



Developing Human Capital in Science, Technology and Innovation for the Fourth Industrial Revolution

Dr Dave Hall

Senior Technical Adviser: Economic Development

RTI International



FASTER, FASTER, FASTER and FASTER



Examples of rate of change

Technology	Average cost for equivalent functionality	Scale
3D printing	\$40,000 (2007) to \$100 (2014)	400x in 7 years
Industrial robots	\$500,000 (2008) to \$22,000 (2013)	23x in 5 years
Drones	\$100,000 (2007) to \$700 (2013)	142x in 6 years
Solar energy	\$30 per kWh (1984) to \$0.16 per kWh (2014)	200x in 20 years
3D LIDAR Sensors	\$20,000 (2009) to \$79 (2014)	250x in 5 years
DNA genome seq	\$10,000,000 (2007) to \$1,000 (2014)	10,000x in 7 years
BCI neuro devices	\$4,000 (2006) to \$90 (2011)	44x in 5 years
Full body med scan	\$10,000 (2000) to \$500 (2014)	20x in 14 years



Source: "Exponential Organizations"

<http://www.slideshare.net/vangeest/exponential-organizations-h>

@dw2



Learning to learn.. And learn again.. And again.....



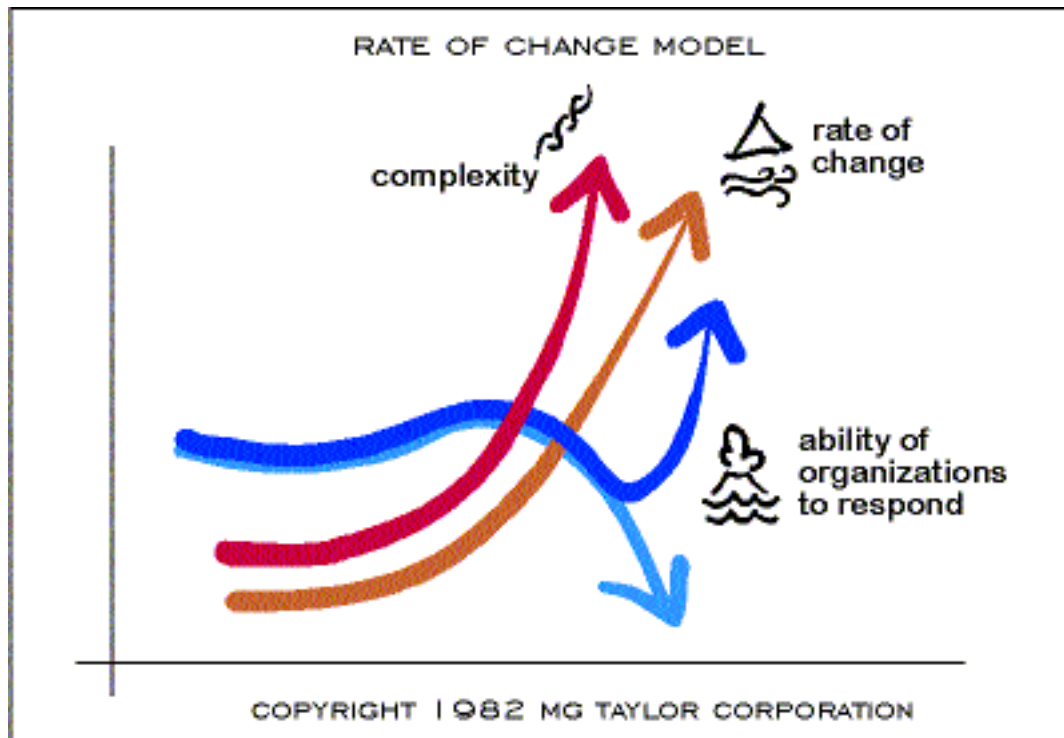
- What we learn/teach today is redundant tomorrow
- WHAT we learn is no longer so important
- **HOW we learn and re-learn is crucial**

Today, because of rapid economic and social change, schools have to prepare students for:

jobs that have not yet been created,
technologies that have not yet been invented and
problems that we don't yet know will arise. **OECD Education Directorate:
2011**

50% of subject knowledge acquired by a student in the first year of a 4-year technical degree will be outdated by the time the student graduates... **World Economic Forum**

ADAPTING TO CHANGE



New approaches and paradigms to keep up with ever increasing complexity and rate of change

“Innovate or die”

THE CHALLENGE



How can the Philippine workforce keep up with the ever increasing complexity and rate of change driven by FIRe?

