Preparing Graduates for 4th Industrial Revolution

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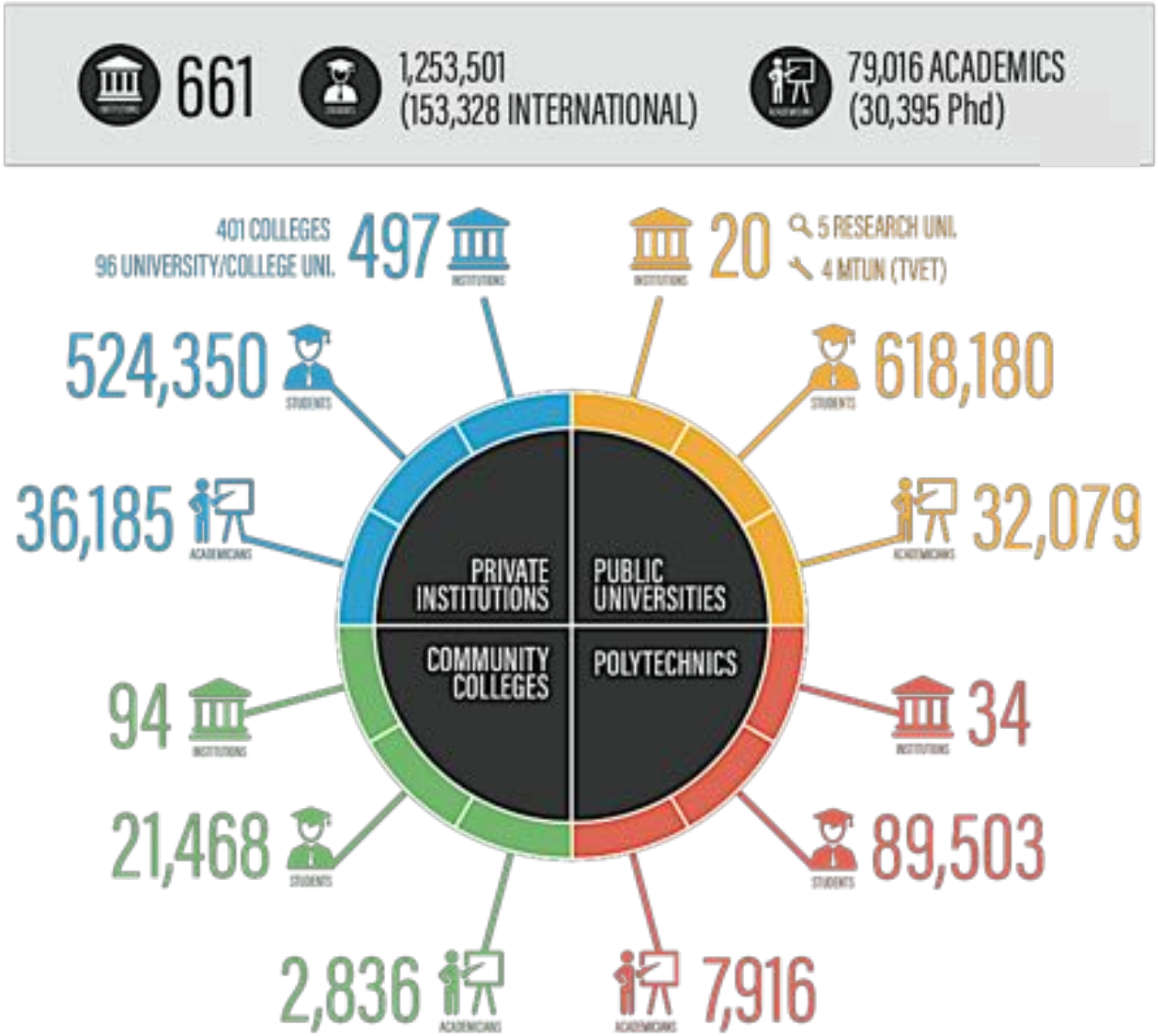
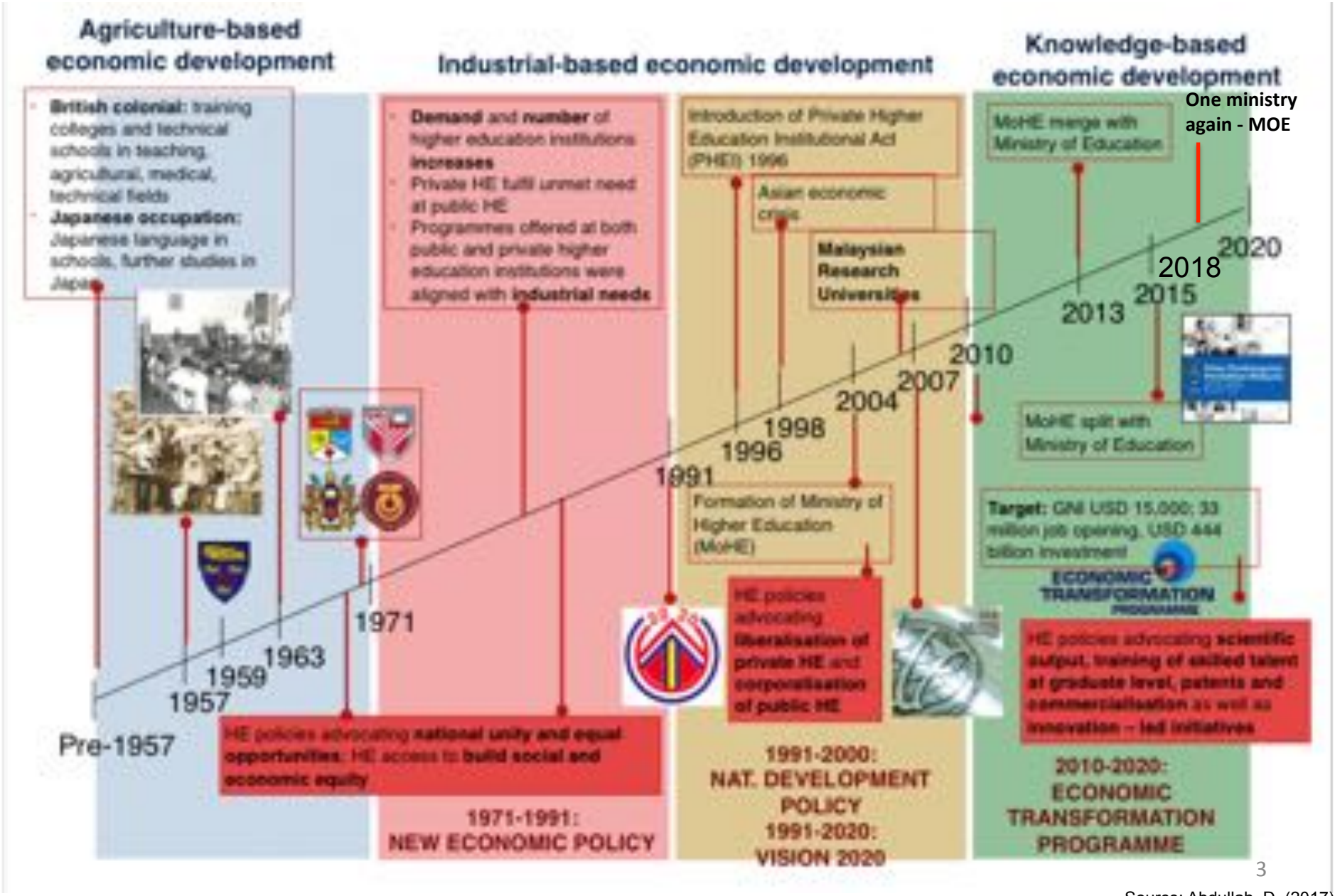
Malaysian Higher Education Landscape



Source: Ministry of Higher Education, Malaysia (2017b)

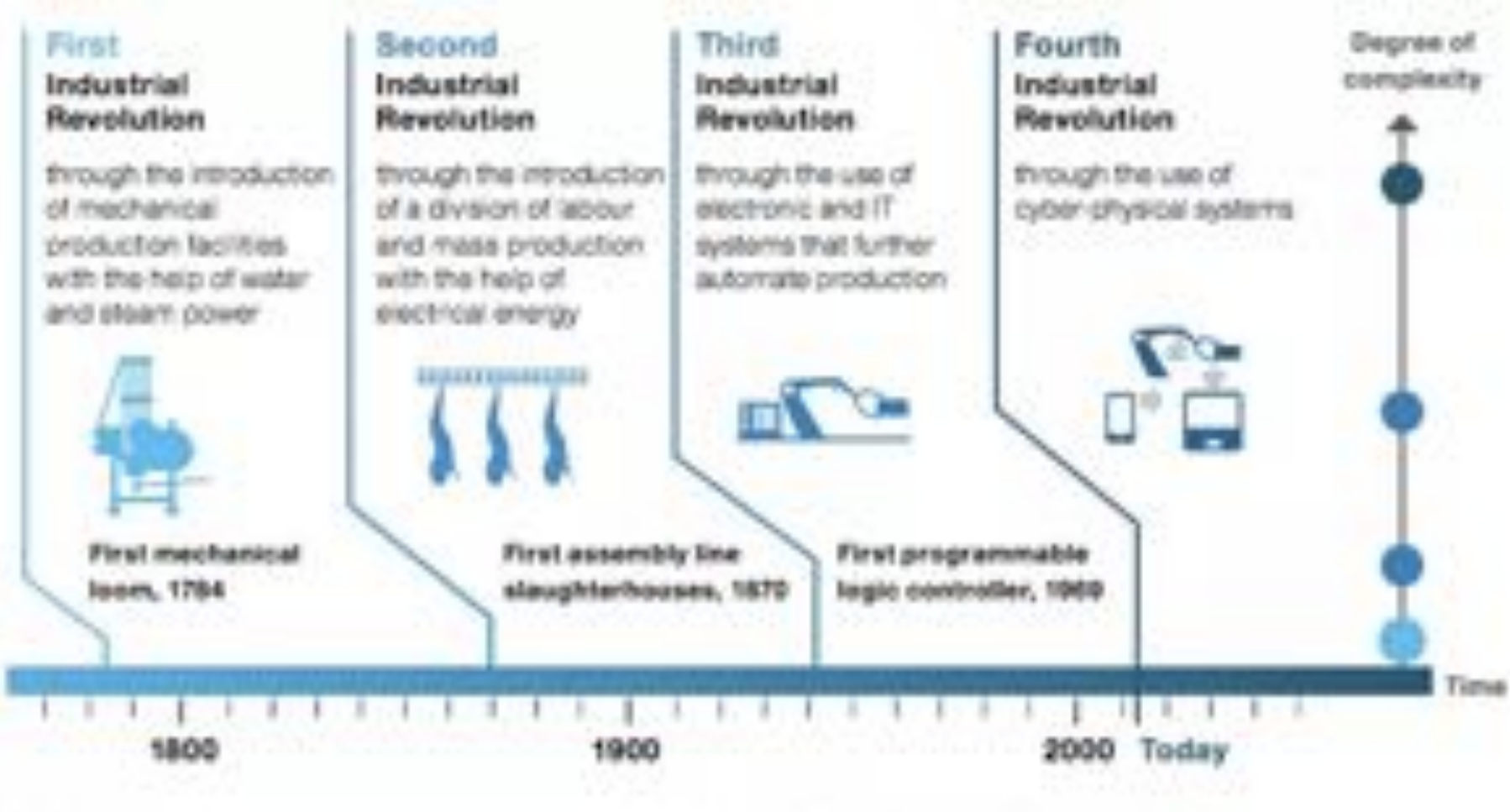
Developments of Malaysian Higher Education



Source: Abdullah, D. (2017)

4^{TH} INDUSTRIAL REVOLUTION

World Economic Forum calls the Fourth Industrial Revolution. Artificial intelligence. Automation. Ubiquitous, mobile supercomputing. Intelligent robots. Self-driving cars. Neuro-technological brain enhancements. Genetic editing.

