PART II

TRANSFORMING PHILIPPINE EDUCATION IN THE AGE OF INDUSTRY 4.0

25 April 2019
Heritage Hotel, Pasay

CUSTER C. DEOCARIS, PH.D.
Chief, Research Management Division
Commission on Higher Education (CHED)

STE[+A]M FOR PHILIPPINES 4.0

CUSTER C. DEOCARIS, PH.D.
RESEARCH MANAGEMENT DIVISION
COMMISSION ON HIGHER EDUCATION (CHED)

26 SEPTEMBER 2018
CENTURY PARK HOTEL-MANILA

STEM to STEAM

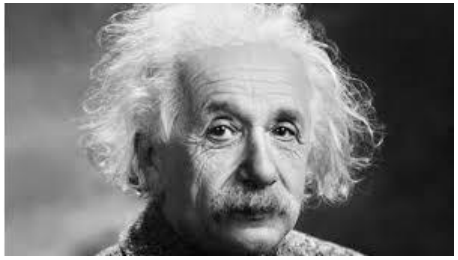
Science | Technology | Engineering | [+ART] | Mathematics

STEM to STEAM

Science | Technology | Engineering | [+ART] | Mathematics

STEM brings together principles of Science, Technology, Engineering & Mathematics with key skills such as problem solving, strategic thinking and collaboration to produce quality products.

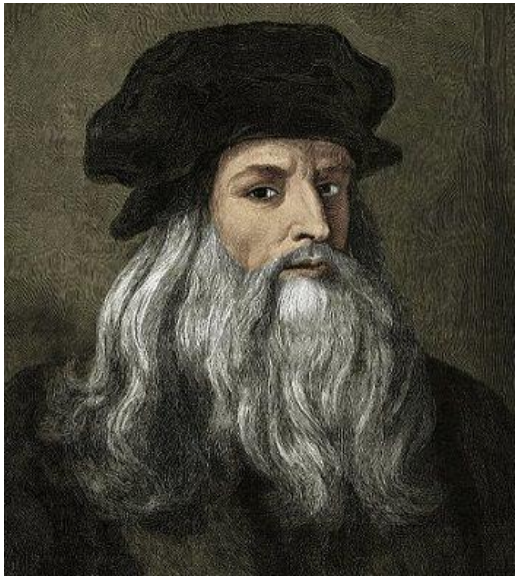
The Arts can connect the dots between the disciplines of STEM. It ignites creative and imaginative thinking which is an essential driver behind innovation a founding principle behind STEM education.



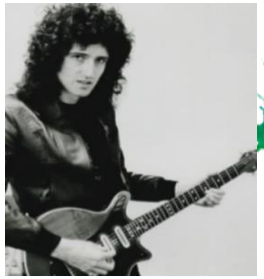
Albert Einstein

Stephen Hawking

Steve Jobs



Leonardo da Vinci



Brian May (Queen)

THAILAND 4.0

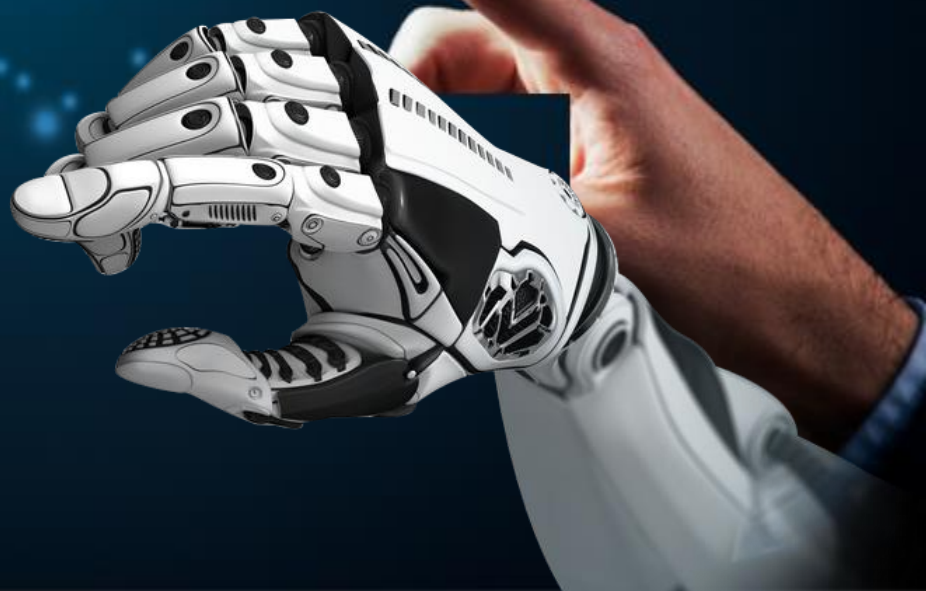
4.0

INDUSTRY 4.0
MALAYSIA

Google search for “Philippines 4.0” as of 12:35 AM, 26 Sept 2018

WHAT IS

INDUSTRY 4.0



A.D. 1769 . . . . . N° 913.

Steam Engines, &c.

WATT'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME I, James Watt, of Glasgow, in Scotland, Merchant, send greeting.

WHEREAS His most Excellent Majesty King George the Third, by His Letters Patent under the Great Seal of Great Britain, bearing date the Fifth day of January, in the ninth year of His said Majesty's reign, did give and grant unto me, the said James Watt, His special license, full power, sole privilege and authority, that I, the said James Watt, my exors, admors, and assigns, should and lawfully might, during the term of years therein expressed, use, exercise, and vend, throughout that part of His Majesty's Kingdom of Great Britain called England, the Dominion of Wales, and Town of Berwick upon Tweed, and also in His Majesty's Colonies and Plantations aforesaid, my "New Invention Being or Improvements upon the Fire or Fire Engines," in which said recited Letters Patent is contained a proviso obliging me, the said James Watt, by writing under my hand and seal, to cause a particular description of the nature of the said Invention to be inrolled in His Majesties High Court of Chancery within four calendar months after the date of the said recited Letters Patent, as in and by the said Letters Patent, and the Inrolment in that behalf made, relation being thereunto respectively had, may more at large appear.

NOW KNOW YE, that in compliance with the said proviso, and in pursuance of the said Statute, I, the said James Watt, do hereby declare that the

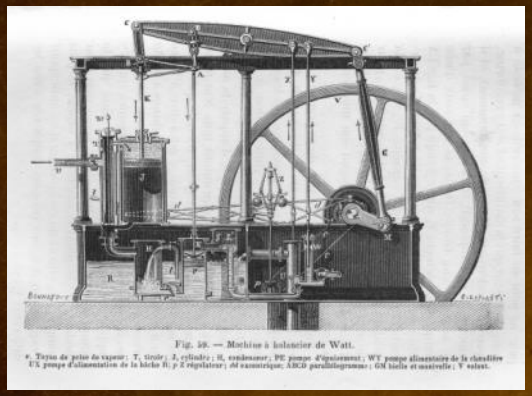


Fig. 59. — Machine à balancier de Watt.

e, Tuyau de petite de vapeur; T, tiroir; J, cylindre; H, condenseur; PE pompe d'épuisement; WY pompe alimentaire de la chaudière UA pompe d'alimentation de la bâche B; p Z régulateur; dd excentrique; ABCD parallélogramme; GM bielle et manivelle; V volant.