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn. —Alvin Toffler

INDUSTRY ENGAGEMENT



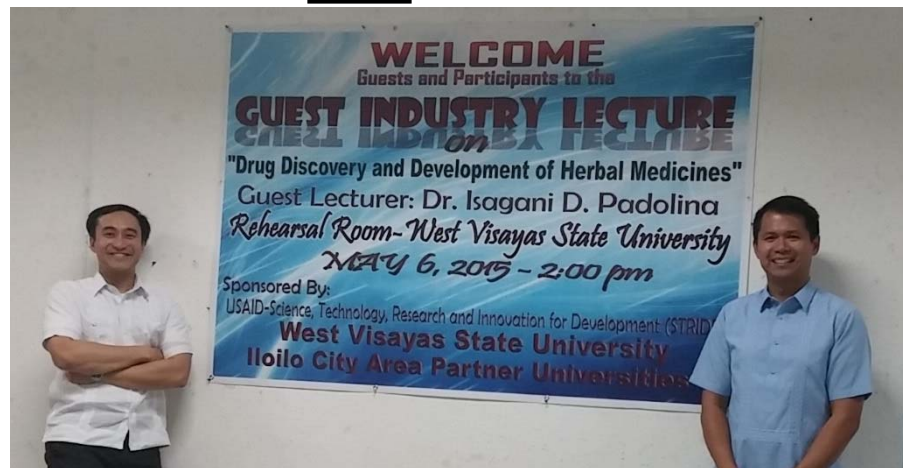
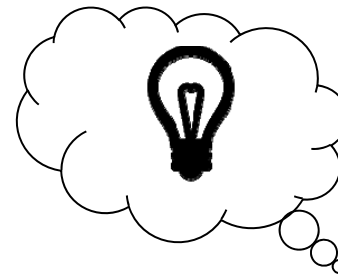
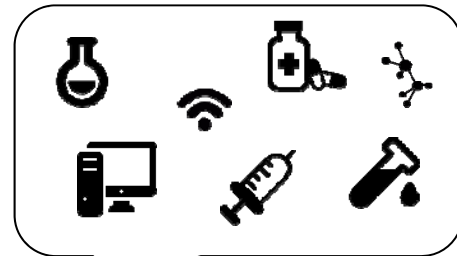
INDUSTRY ENGAGEMENT

"YES – OF COURSE WE ENGAGE!!!"



- Self test:
 - What percentage of students have 1-year paid internships?
 - How often does industry review your curriculum?
 - How many undergraduate projects come from industry?
 - How many industrialist teach your courses/units?
 - How quickly can you set up an industry visit
 - How many industrialists can you rely on to complete a survey or a series of interviews?
 - What percentage of your research activity is in collaboration with industry?
 - How much revenue do you generate? And is revenue important?
 - **How many are ‘friends’?**

STRIDE Guest Industry Lectures



The USAID STRIDE Guest Industry Lectures Program emphasizes the importance of learning and sharing between Academe and Industry



Faculty Immersion with Industry



Faculty experts immerse with industry partners to learn and understand their processes and technical requirements

STRIDE



1k cups

1000000
1 MILLION CUPS



STRIDE Innovation Workshops



Innovation Workshops

*from industry challenges
to collaboration & research innovations*



STRIDE Career Centers



FLORIDA STATE UNIVERSITY



William Davidson Institute
AT THE UNIVERSITY OF MICHIGAN



STRIDE



University Knowledge and Technology Transfer Offices (KTTO)