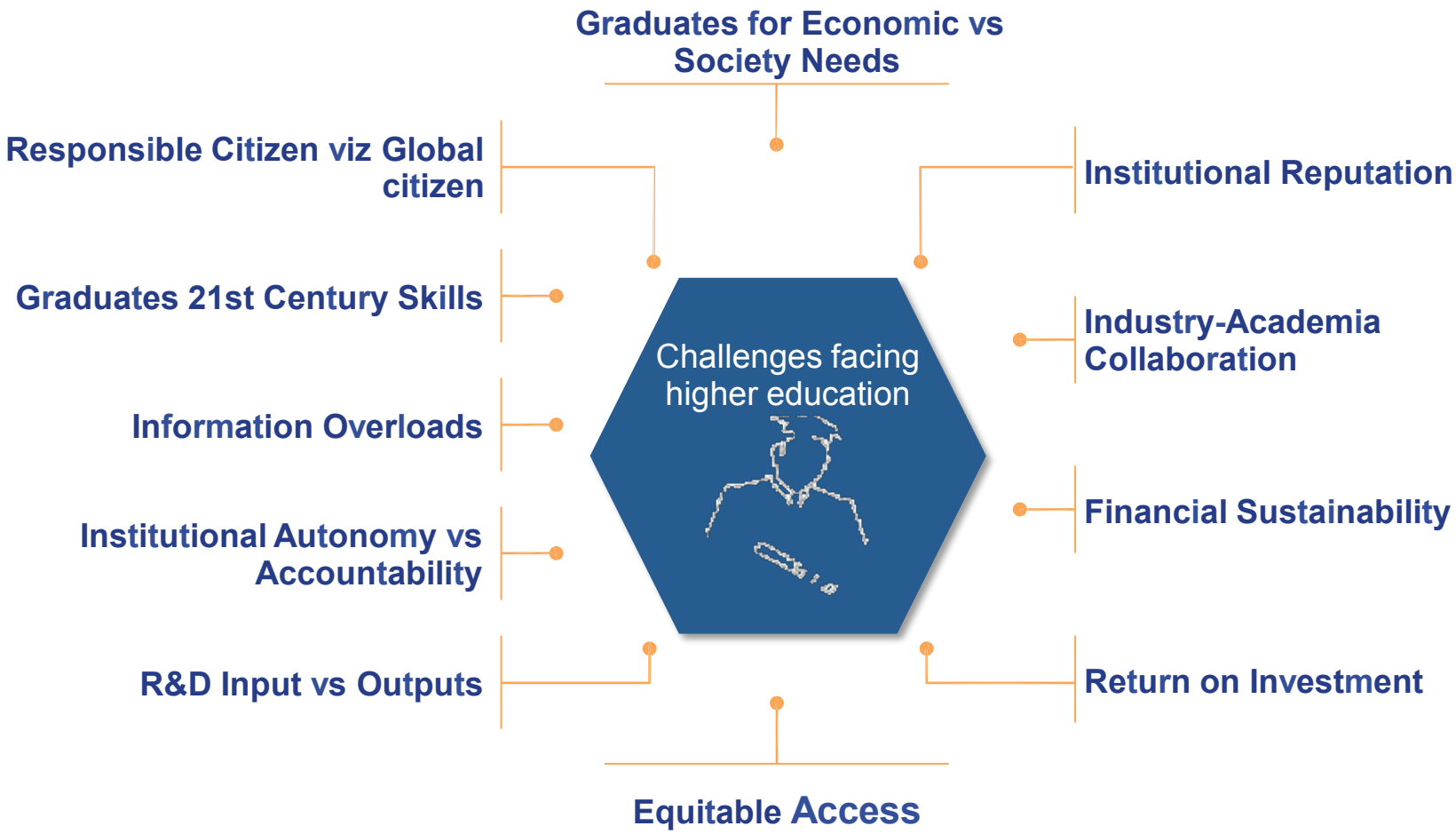


Cyber-physical assistance systems are driving the fourth industrial revolution

Source: Siemens, Pictures of the Future, Spring 2013

Addressing Current and Future Challenge

GLOBAL Economic crisis	GLOBAL Competition due to GLOBALIZATION	Accelerating PACE of CHANGE due to DIGITAL age



THE WORLD BANK

UNESCO

u21Global
Graduate School For Global Leaders

OECD
BETTER POLICIES FOR BETTER LIVES

::THE IMPACTS!::

The Impacts

::Business::
robotics and **3D and 4D printers** will overtake traditional **manpower**

::Health::
Diagnosis will be faster - doctors will still play a major role, but with better tools to perform their task

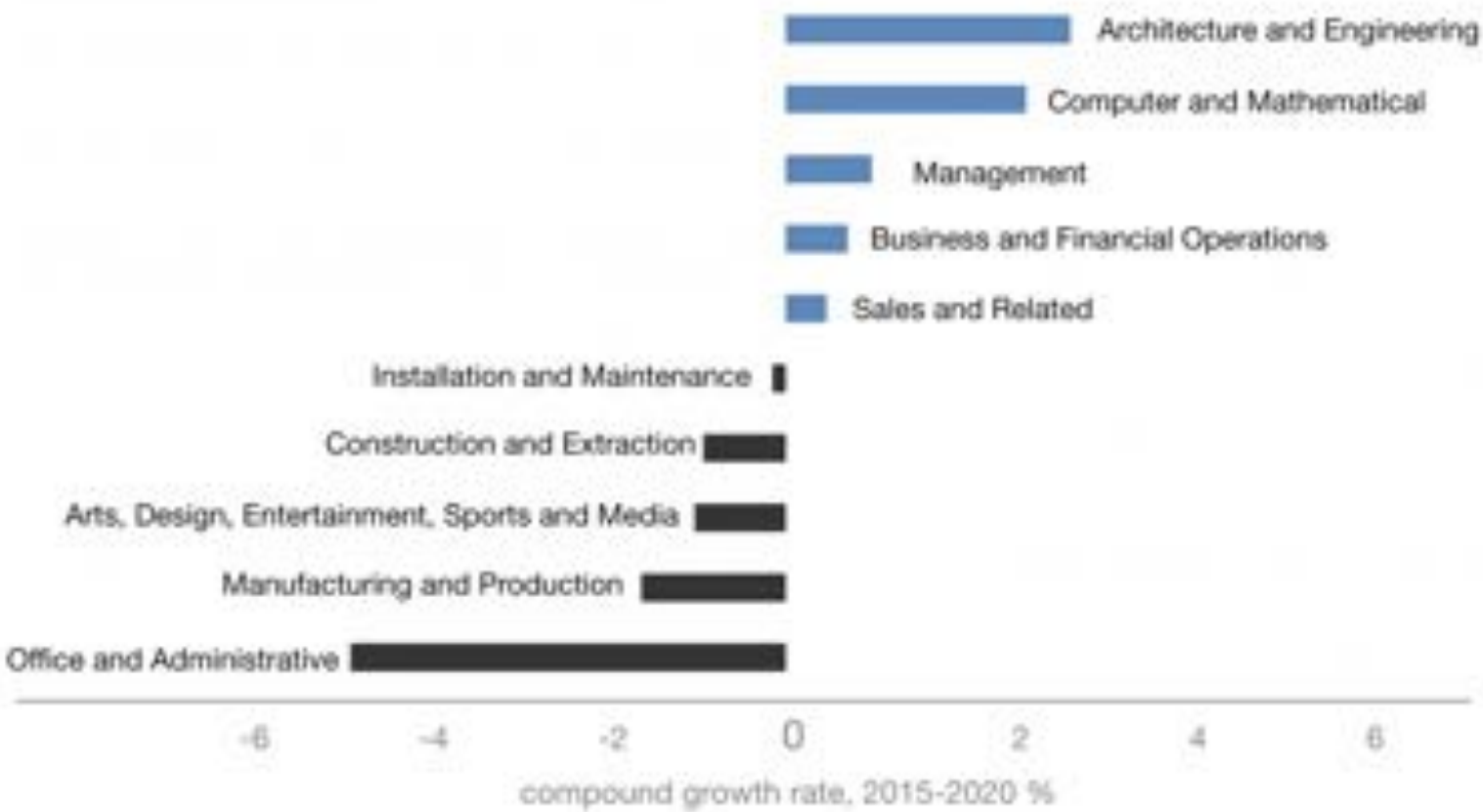
::Transportation::
Cars, trains and planes will become driverless

Impact over the education system:

