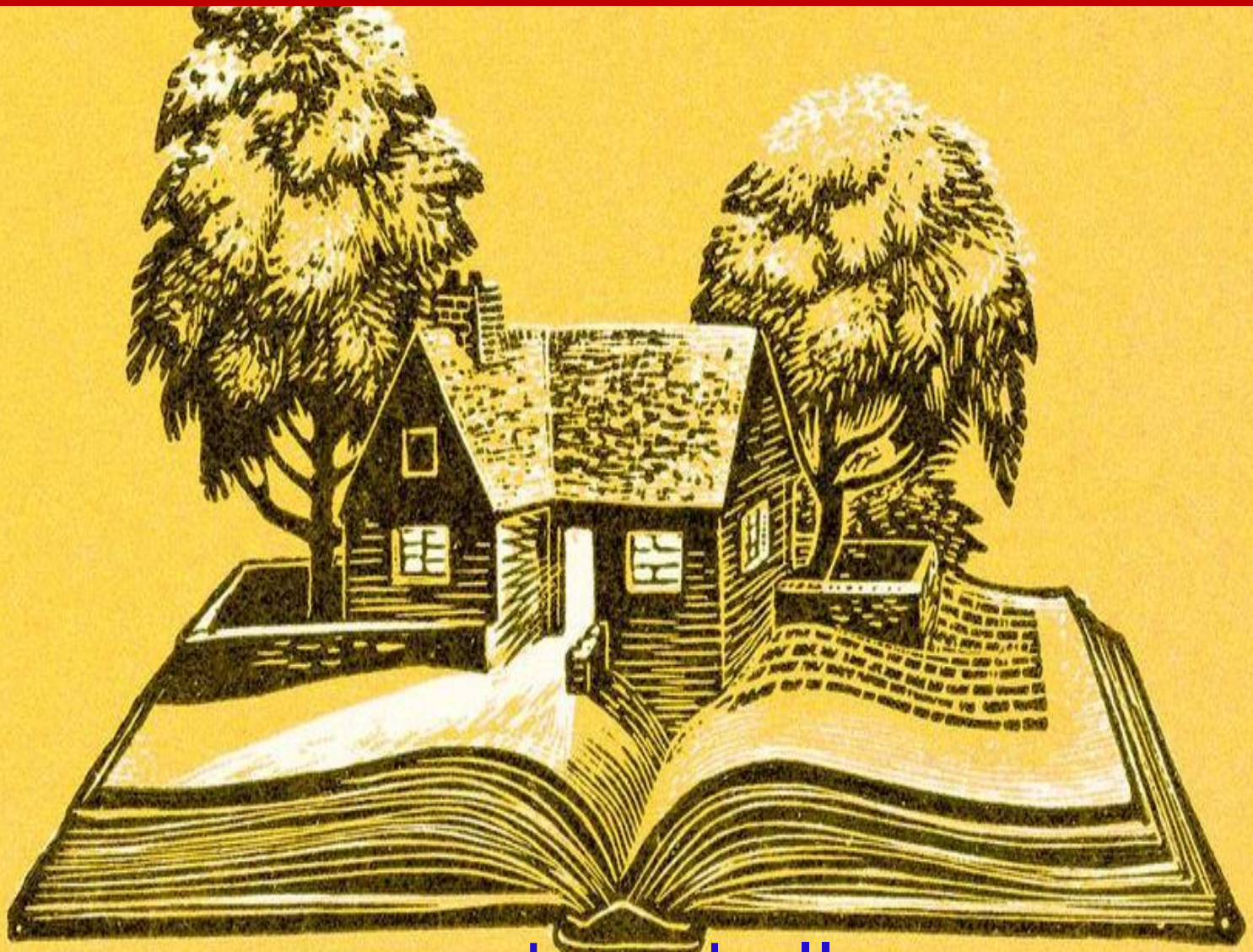
Flip the roles, not just the classroom


Educators of the future

Educators of the Future

designer

Educators of the Future

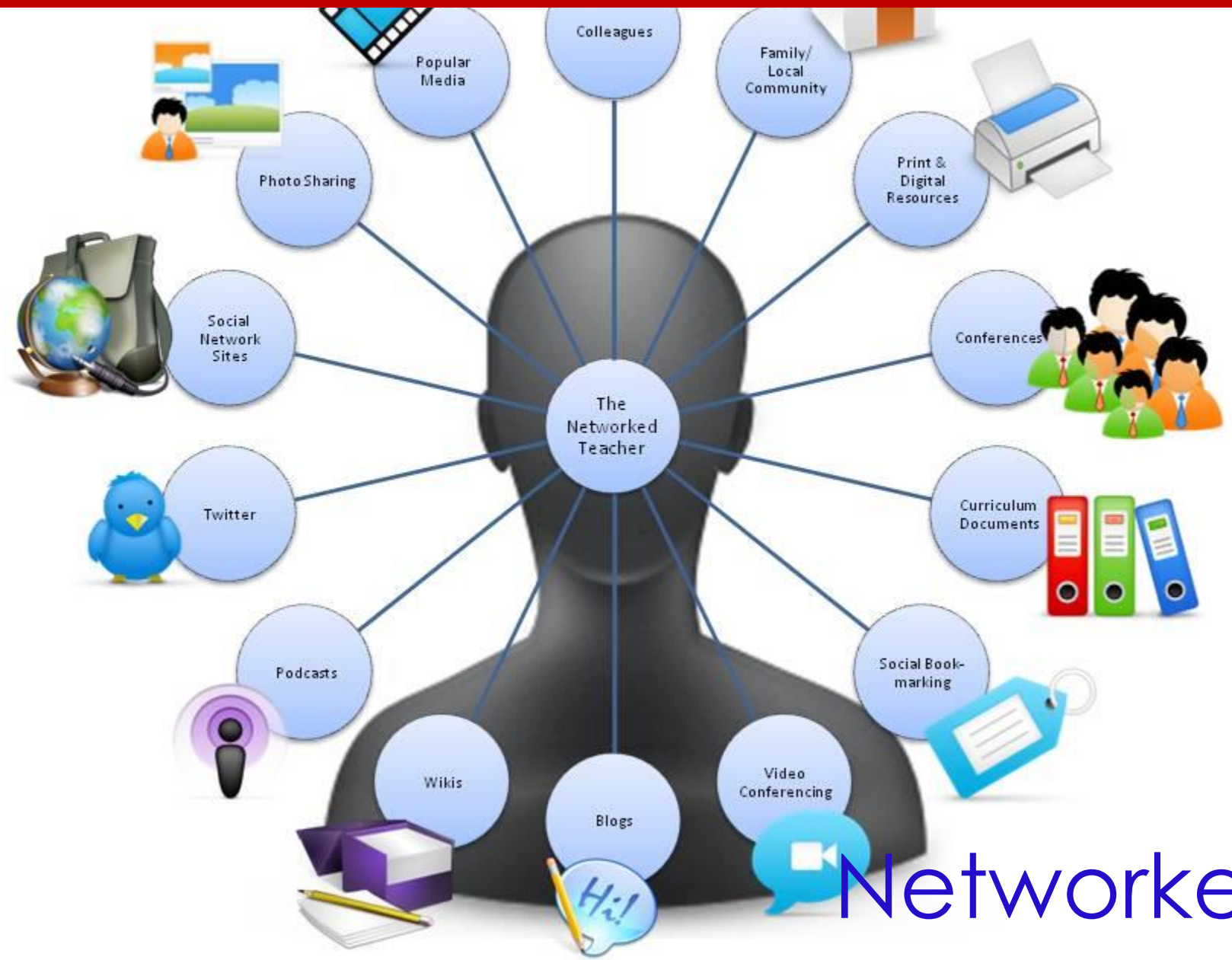


storyteller

Educators of the Future

Learner

Educators of the Future



Networked

Educators of the Future

Educators of the Future

Innovator

Educators of the Future

Educators of the Future

analysts, planners, collaborators,

Educators of the Future

curriculum experts, synthesizers

Educators of the Future

problem-solvers and researchers


Drone-based learning

Universiti Kebangsaan Malaysia
The National University of Malaysia

Pusat Pengajaran & Teknologi Pembelajaran
Centre for Teaching & Learning Technologies

EDUCATION 4.0 WORKSHOP SERIES 2018

DRONAGOGY

Drone-Based Learning for the FOURTH INDUSTRIAL REVOLUTION

DR. MUHAMMAD HELMI BIN NORMAN
Universiti Kebangsaan Malaysia

11th OCTOBER 2018
8.30AM - 1.00PM

Hab Inovasi Pembelajaran,
Fakulti Pendidikan,
Universiti Kebangsaan Malaysia, Bangi.

Registration:

Please click on the link below or scan the QR code to register.

http://bit.ly/2BKRwbl

Secretariat:

Nor Haryanti Rasli
03 8921 4299
yanti@ukm.edu.my

Augmented-Reality AR-based Learning

KnowledgeWorks

AUTOMATING CHOICES

Algorithms and artificial intelligence are becoming increasingly embedded in our lives. They are automating many of our experiences, services and interactions with one another to achieve efficiency and personalization and are raising questions related to trust, bias and individual agency.

CIVIC SUPERPOWERS

Individuals, nonprofits and volunteer organizations are flexing their civic muscles. They are using participatory media, machine learning and data analytics to fill a growing governance gap, with hopes of reweaving the social fabric and redefining civic engagement.