James Watt
(Patent 913: A method of lessening the consumption of steam in steam engines – the separate condenser)
Filed: 5 January 1769

INDUSTRY 1.0 (circa 1770)

Revolt of the Luddites

British Parliament Response

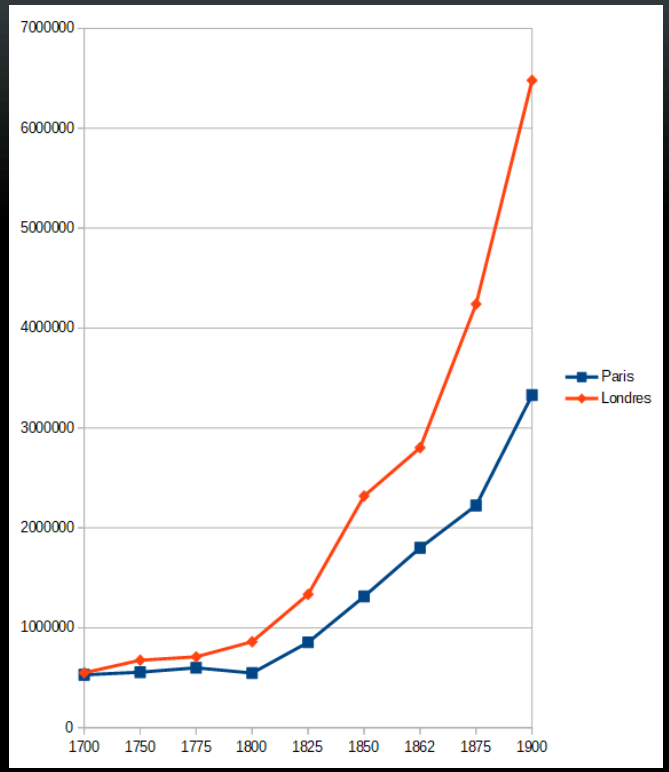
- Frame Breaking Act of 1812
- Malicious Damage Act 1861

INDUSTRY 1.0 (circa 1770)

London and Paris (19th century)

Print c. 1840 by John Le Ceux, of Second Court, St. John's College, Cambridge

Victor Hugo
Les Misérables (1862)

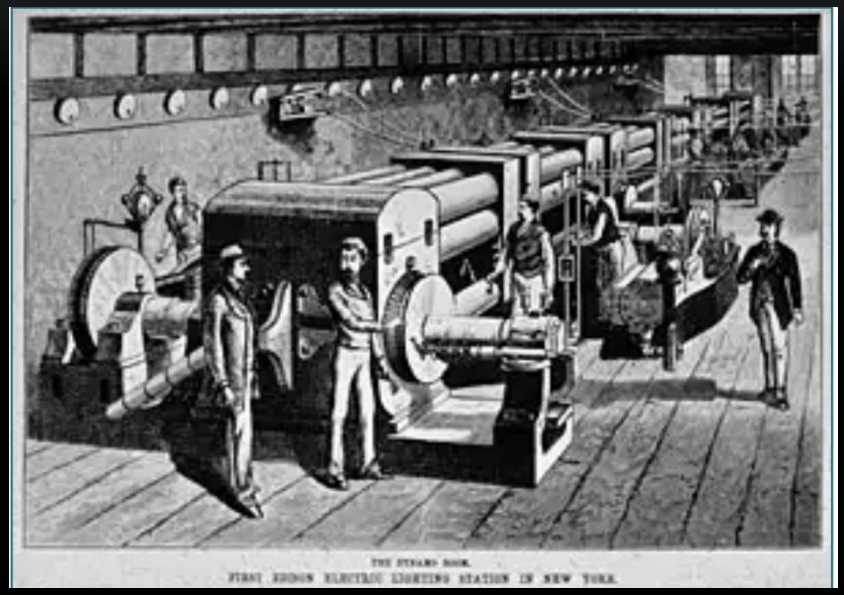


Source: Chandler datas, from 1987

INDUSTRY 1.0 (circa 1770)

Age of Electrification (late 19th century)

Mary Poppins Returns (2018)
Scene: Edwardian, London (1910)



Electric generator at Pearl street, Manhattan installed by Thomas Edison (1914)

INDUSTRY 2.0 (circa 1900)

Moving Assembly Line and Expansion of the Iron & Steel Industry

Engine installation at the Ford Motors, Highland Park, Michigan (1913)

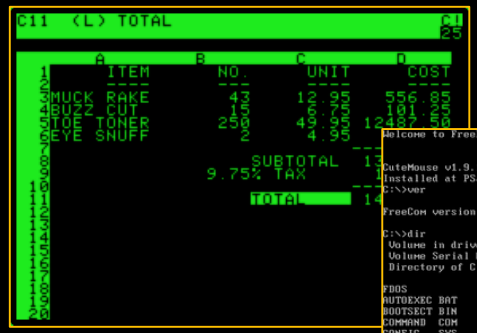
Early 20th century high rise building, e.g. Empire State Building (1931)

INDUSTRY 2.0 (circa 1900)

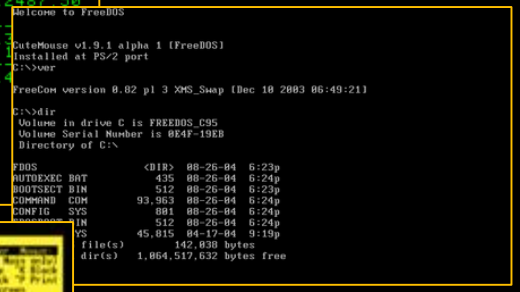
Birth of Personal Computers

Altair 8800 (1975)

Steve Wozniak and Steve Jobs started Apple (April 1, 1976)



VisiCalc , Apple (1979)



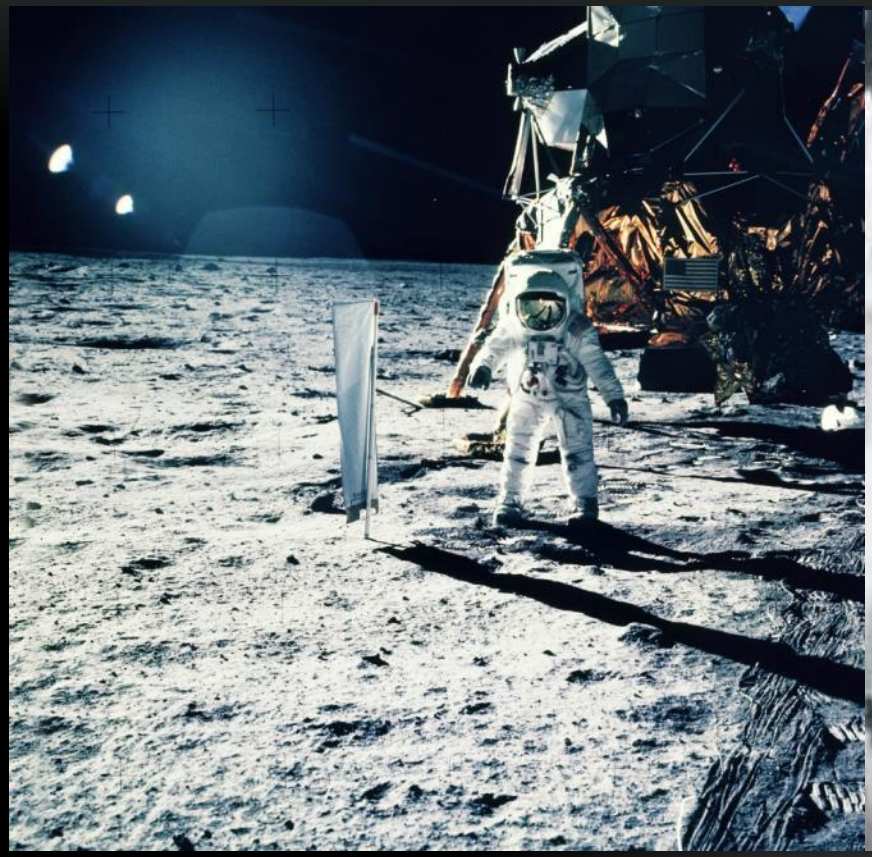
DOS , Microsoft (1981)

Wordstar 3.0 (1982)

Paul Allen and Bill Gates started Microsoft (April 4, 1975) and wrote BASIC for Altair

INDUSTRY 3.0 (1970)

Race of Programmable Logic Controllers (1969)



INDUSTRY 3.0 (1970)