Managing the
University-
Industry
Relationship

European Commission Factories of the Future



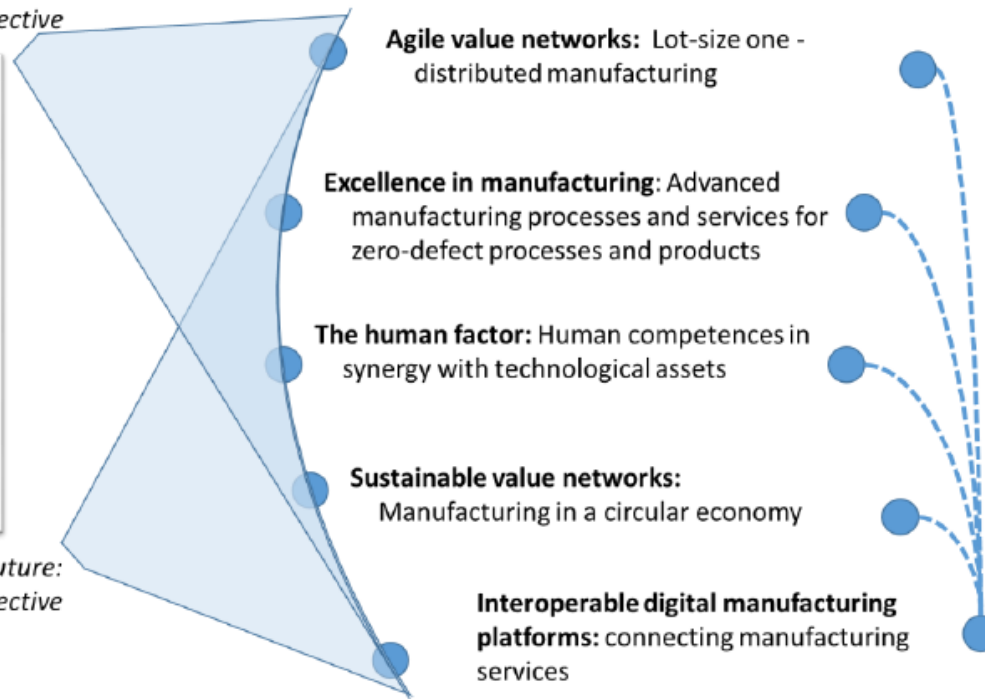
Building on the vision of the FoF 2020 roadmap and public consultation in 2016

→ Key priorities for FoF 18-19-20

*Vision of the factories of the future:
the challenge perspective*



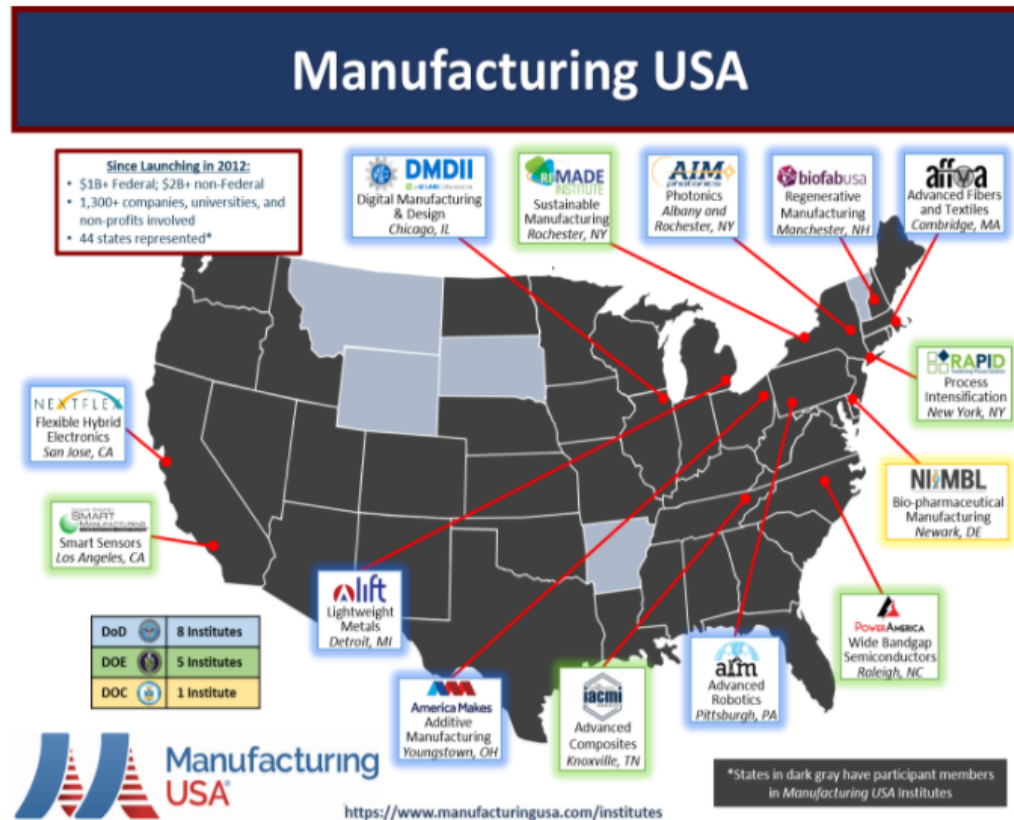
*Vision of the factories of the future:
the technology perspective*