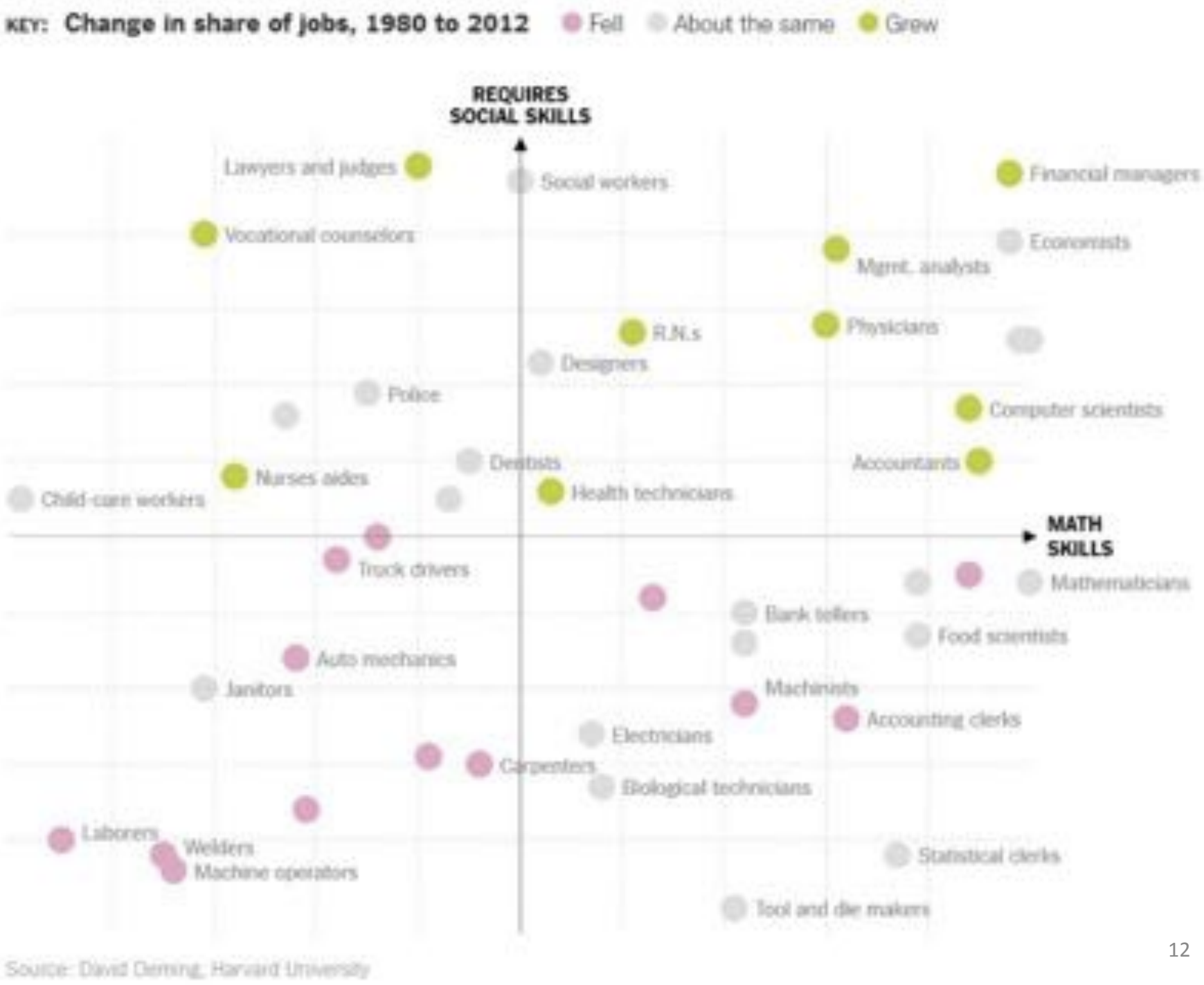
- New learning methods fostering creativity.
- Changing roles played by schools and teachers is already a reality, although they will not disappear.

In this new industrial revolution, will unemployment rates rise?

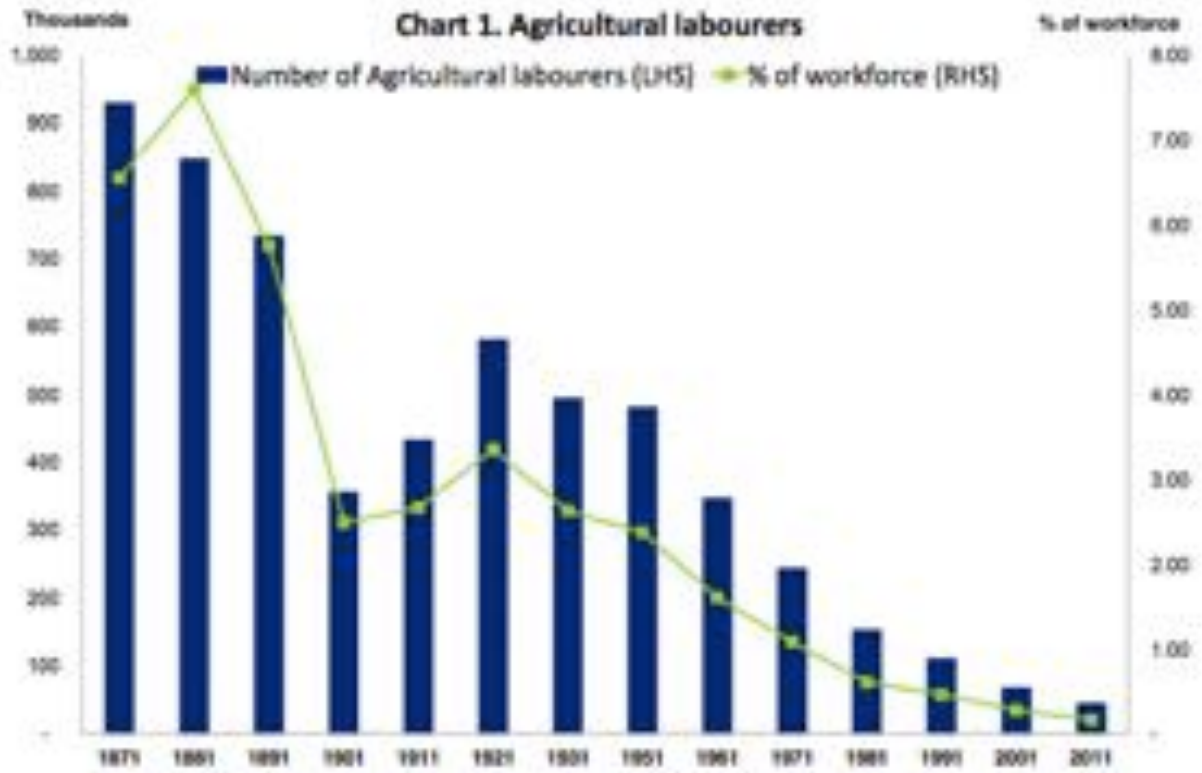
Job families in decline and on the rise



Source: Future of Jobs Report, World Economic Forum

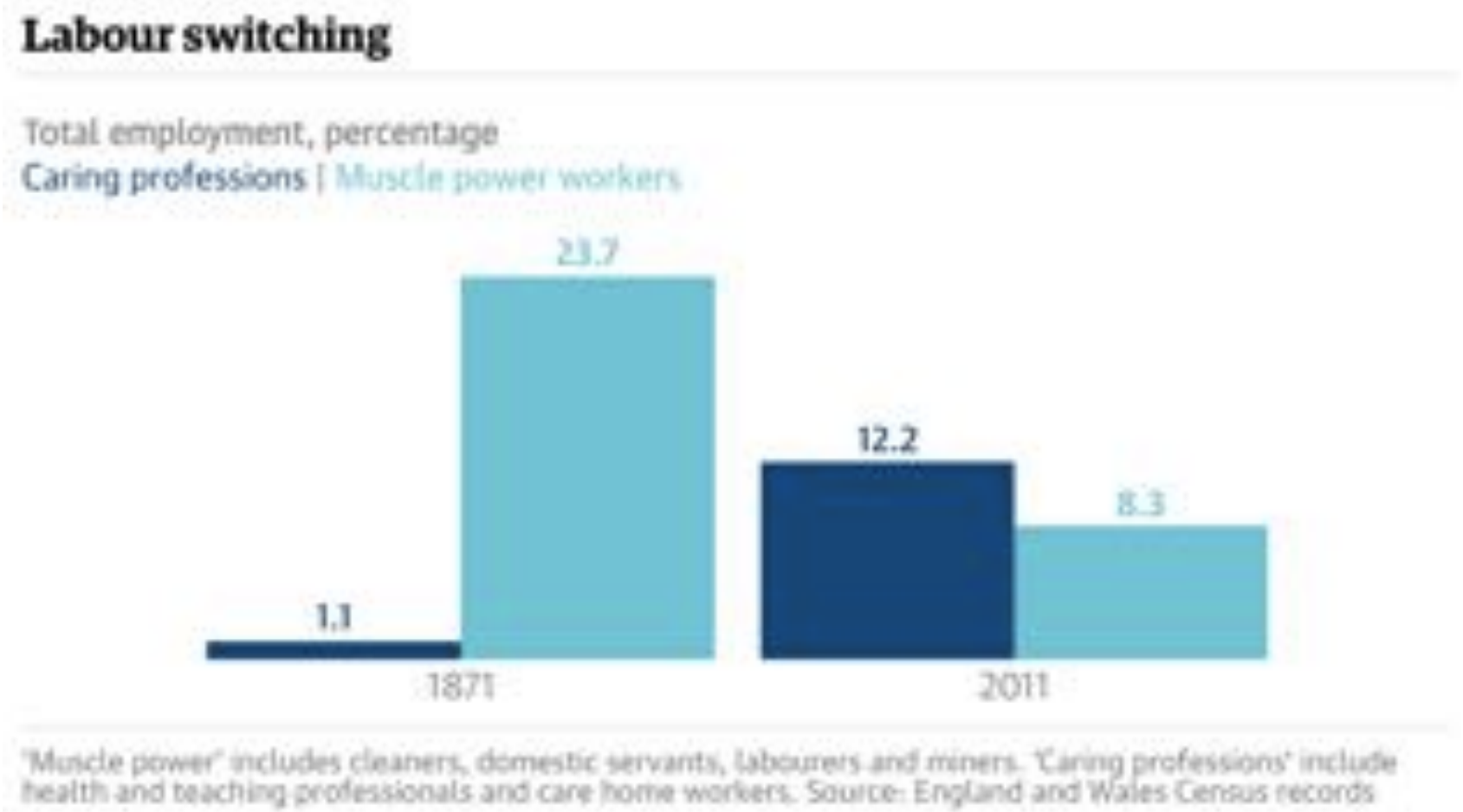


Source: David Deming, Harvard University



job-destroying effects of technological change

Source: Stewart, Debapratim De & Cole (2014)