Era of Super-Fast Computation and Connectivity

Robot Swarms

Additive Manufacturing (3D Printers)

Digital Twin, *Black Panther* (2018)

Driverless Cars, *Knight Rider* (1982)

INDUSTRY 4.0 (2000)

Birth of the Social Humanoids

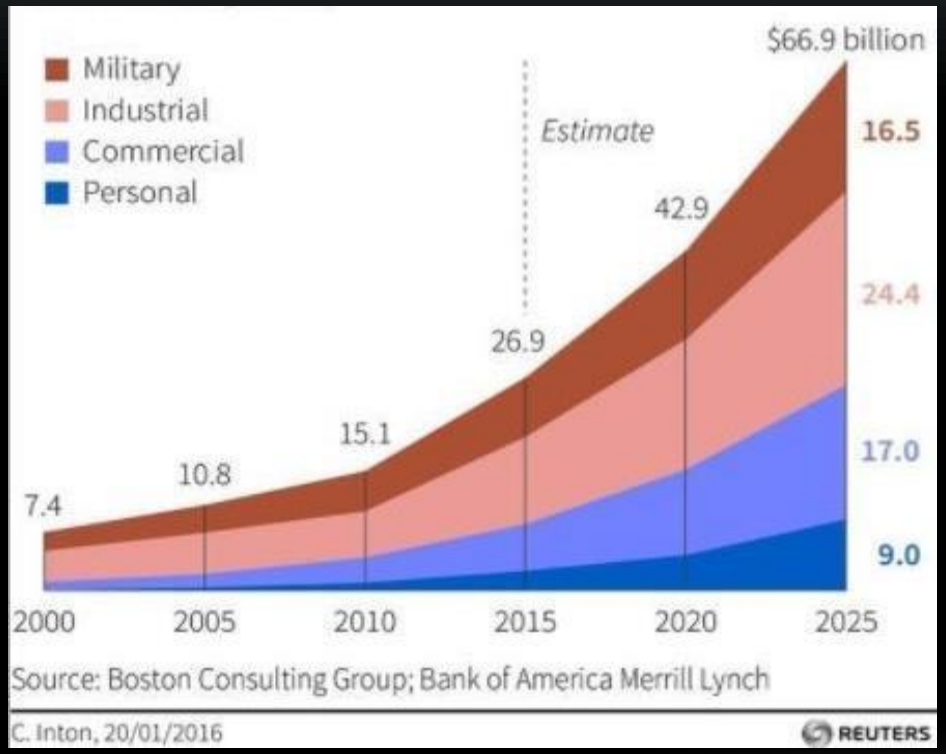
Sophia, the robot, by Hanson Robotics, Hong Kong (2016)

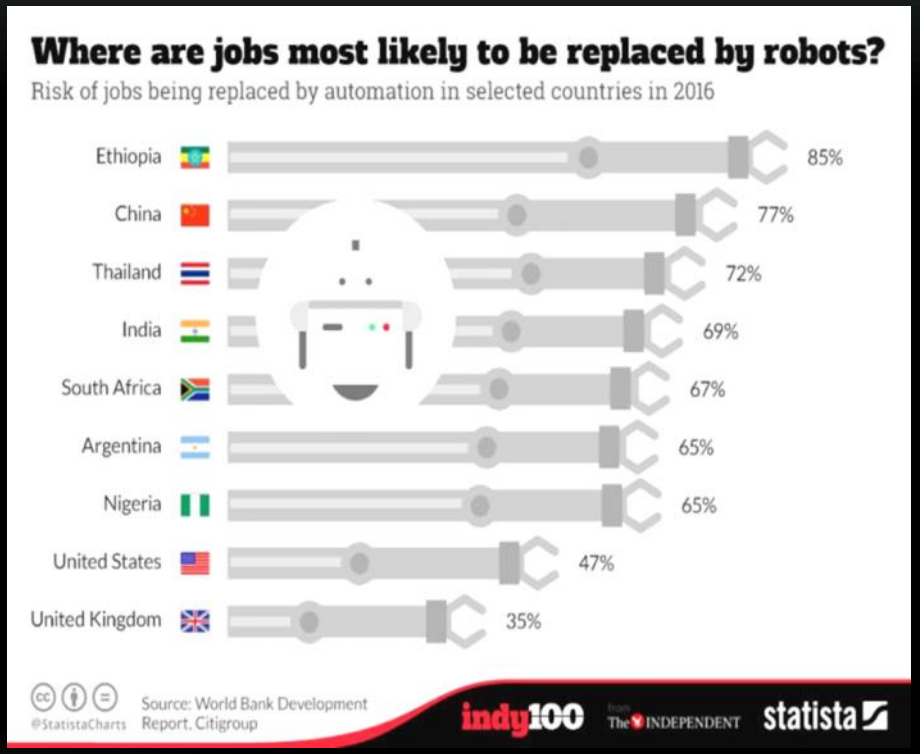
INDUSTRY 4.0 (2000)

Deep Blue (AI) *vs* Garry Kasparov (1989)

INDUSTRY 4.0 (2000)

Global Spending on Robotics on the rise





INDUSTRY 4.0 (2000)

Global Spending on Robotics on the rise

Foxconn replacing 60,000 workers by robots in Guangdong, China (2017)

Molly Robotics showcased a robot chef that prepares 2,000 gourmet meals (2017)

Catalogue of fears

Probability of computerisation of different occupations, 2013
(1 = certain)

Job	Probability
Recreational therapists	0.003
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health technologists	0.40
Economists	0.43
Commercial pilots	0.55
Machinists	0.65
Word processors and typists	0.81
Real-estate sales agents	0.86
Technical writers	0.89
Retail salespeople	0.92
Accountants and auditors	0.94
Telemarketers	0.99

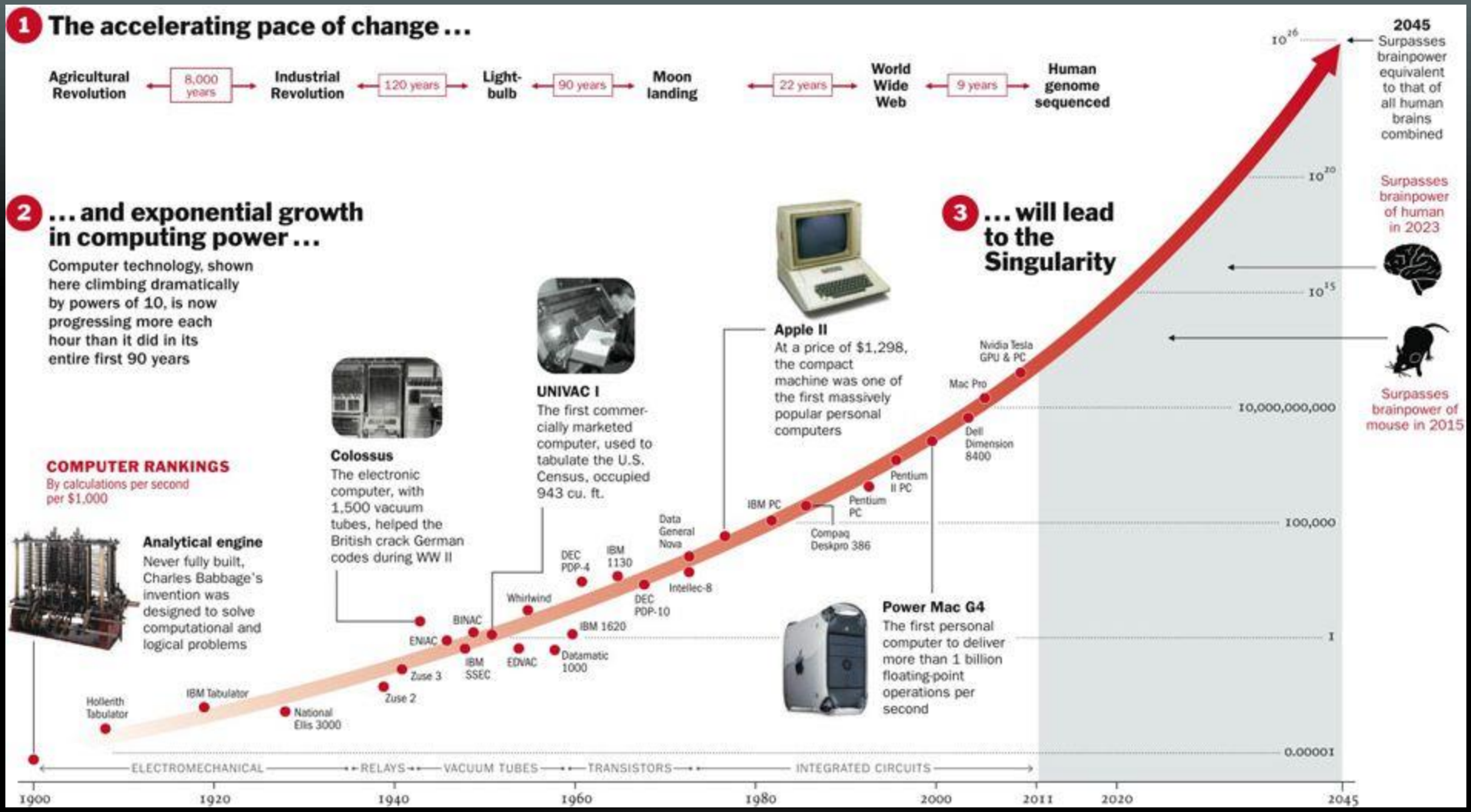
Source: "The Future of Employment: How Susceptible are Jobs to Computerisation?", by C. Frey and M. Osborne (2013)