- Initiated in 2008
- Eur 7.1 billion from H2020 funds
- Public-Private Partnership with industry contribution
- 240 projects involving 2,000 organizations across Europe
- Active SME involvement

Source: European Factories of the Future Research Association, www.effra.eu/

Manufacturing USA Innovation Institutes



- Initiated in 2012 by the U.S. Office of Science and Technology Policy
- \$1B+ from government, \$2B+ in private matching
- Public-Private Partnerships
- Funds advanced manufacturing research, including I4.0
- Intentional SME connection program

Source: www.businessdefense.gov/Programs/Manufacturing-USA-Institutes/

Oregon Nanoscience & Microtechnologies Institute (ONAMI)



- Launched in 2003
- Pooled faculties into a collaborative inter-university institute
- Objectives
 - Grow economic activity aggressively in areas aligned with industry
 - Invigorate collaboration between universities and corporate R&D centers
 - Create educational, research, and employment opportunities
- Leveraged each institution's strengths, rather than compete for limited monies
- Incentivized and rewarded collaboration through creative funding models
- Promoted dialogue and the exchange of knowledge and ideas through targeted events
- Now recognized as one of the most successful regional initiatives in the United States



KNOWLEDGE TRANSFER PARTNERSHIPS



- Running since 1975 in the UK
- Formerly known as Teaching Company Scheme, became KTP in 2003
- Around 1,000 concurrent programs at any one time in UK
- Aims of each KTP programme
 - to facilitate the transfer of knowledge and technology and the spread of technical and business skills to the company
 - to stimulate and enhance business-relevant research and training undertaken by the knowledge base
 - to enhance the business and specialist skills of a recently qualified graduate.



NC STATE UNIVERSITY

Centennial Campus

**70+ Partners
75+ University
Centers, Institutes
, and
Departments
7,000+ Students**

Named Outstanding Research Park
- Association of University Research Parks (AURP)



Malaysia HE 4.0

- Re-inventing higher education to address FIRE
- Breaking down the traditional university
- Merging education and workforce development with industry



Malaysia HE 4.0



- 2u2i
- MOOC
- APEL
- CEO@Faculty



Malaysia HE 4.0

Redefining the modern university



NO CHANGE

TRADITIONAL BRICK & MORTAR UNIVERSITY

Universities choose to engage in "business as usual" mode in delivery of education and dependency on the government for financial assistance. The traditional brick and mortar university may have the tendency of not responding to the demands of 4IR. However, it will undergo minimal changes in order to remain relevant and sustainable. Innovative approaches to partnership and collaboration between universities and industries will materialise but will less likely be sustainable in the long run.

MARGINAL CHANGE

JUKEBOX UNIVERSITY



The model allows students to select courses and educational programmes from various institutions using a concept similar to a musical 'jukebox'. The certification is awarded by the universities that have mutual recognitions on the programmes offered.

FUTURE UNIVERSITY MODEL

ADAPTIVE CHANGE

UBERISED UNIVERSITY



This type of university model provides cost-effective education through learning platforms. This model mimics the Uber urban transportation service concept whereby education is demand-driven, self-tailored, hassle free, highly accessible and convenient. The focus of this model is flexible education which promotes access to lifelong learning.

RADICAL CHANGE

NANO/MICRO CERTIFICATION

Nano/Micro certification model is a non-traditional certification programme offered by organisations/individuals that is recognised by the industry. It uses modular concept where certifications and credentials are stackable. These industry-driven certifications are capturing the interest of the digital natives.



Conclusions/Ways forward



- Resolve to re-invent tertiary education (incl TVET)
- Accept concept of lifelong learning
- Involve industry in curriculum development AND delivery
- Accept and encourage industry accreditation
- Encourage and explore novel university/industry education and re-education models
- Enable and encourage rapid revision of content
- Fully embrace Continuous Professional Development
- Accept that 'part-time' study will be the norm



Thank you!
Maraming salamat!