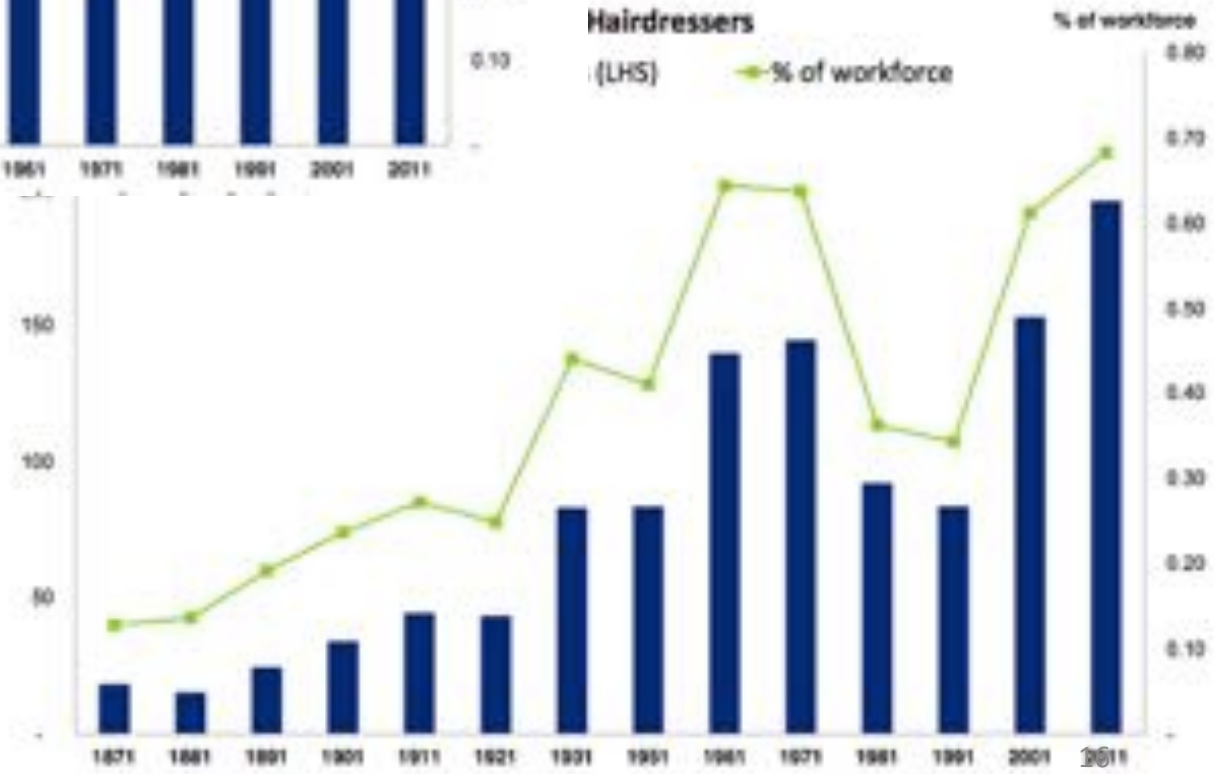


Source: Stewart, Debapratim De & Cole (2014)

909% - nursing auxiliaries and assistants
580% - teaching and educational support assistants
183% - welfare, housing, youth and community workers
168% - care workers and home cares

79% - weavers and knitters from 24,009 to 4,961
57% - typists
50% - company secretaries

Technology has boosted jobs in knowledge-intensive sectors



... and left more money for grooming

Source: Stewart, Debapratim De & Cole (2014)

The Pilot Critical Occupations List (COL) 2015/2016

No.	Critical Occupation
1	Finance Managers
2	Policy and Planning Managers
3	Business Services Managers
4	Administrative Managers
5	Research and Development Managers
6	Information and Communications Technology (ICT) Services Managers
7	Geologists and Geophysicists
8	Mathematicians, Actuaries and Statisticians
9	Industrial and Production Engineers
10	Civil Engineers
11	Mechanical Engineers
12	Chemical Engineers
13	Mining Engineers, Metallurgists and Related Professions
14	Engineering Professionals Not Elsewhere Classified
15	Electrical Engineers
16	Electronic Engineers
17	Telecommunications Engineers
18	Graphic and Multimedia Designers
19	Manufacturing Professionals
20	Accountants
21	Financial and Investment Advisers

No.	Critical Occupation
22	Financial Analysts
23	Management and Organisation Analysts
24	Personnel and Career Professionals
25	Advertising and Marketing Professionals
26	Systems Analysts
27	Software Developers
28	Applications Programmers
29	Software and Application Developers and Analysts Not Elsewhere Classified
30	Database Designers and Administrators
31	System Administrators
32	Computer Network Professionals
33	Database and Network Professionals Not Elsewhere Classified
34	Lawyers
35	Electronics Engineering Technicians
36	Mechanical Engineering Technicians
37	Environmental and Occupational Health Inspectors and Associates
38	Securities and Finance Dealers and Brokers
39	Credit and Loans Officers
40	Accounting Associate Professionals
41	Insurance Underwriters
42	Information and Communications Technology (ICT) User Support Technicians

Note: The Critical Occupations List (COL) is constructed based on the Malaysia Standard Classification of Occupations (MASCO) 2008

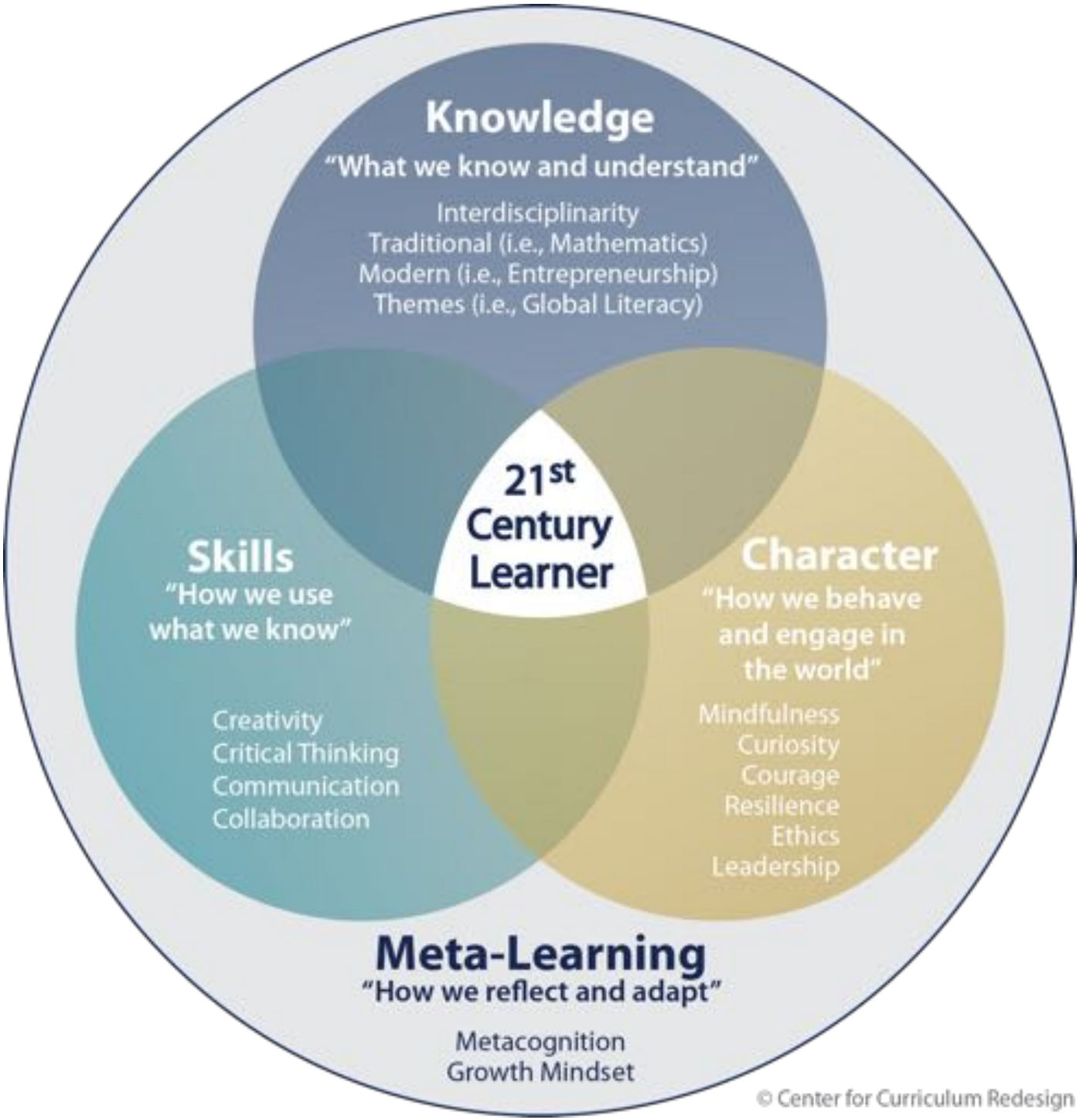
::Job Skills Required!::