Economist.com

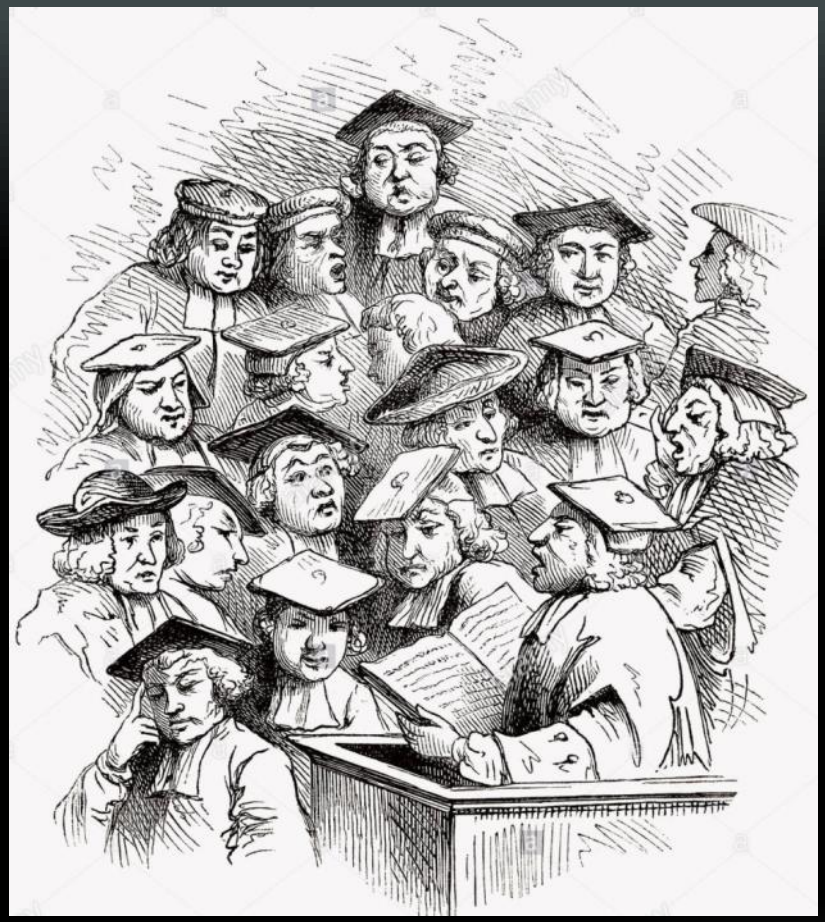
Samantha West telemarketing robot selling life insurance in the US (2013))

'Persuasive' robots as robot nurse to support labor shortages in Japan (2019))

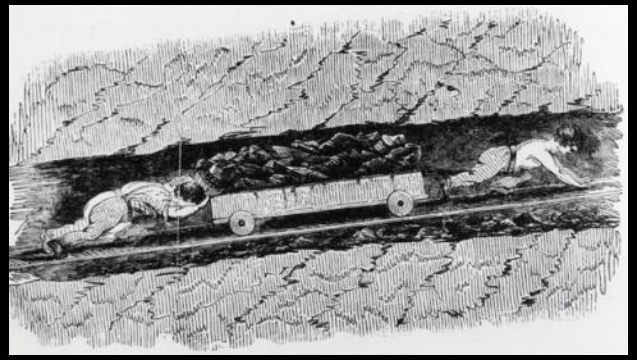
INDUSTRY 4.0 (2000)



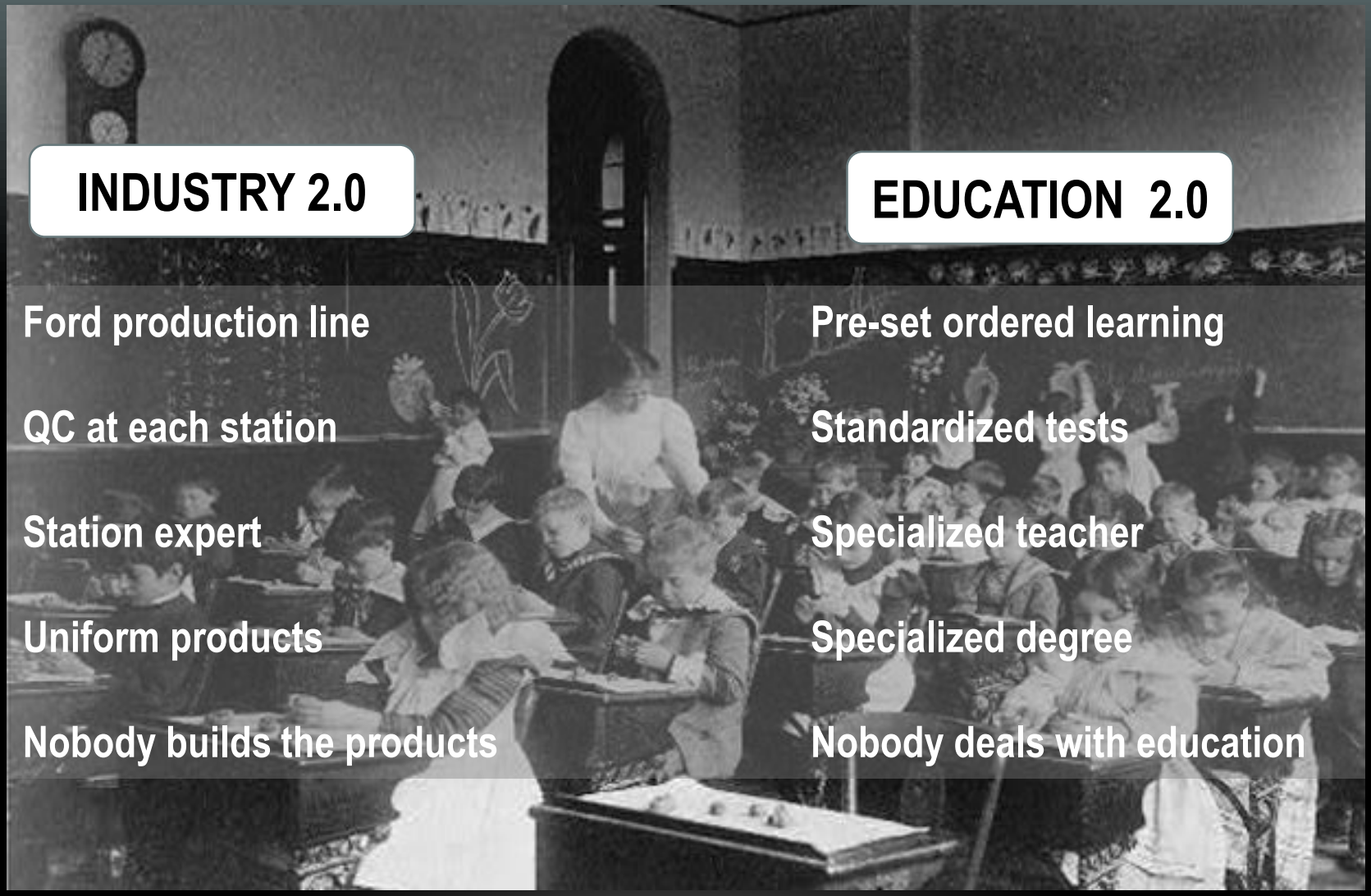
INDUSTRY 5.0 (2023-2045)