ACCELERATING BRAINS

Rapid advances in technology and neuroscience are combining to transform our cognitive abilities in intended and unintended ways. They are shaping how we partner with digital tools, relate with one another and engage with our surroundings.

TOXIC NARRATIVES

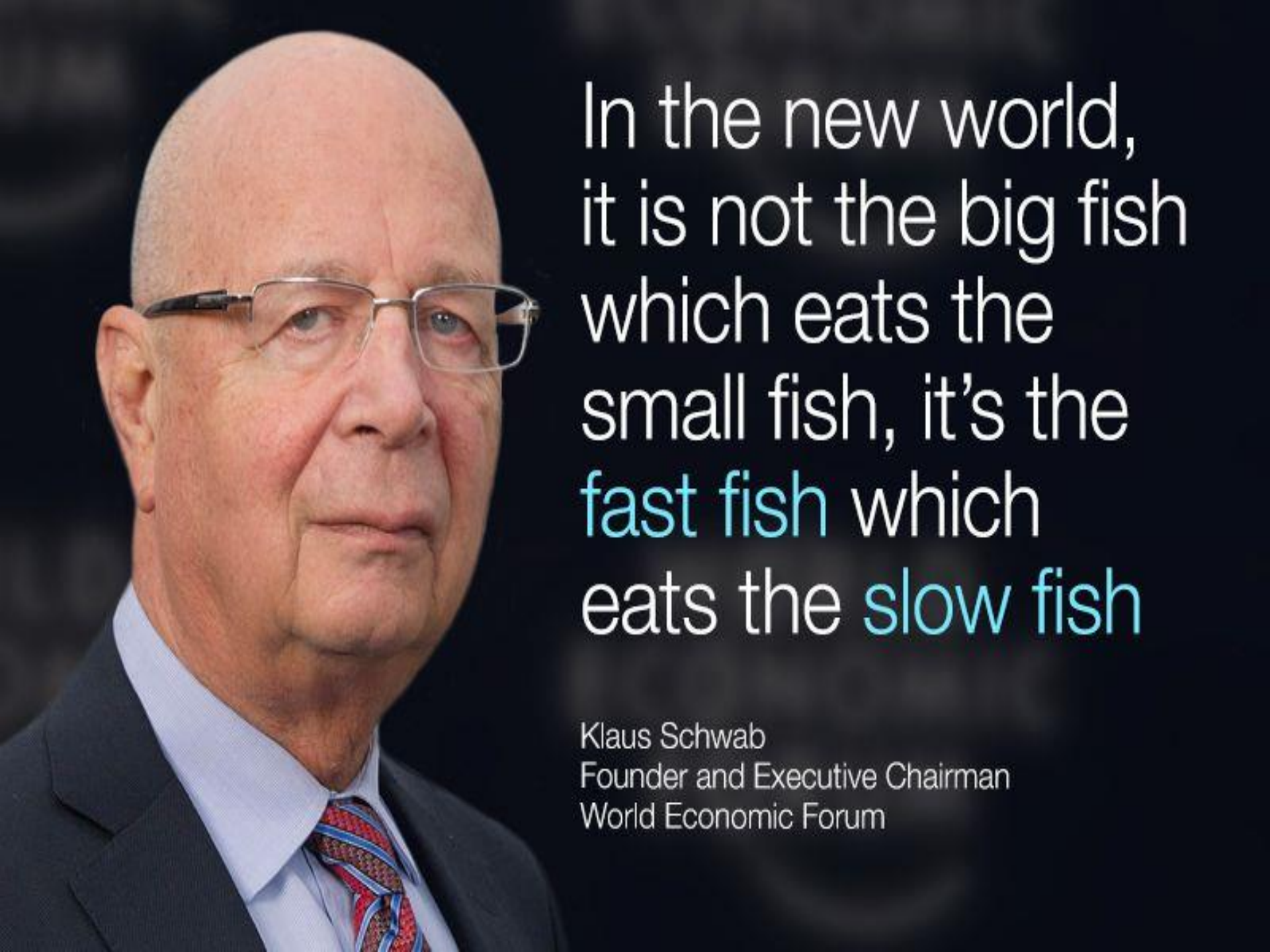
The narratives and metrics of success and achievement that shape people's aspirations, choices and behaviors are becoming increasingly detrimental to individual and social health and are contributing to growing toxicity in systems and institutions.

REMAKING GEOGRAPHIES

Migration patterns, small-scale production and efforts to grow placed-based and cultural assets are combining to reshape community landscapes in response to economic transition and climate volatility.

The next few pages describe these drivers of change in more detail and raise key questions about what they could mean for learning.

5 Drivers of Change


In the new world, it is not the big fish which eats the small fish, it's the fast fish which eats the slow fish
Klaus Schwab
Founder and Executive Chairman
World Economic Forum

The future of learning in IR 4.0 will be dramatically different, at all levels of education and throughout life

Are we ready to *change?*