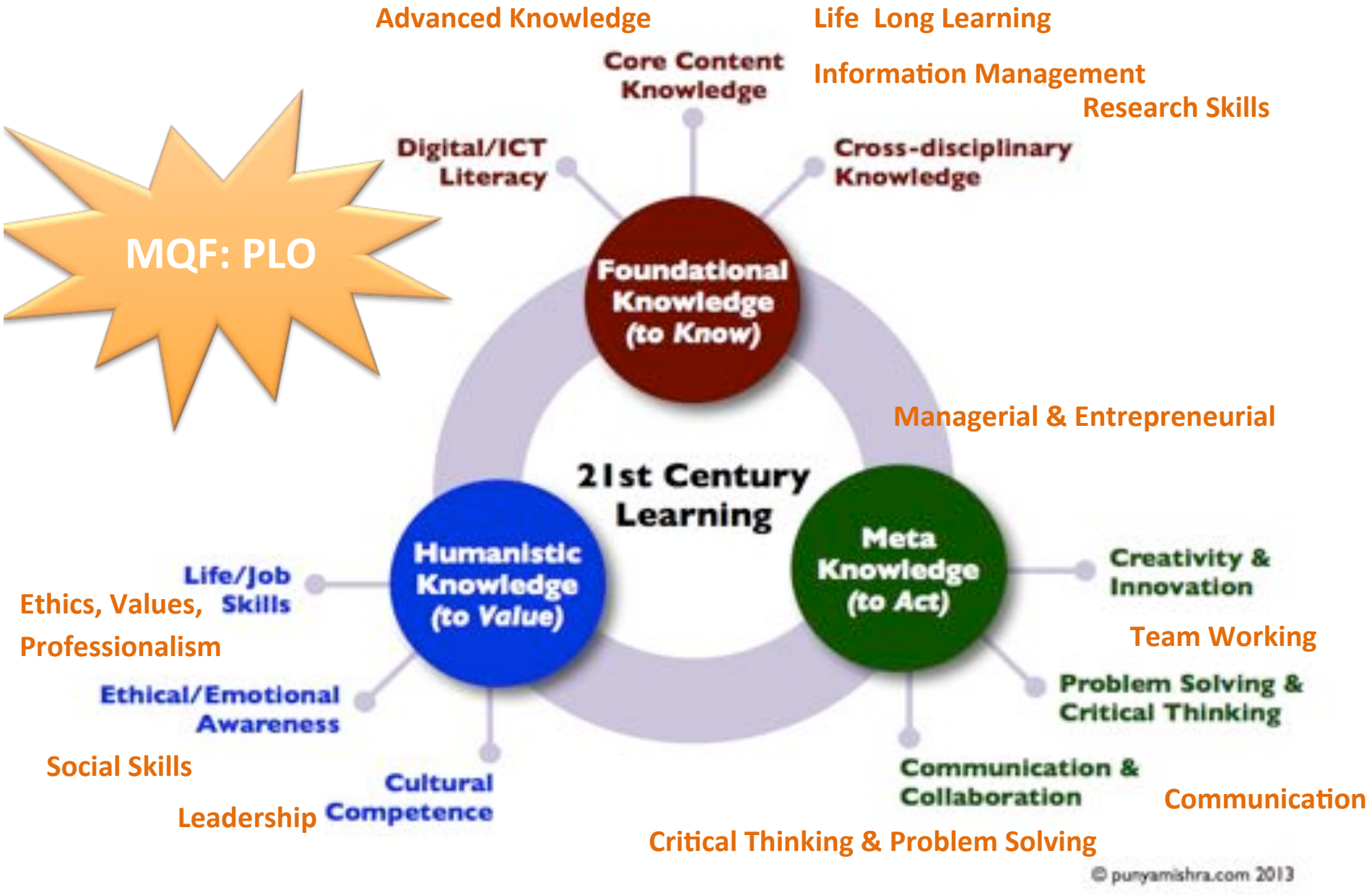
The 21st C Learner is . . .

How to be ready for Industry 4.0??

TACIT KNOWLEDGE

UNIQUE


Knowledge
"What we know and understand"
Interdisciplinarity
Traditional (i.e., Mathematics)
Modern (i.e., Entrepreneurship)
Themes (i.e., Global Literacy)
21st Century Learner
Skills
"How we use what we know"
Creativity
Critical Thinking
Communication
Collaboration
Character
"How we behave and engage in the world"
Mindfulness
Curiosity
Courage
Resilience
Ethics
Leadership
Meta-Learning
"How we reflect and adapt"
Metacognition
Growth Mindset
© Center for Curriculum Redesign

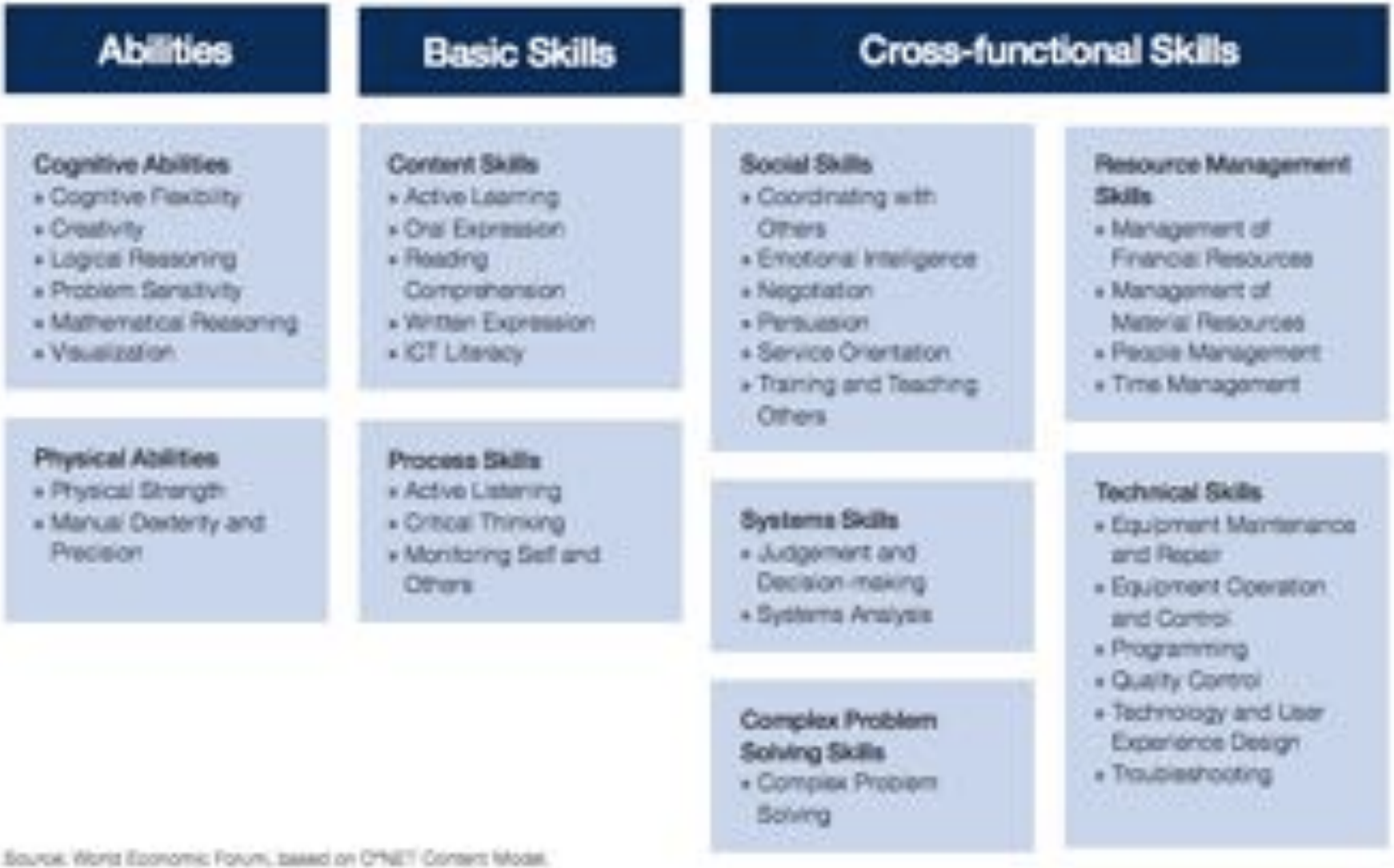

Advanced Knowledge
Life Long Learning
Core Content Knowledge
Information Management
Research Skills
Digital/ICT Literacy
Cross-disciplinary Knowledge
MQF: PLO
Foundational Knowledge (to Know)
Managerial & Entrepreneurial
21st Century Learning
Humanistic Knowledge (to Value)
Meta Knowledge (to Act)
Life/Job Skills
Ethics, Values, Professionalism
Creativity & Innovation
Team Working
Ethical/Emotional Awareness
Problem Solving & Critical Thinking
Social Skills
Cultural Competence
Communication & Collaboration
Communication
Leadership
Critical Thinking & Problem Solving
© punyamishra.com 2013

TOP SKILLS NEEDED

In 2018	In 2020	In 2030
Active listening	**Emotional intelligence**	**Active learning**
Complex problem solving	Complex problem solving	**Fluency of ideas**
Coordinating with others	Coordinating with others	Judgement/Decision making
Creativity	Creativity	**Learning strategies**
Critical thinking	Critical thinking	**Originality**
Judgement/Decision making	Judgement/Decision making	
Negotiation	Negotiation	
People management	People management	
Quality control	**Cognitive flexibility**	
Service orientation	Service orientation	

Source: Gracey (2018)

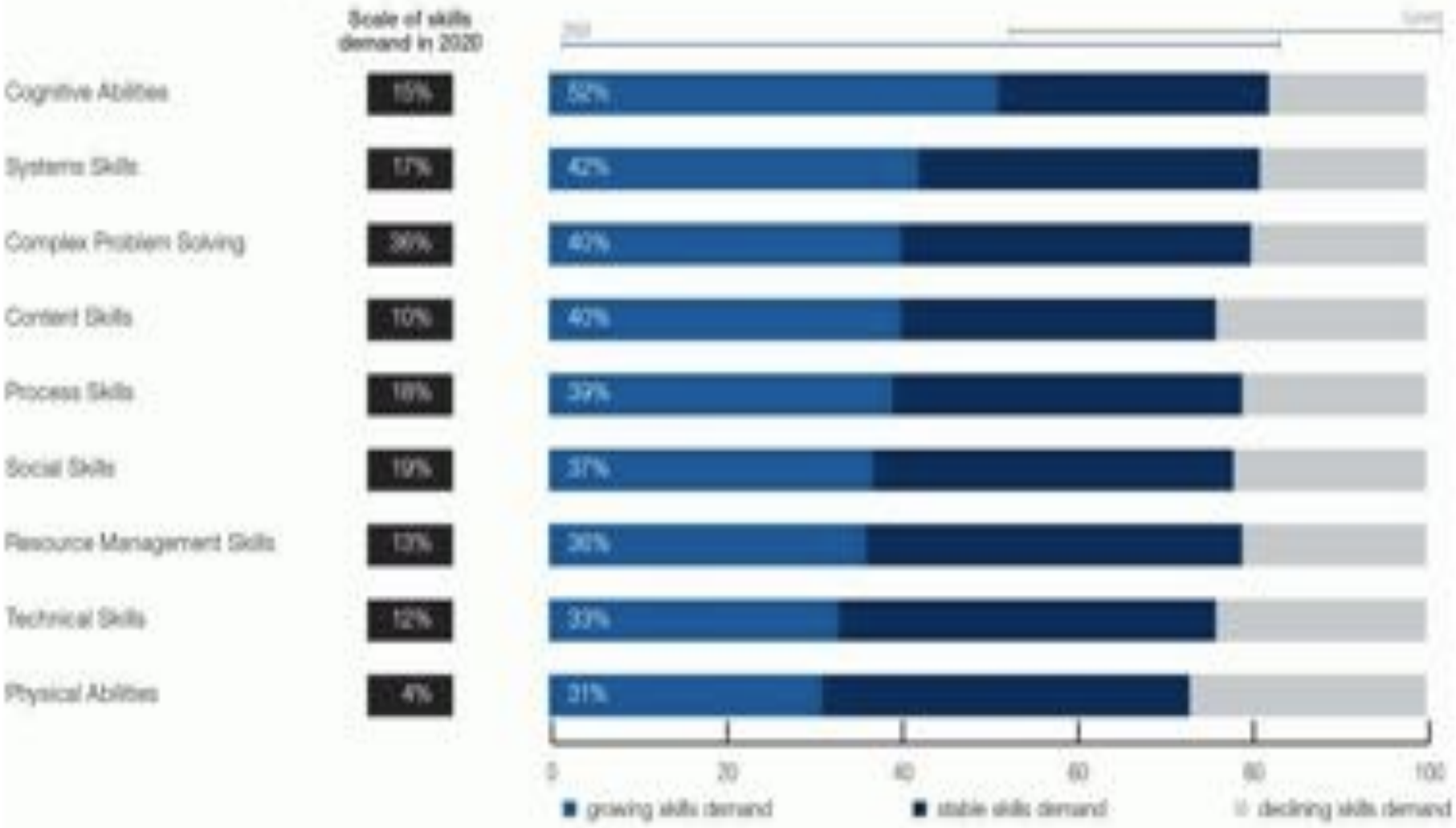
Figure 9: Core work-related skills



Source: World Economic Forum, based on O*NET Content Model.
Note: See Appendix A for further details.