St. John Bosco (1815-1888)

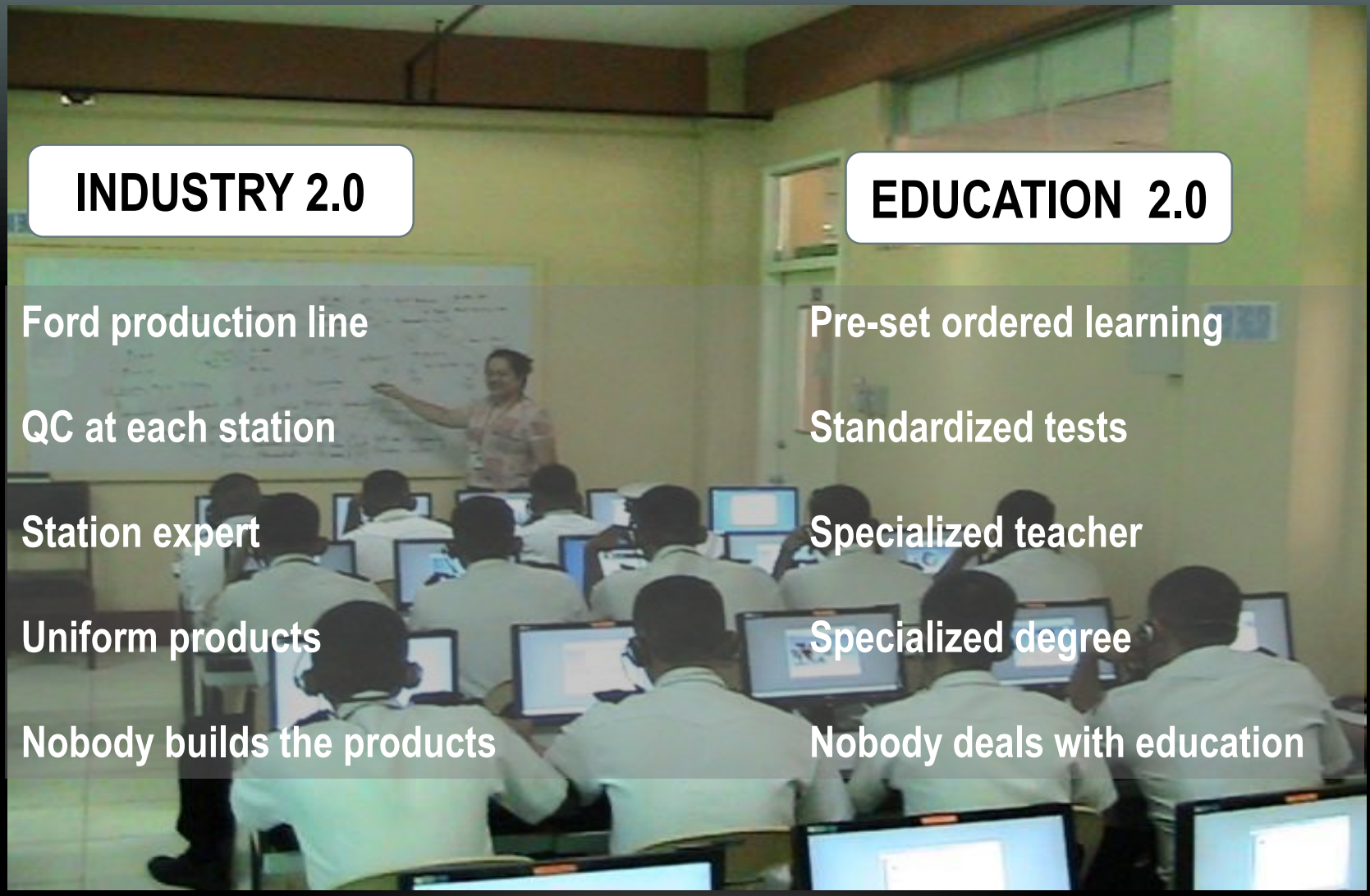


INDUSTRY 1.0 & EDUCATION



Adapted from the lecture by Prof. Oded Reichsfeld, Intellitek

INDUSTRY 2.0 & EDUCATION



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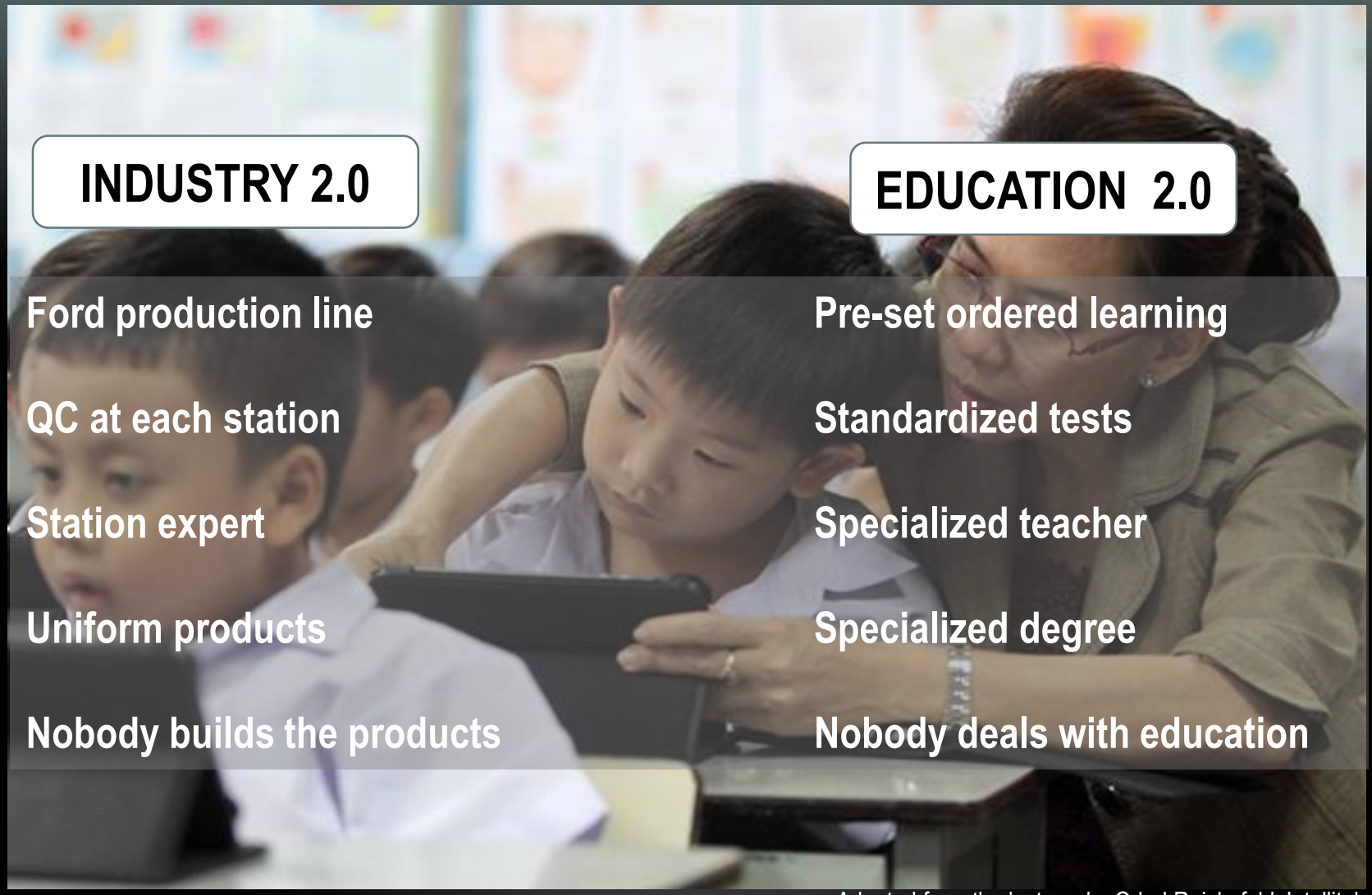
INDUSTRY 3.0 & EDUCATION