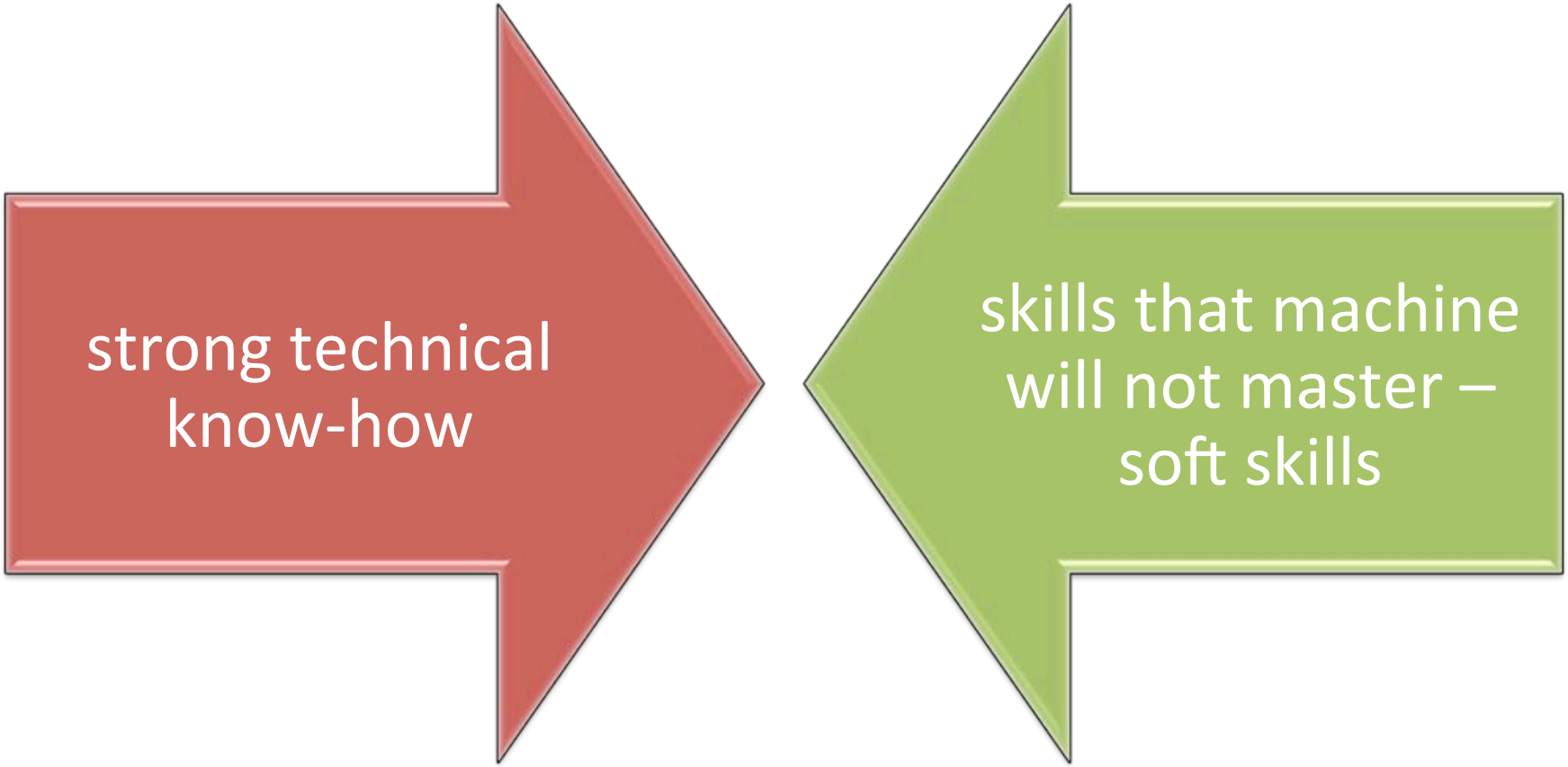
Figure 10: Change in demand for core work-related skills, 2015-2020, all industries

Share of jobs requiring skills bundle as part of their core skill set, %



Source: Future of Jobs Survey, World Economic Forum

So, which skills should students learn?



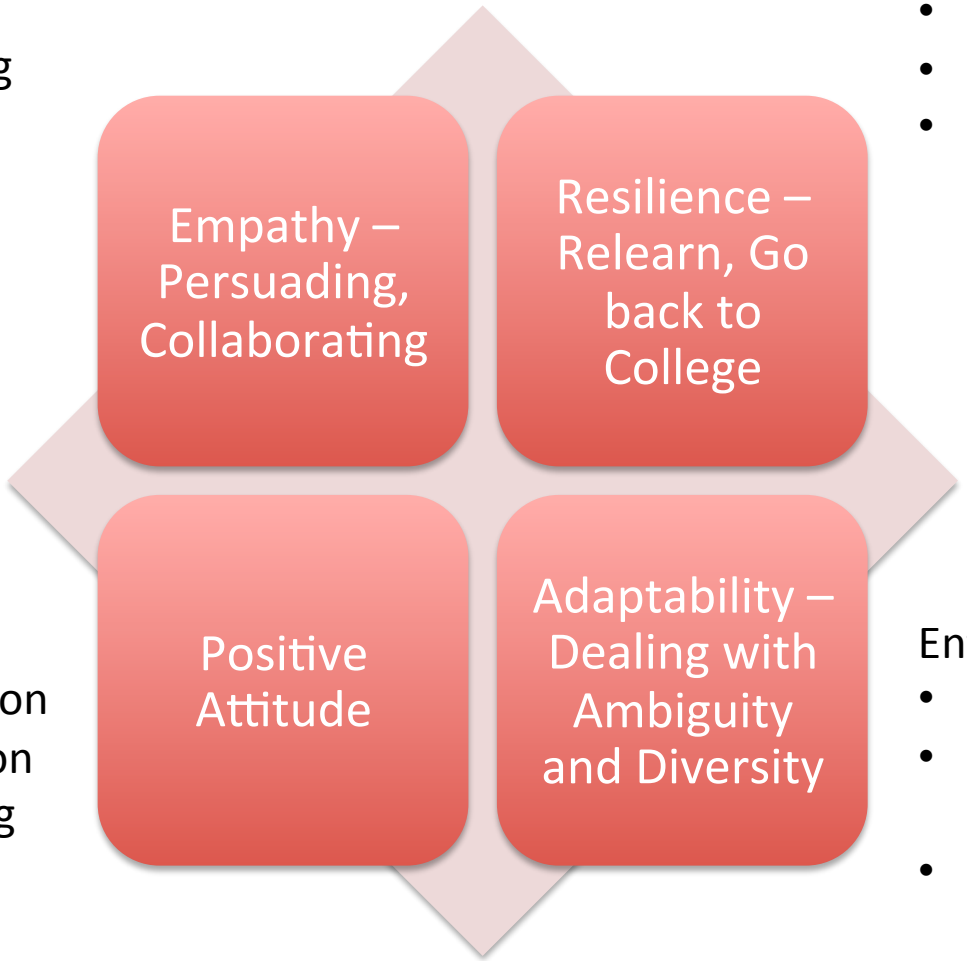
Skills that machine will not master

Transferable skills:

- Analytics
- Problem Solving
- Prioritisation.
- Delegation.
- Listening

Data Literacy:

- Technical Skills
- Maths Skills
- Linguistics Skills



Synthesizing Skills:

- Conceptualization
- Cross-application
- Decision making

Entrepreneurial Skills:

- Financial Literacy
- Collaborating & Influencing
- Societal Impact

UNDECIDED?

WHAT DO YOU LIKE TO DO?

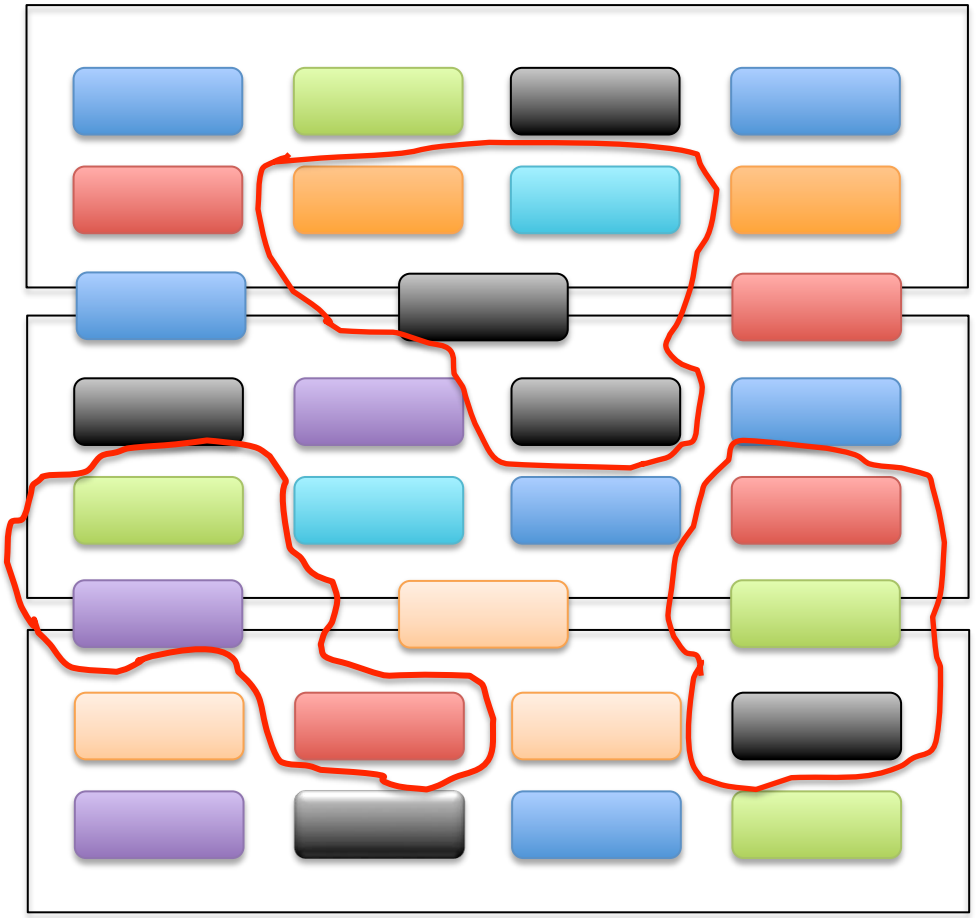
I LIKE TO WORK WITH NUMBERS	I ENJOY SCIENCE	I ENJOY TECHNOLOGY	I WANT TO TEACH	I LOVE TO WRITE	I WANT TO DO SOMETHING CREATIVE	I WANT TO PERFORM
Accounting Economics Engineering Finance Mathematics Sociology	Applied Science Biochemistry Biology Chemistry Cognitive Science Exercise Science Nursing	Applied Science Cinema & Media Comm Cognitive Science Computer Science Engineering Information Systems	Biology Chemistry Elementary Education English Health & Human Perf. History Mathematics Music Education Spanish Studio Arts Theatre	Communication Arts English History Journalism Philosophy Politics	Cinema & Media Comm. Engineering English Graphic Design Interior Design Music Philosophy Studio Arts Theatre	Communication Arts Music Theatre

I WANT TO RUN MY OWN BUSINESS	I LIKE WORKING WITH MY HANDS	I'M INTERESTED IN LAW ENFORCEMENT	I LOVE ATHLETICS	I WANT TO CHANGE THE WORLD	I WANT TO HELP PEOPLE	I FEEL CALLED TO MINISTRY
Business Admin. Entrepreneurship Management Marketing	Applied Science Engineering Studio Arts Theatre	Cognitive Science Psychology Social Work Sociology	Athletic Training Exercise Science Health & Human Perf. Marketing Psychology	Christian Ministries Elementary Education Global Business International Studies Politics Social Work Sociology Spanish	Christian Ministries Communication Arts Elementary Education Health & Human Perf. Nursing Organizational Comm. Politics Psychology Social Work Sociology	Biblical Studies Christian Ministries Organizational Comm. Psychology Sociology

IDEA

Are you unsure about your major or academic plan? The IDEA Center provides resources and support for students declaring or changing their major. For more information, contact your CAP Coach.

STILL UNDECIDED?
GEED 214
DISCOVER YOUR CALLING
A 1-credit course offered both fall and spring semesters

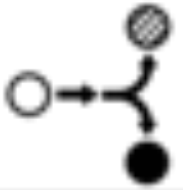


Undeclared/
Undecided
Major

Others

Configure Your Own Degree!!!

::Rethinking Learning::

	First Industrial Revolution	Fourth Industrial Revolution
Learning Objectives	Mastery of basic skills and knowledge (e.g., reading, math) 	Development of whole person across multiple intelligences (e.g., emotional, intellectual, social) 
Role of Educator	Expert 	Facilitator 
Learner Experience	'Factory model' - Passive, structured, directed, en masse 	'Custom model' - Active, self-directed, exploratory 
Target Age	K-12 	Lifelong learning 
Expertise	"Teacher knows best" 	"Anyone can teach" 
Access	Physical classroom 	Anytime, anywhere, any device 

New Roles

Challenges of future TnL must be turned into opportunities for change!

*Changes of Organizational Structures:
- New Business Models
- Enhancing Interdisciplinary
- New concepts of faculties & departments

*Changes of learning:
- Personalized and Adaptive Learning
- Massive, Crowd-based learning
- Distance Learning, Learning on-demand

*Changes of Accreditation Procedures:
- New roles of examination offices
- Flexible Curriculum of Degree Programs
- Encourage the use of Organic Curriculum

Changes of Thinking:
- Data-driven decision making and thinking
- Innovative-based thinking
- Humanization of technology thinking

*Changes of Teaching Methods:
- Learning Spaces, Futuristic Learning Spaces & Advanced Technology in L&T
- Flipped Classroom, case-based, problem-based , Course-less structure

Changes of Assessment Methods:
- Holistic, Authentic
- Personalized-based Assessment
- Real-time, Contextual, Integrated

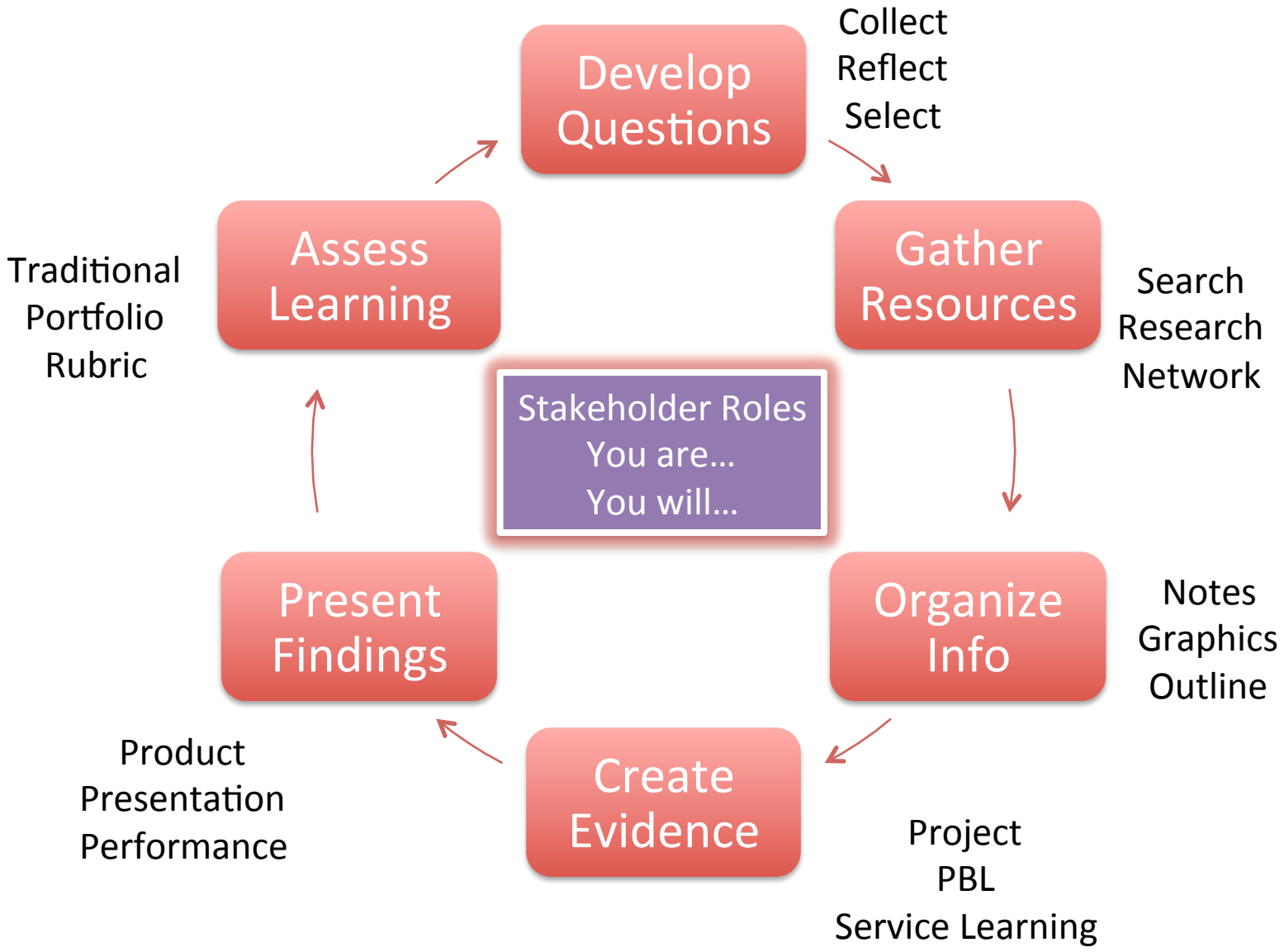
*Source: *Partly Adapted from Sabina-Jeschke, Engineering Education for Industry 4.0 (2016)*