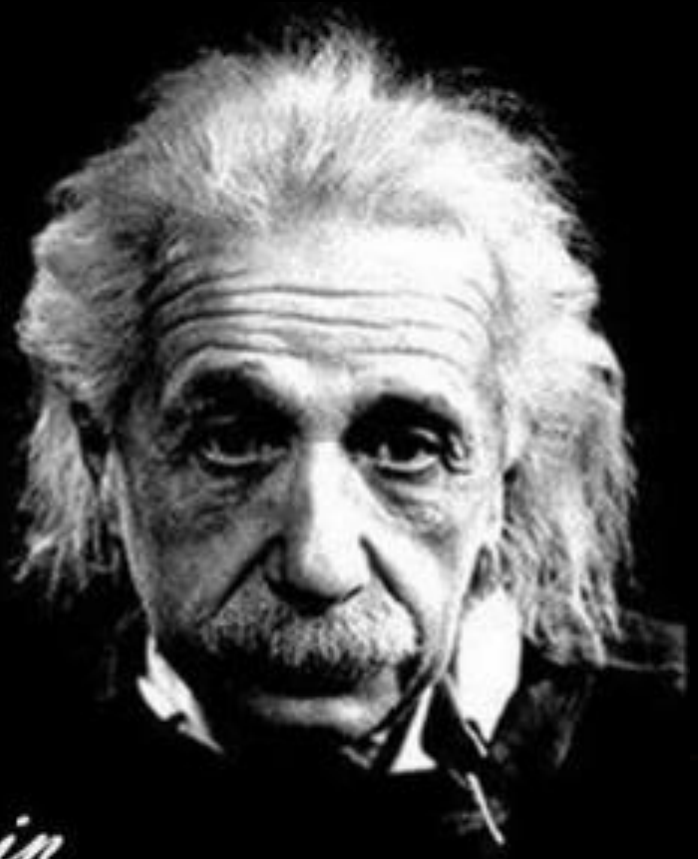
Adapted from the lecturer by Oded Reichsfeld, Intellitek

INDUSTRY 4.0 & EDUCATION

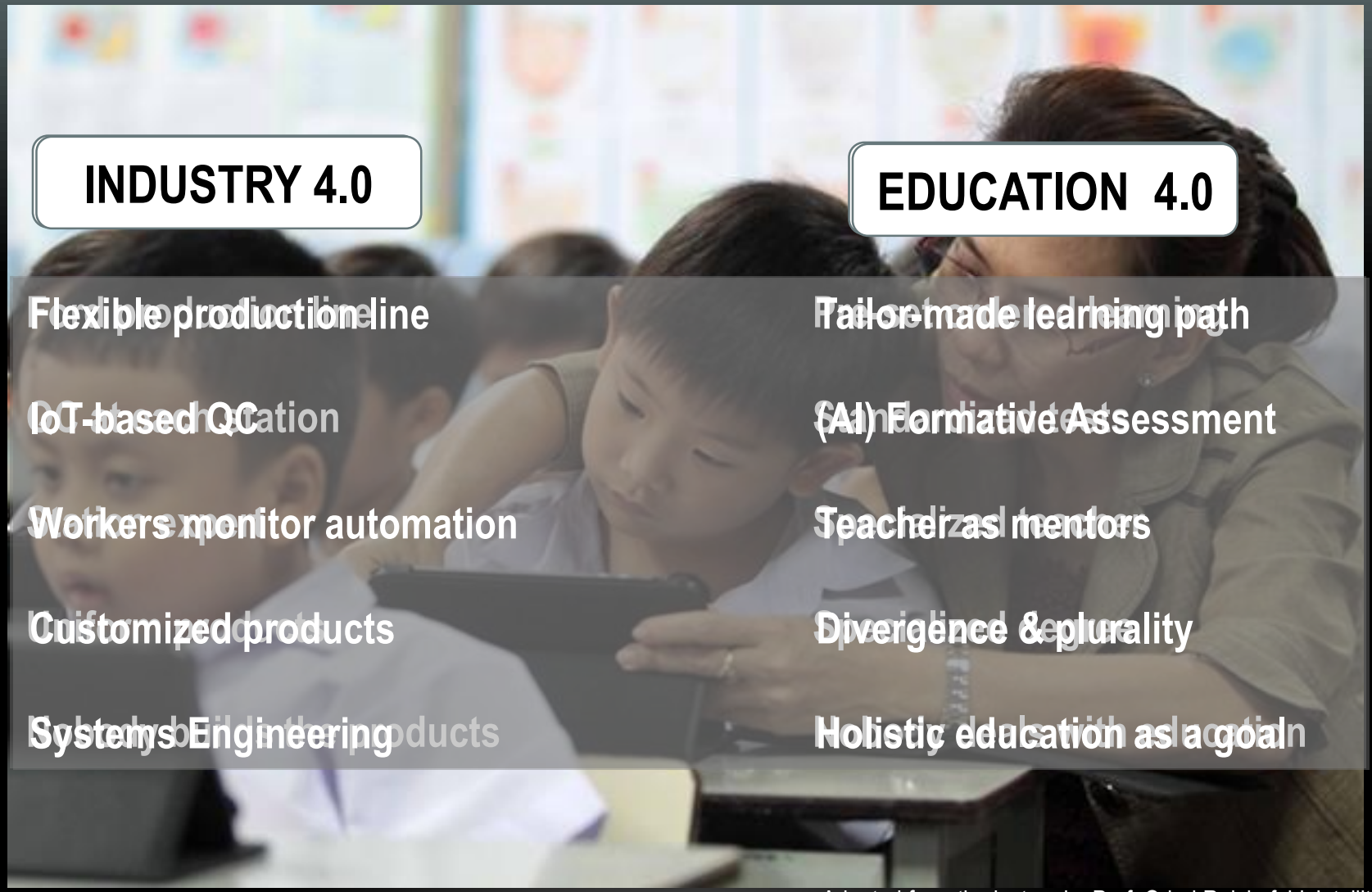
19th century (Education 2.0)

2018 (Education 4.0?)