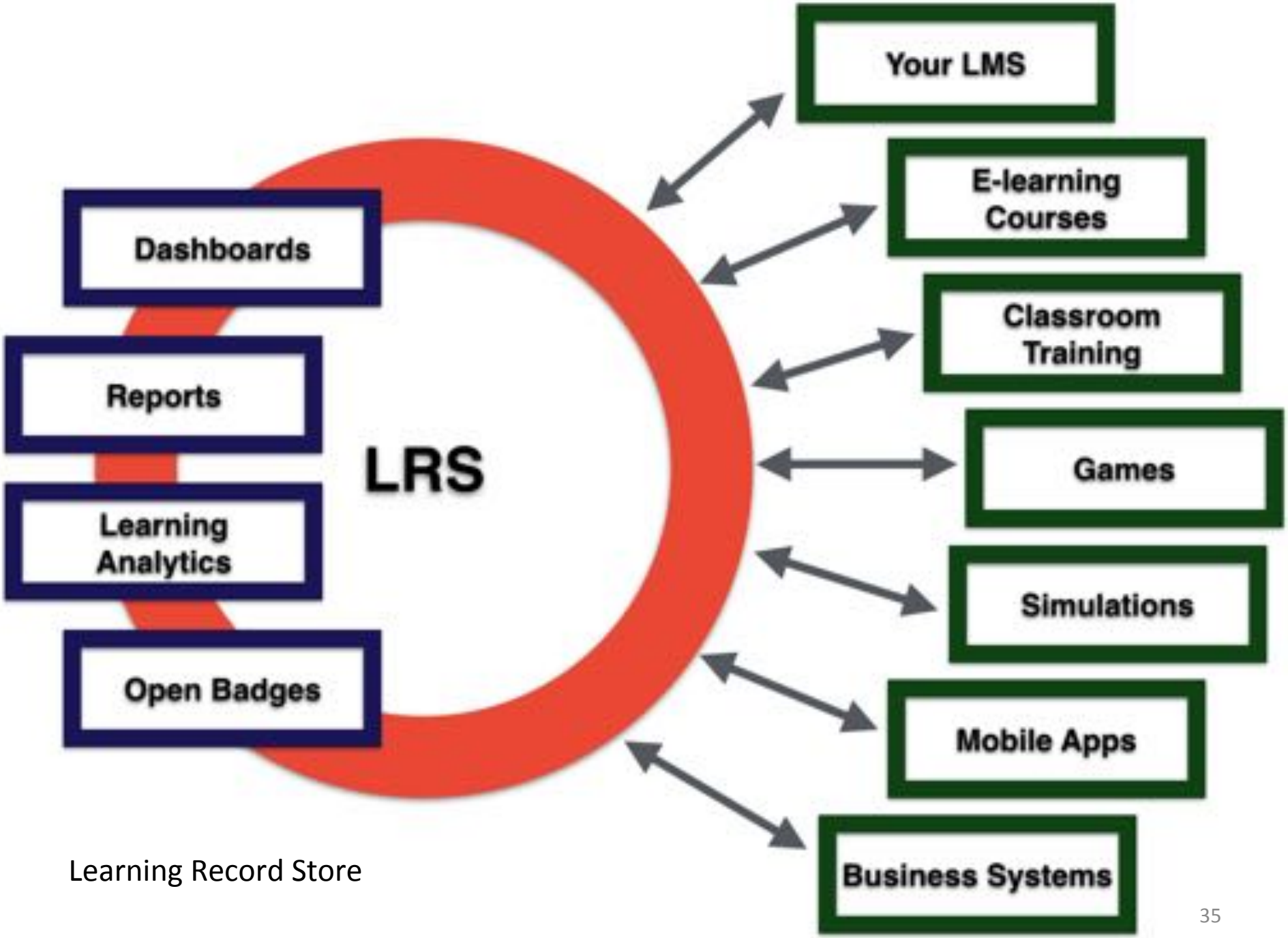
WHAT UNIVERSITIES NEED TO DO

1. Instil 4Cs into students — Communication, Collaboration, Critical Thinking, Creativity
2. Make programming and ICT education a compulsory subject
3. Develop educational content in collaboration with industry
4. Reform content and the methodology of education via digital
5. Have top people resources to lead global industry engagement
6. Create new business trends through reform of higher education
7. Industry 4.0 government, industry, university research

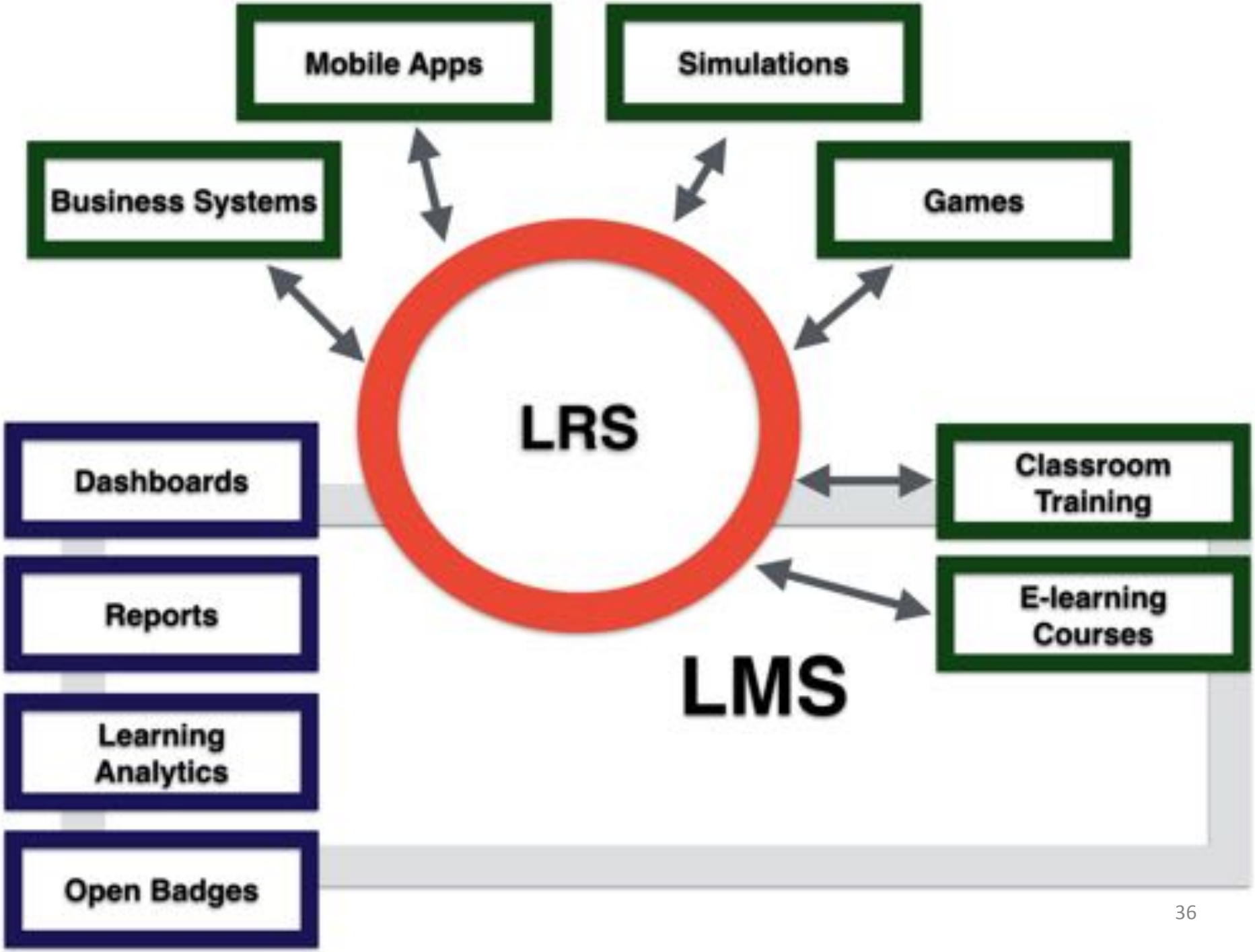
INFOGRAPHICS **NST**

PBL for 21st Century Learners





Learning Record Store


Mobile Apps
Simulations
Business Systems
Games
LRS
Dashboards
Reports
Learning Analytics
Open Badges
Classroom Training
E-learning Courses
LMS

Learning with Community

- LMS, web-based, FB group

Learning with Crowd

- MOOCs, FB Page

Community vs Crowd!

Crowd-Sourced Learning Skills

- Independent Learners
- High Self-Regulation
- Highly Motivated Learners
- High Social Presence Awareness
- Peer Scaffolding Skills, Peer Feedback
- High self-esteem
- Strong in varies of multiple intelligences
- Wisdom in learning
- Peer Assessment
- Self-Assessment

Network Perspective

Learning can be:

- A relation that connects people
  - teaching, learning, collaborative learning
- The characterization of the tie
  - Learning relationship
- A characterization of the outcome of relations
  - Learning community, community of inquiry, practice
- The network outcome of relations
  - social capital, knowledge held in the network
- Derived from ambient influence
  - news, gossip, common knowledge, culture, values

Source: Haythornthwaite (2014)

Paradigm Shift of Research Focus

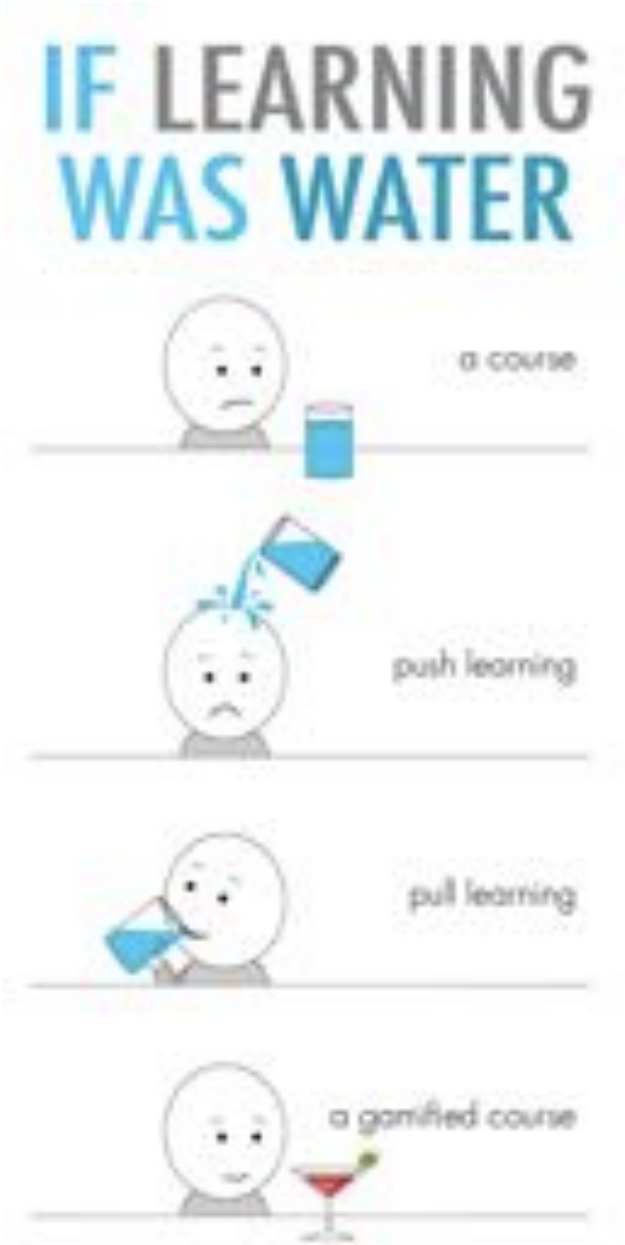
(through technology; social media, LRS, LA)

- **Who** learns from whom?
  - Who talks to, gives help to, collaborates with whom?
- **What** do they learn from each other?
- **Which media** support which kinds of learning?
- What **outcomes** do these relations build?
  - Access to resources Trust, mobility, equity, etc.
- What **benefit** accrues to the network?
  - social capital, shared knowledge, resources
- How do **resources flow** in the network

Source: Haythornthwaite (2014)

The Bottom Line

TACIT KNOWLEDGE



Assess,
Learn,
Apply,
Adapt

THANK YOU