we cannot solve
our problems with
the same thinking
we used when
we created them



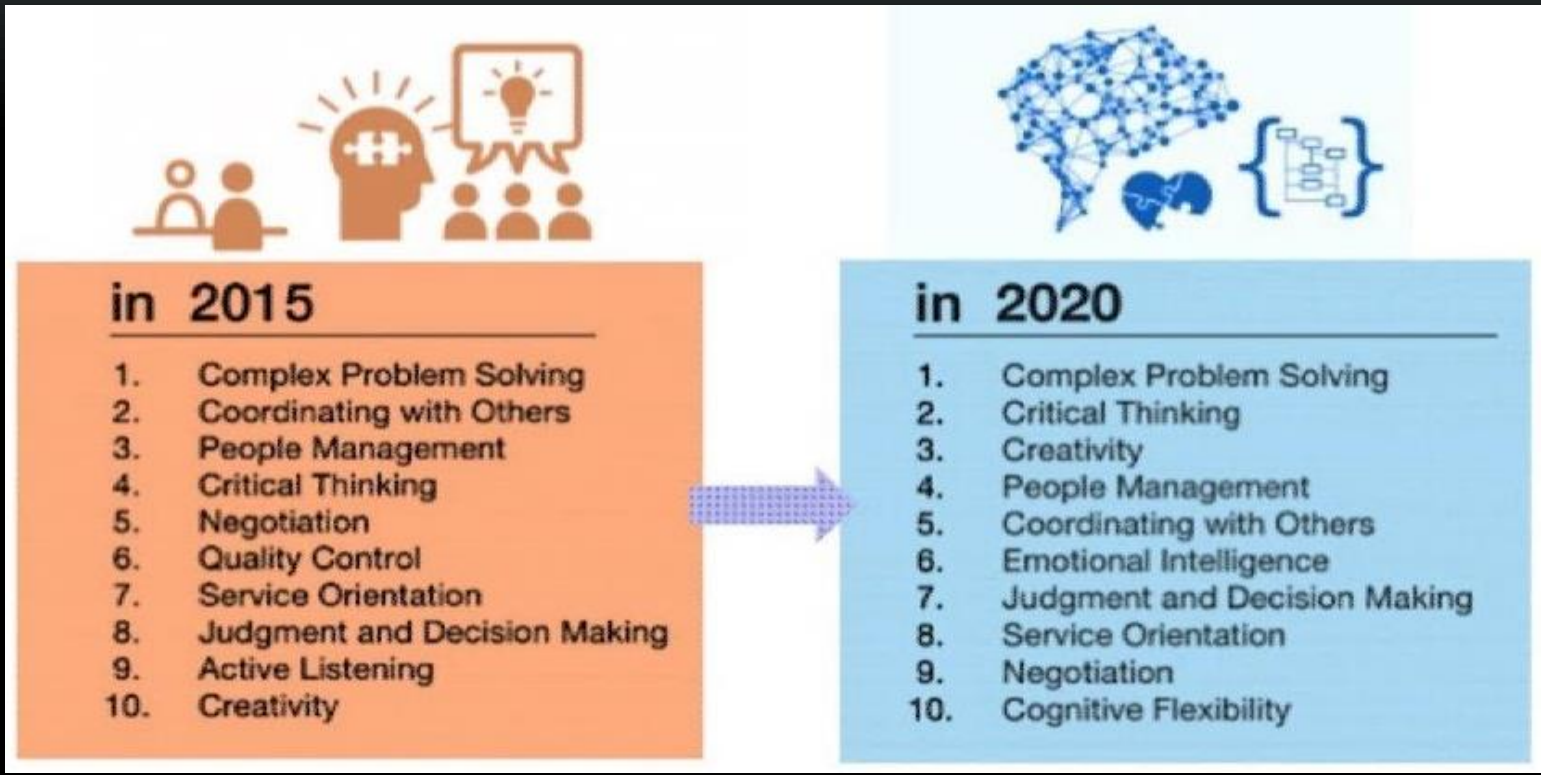
~ Albert Einstein



Adapted from the lecture by Prof. Oded Reichsfeld, Intellitek

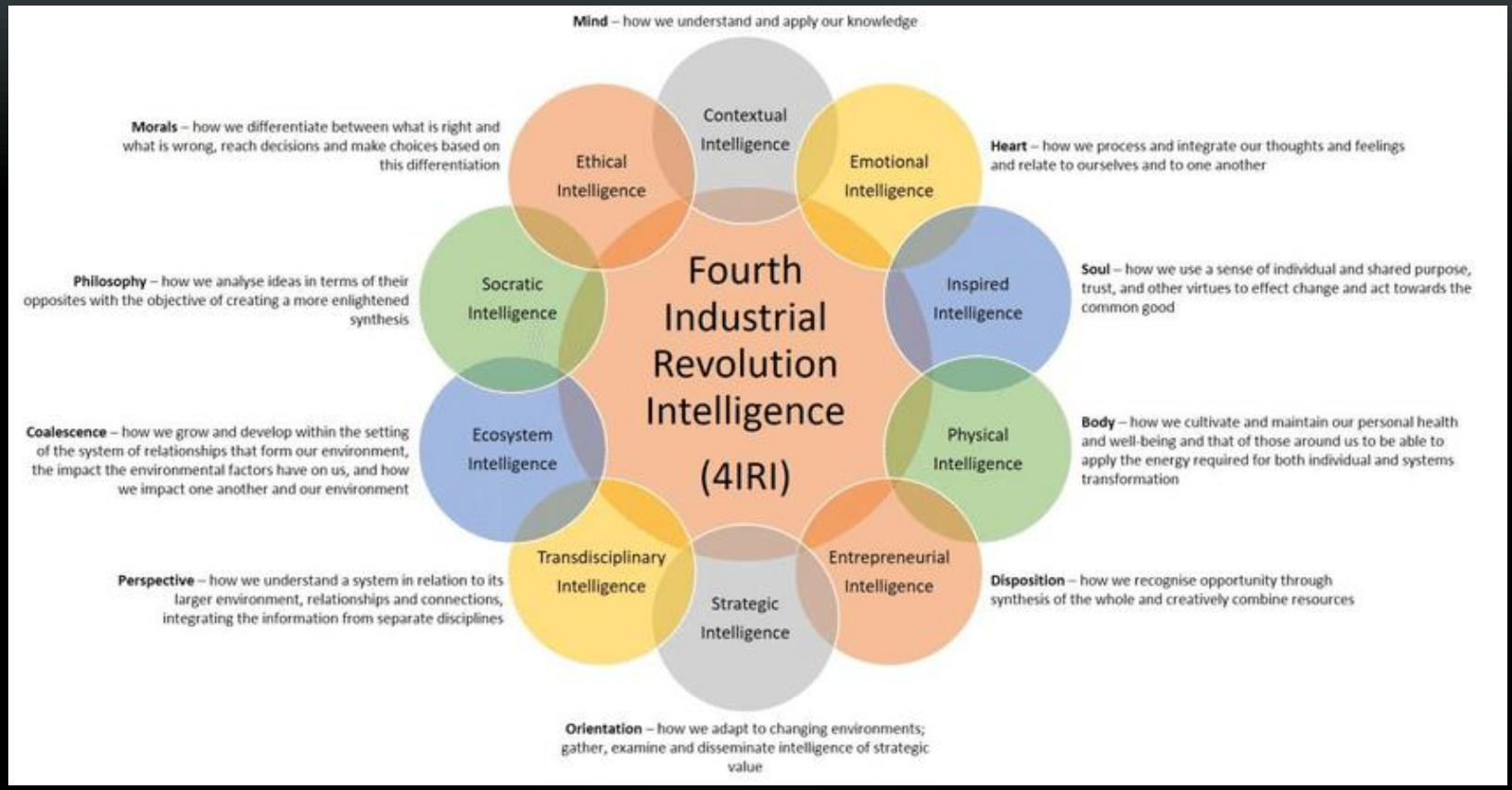
INDUSTRY 4.0 & EDUCATION

Shift to Critical Thinking, Creativity and Emotional Intelligence



Future of Jobs Report, World Economic Forum (2016)

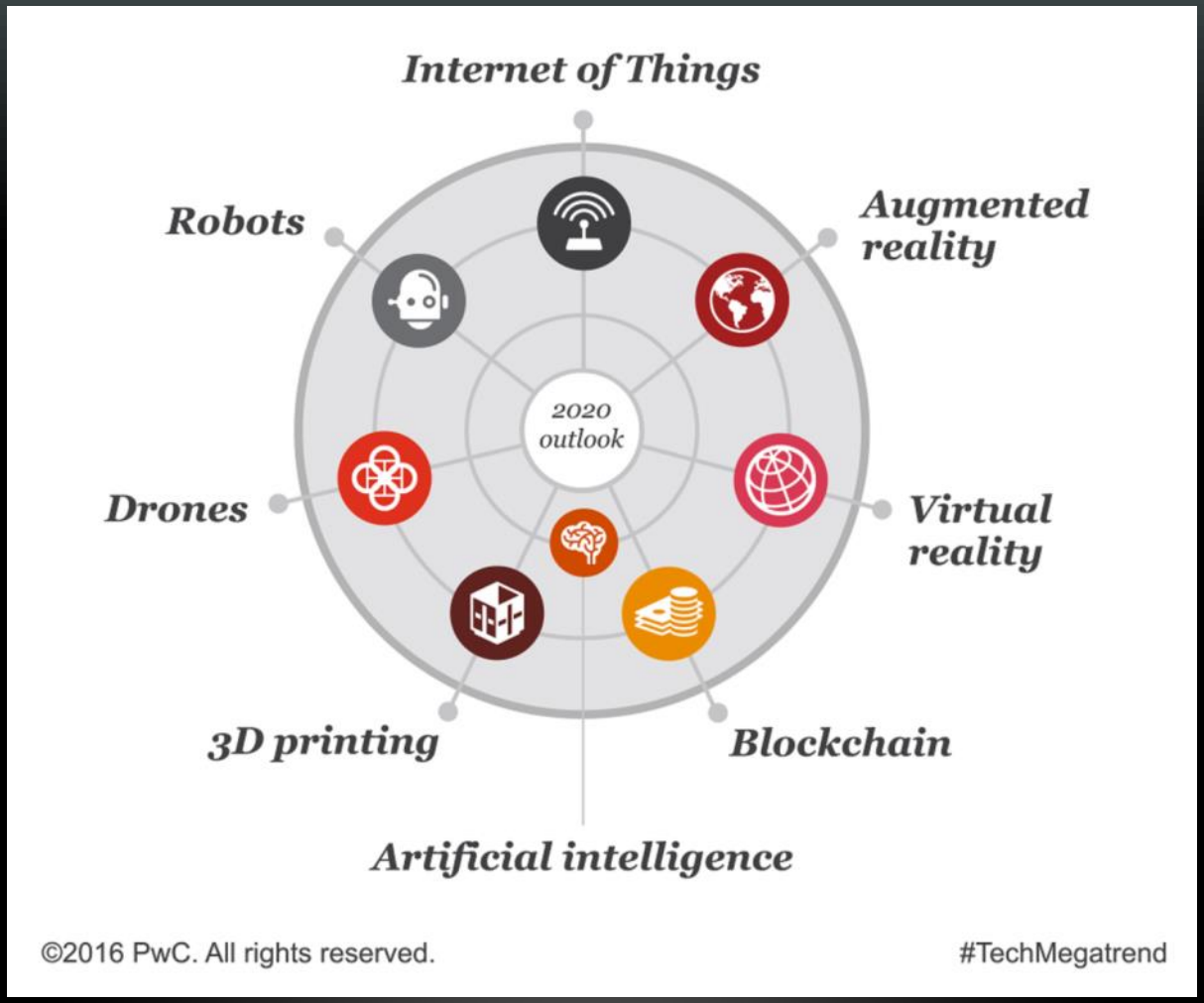
Emergence of new IR 4.0 Intelligence



Oosthuizen (2017)

INDUSTRY 4.0 & EDUCATION

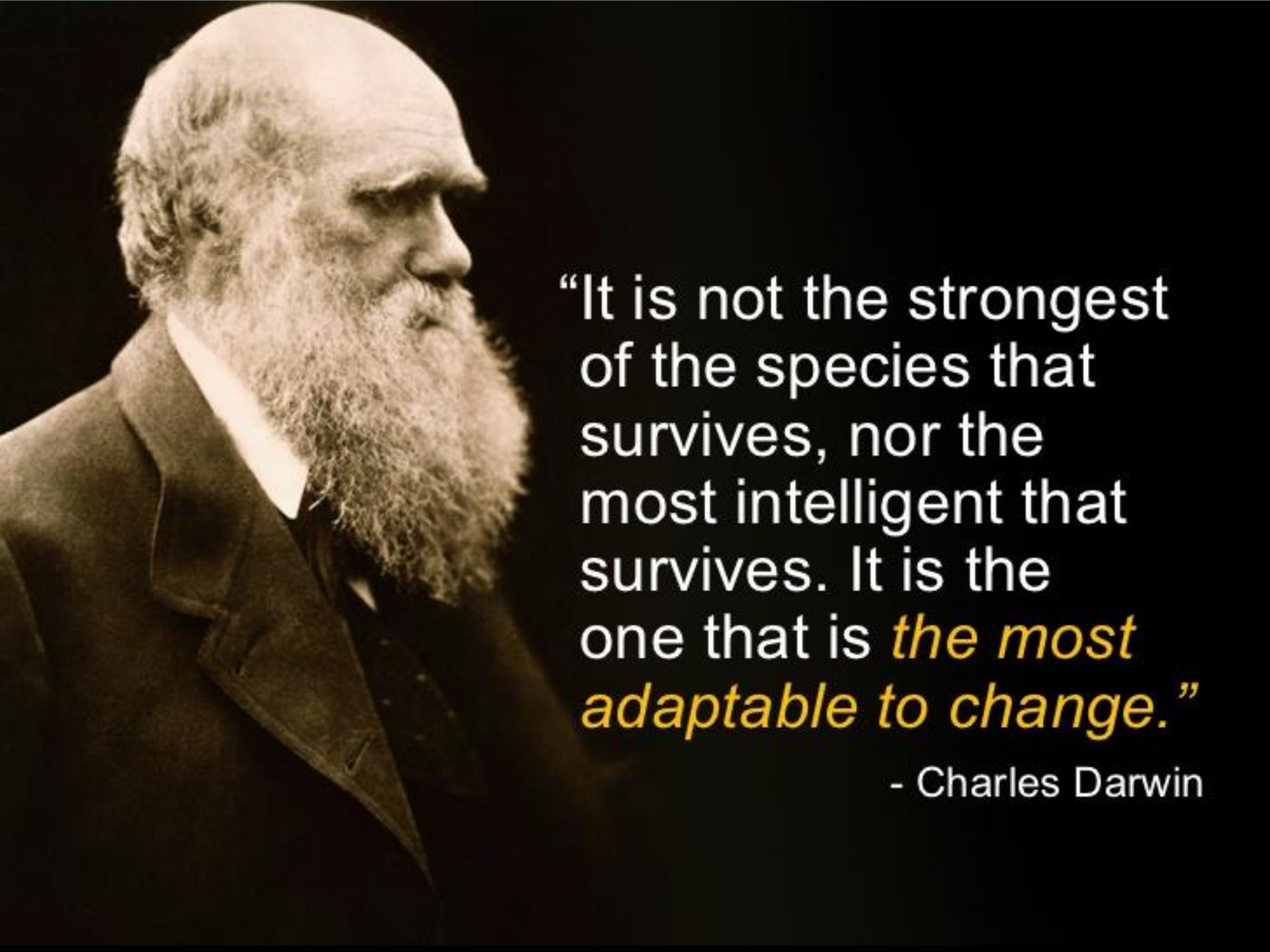
Eight Mega-Trends in Technology



INDUSTRY 4.0 (2000)

Massive Retooling and Capacity-Building of our Teachers for Education 4.0

INDUSTRY 4.0 & EDUCATION


“It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is *the most adaptable to change.*”
- Charles Darwin