



Ingeniería 2014
Latinoamérica y Caribe
Congreso - Exposición

Construyendo un Futuro
Regional Sostenible

4 al 6 de Noviembre de 2014 - Centro Costa Salguero - Buenos Aires - Argentina

Disrupting the Way We Teach Engineering

Lueny Morell

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Wednesday, November 5 2015

10:30





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Trastornando la Forma de Enseñar Ingeniería

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agenda

- Why we should change the way we teach engineering?
- How should we teach engineering?
- Final thoughts

VUCA WORLD

VOLATILE

UNREST

COMPLEX

AMBIGUOUS

10.9 BILLION



The world's expected
population in 2100
(up from current 7.2 billion)

Urban economic shifts

2007 – 8

2025 –
20/50

Urban economic clout moves east.

World's top 50 cities, ranked by GDP¹

○ Dropout—included in 2007 but not in 2025

● Top 50 city in both 2007 and 2025

● Newcomer—absent in 2007 but included in 2025

Newcomers in 2025

Bangkok
Beijing
Chengdu
Chongqing
Delhi
Doha
Foshan
Guangzhou
Hangzhou
Mumbai
Nanjing
Shenyang
Shenzhen
Tianjin
Wuhan
Xi'an

Dropouts in 2025

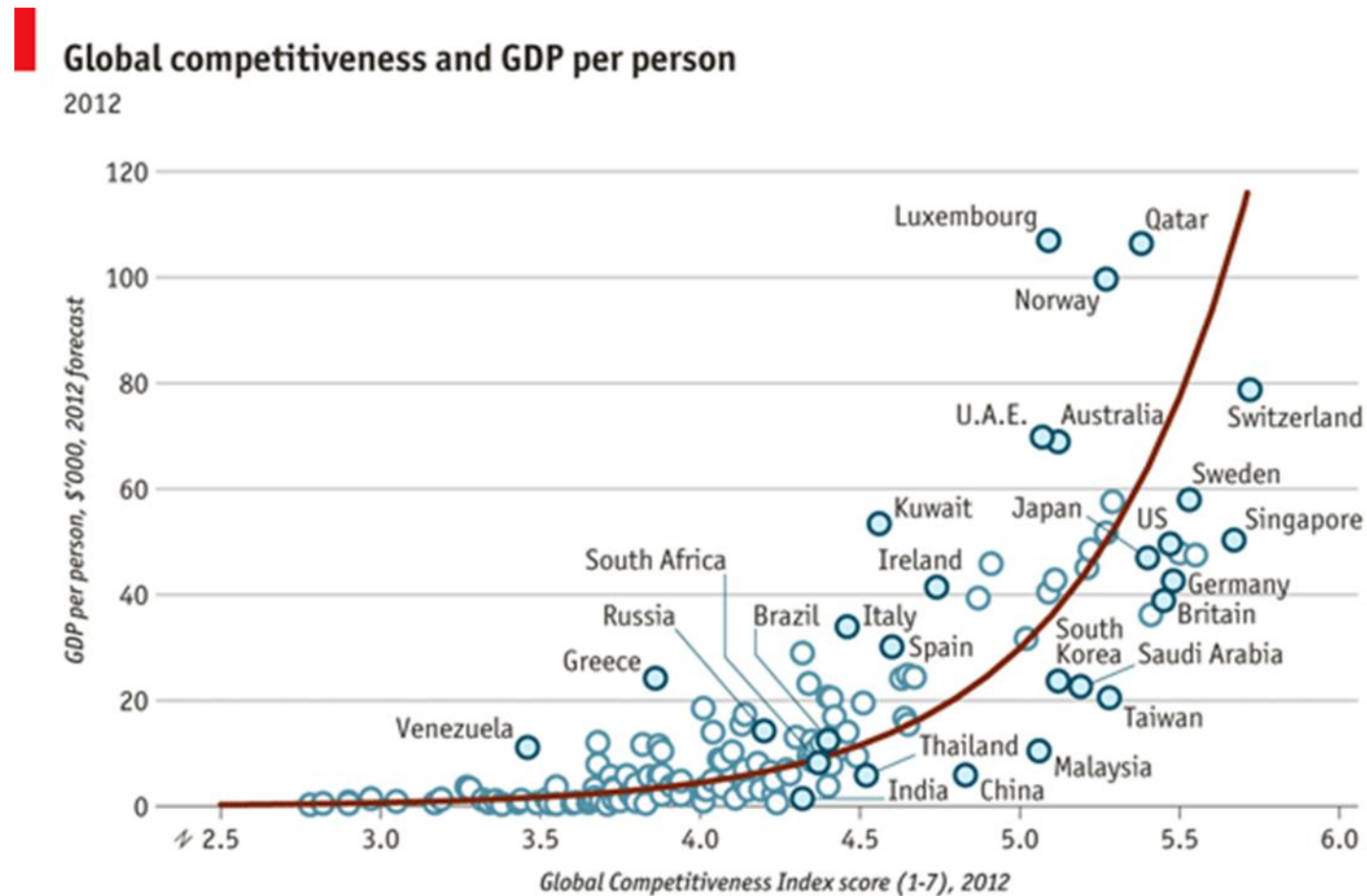
Athens
Barcelona
Denver
Detroit
Hamburg
Lille
Melbourne
Minneapolis–St. Paul
Munich
Nagoya
Oslo
Rhein–Main
Rio de Janeiro
Stuttgart
Taipei
Vienna



¹GDP is measured in dollars, using market exchange rates in 2007 and predicted real exchange rates in 2025. Data points on map and in lists refer to metropolitan areas rather than specific city jurisdictions, aggregating neighboring cities when appropriate (eg, Rhein-Ruhr in Germany; Los Angeles, Long Beach, and Santa Ana in California; or Mumbai and Thane in India).

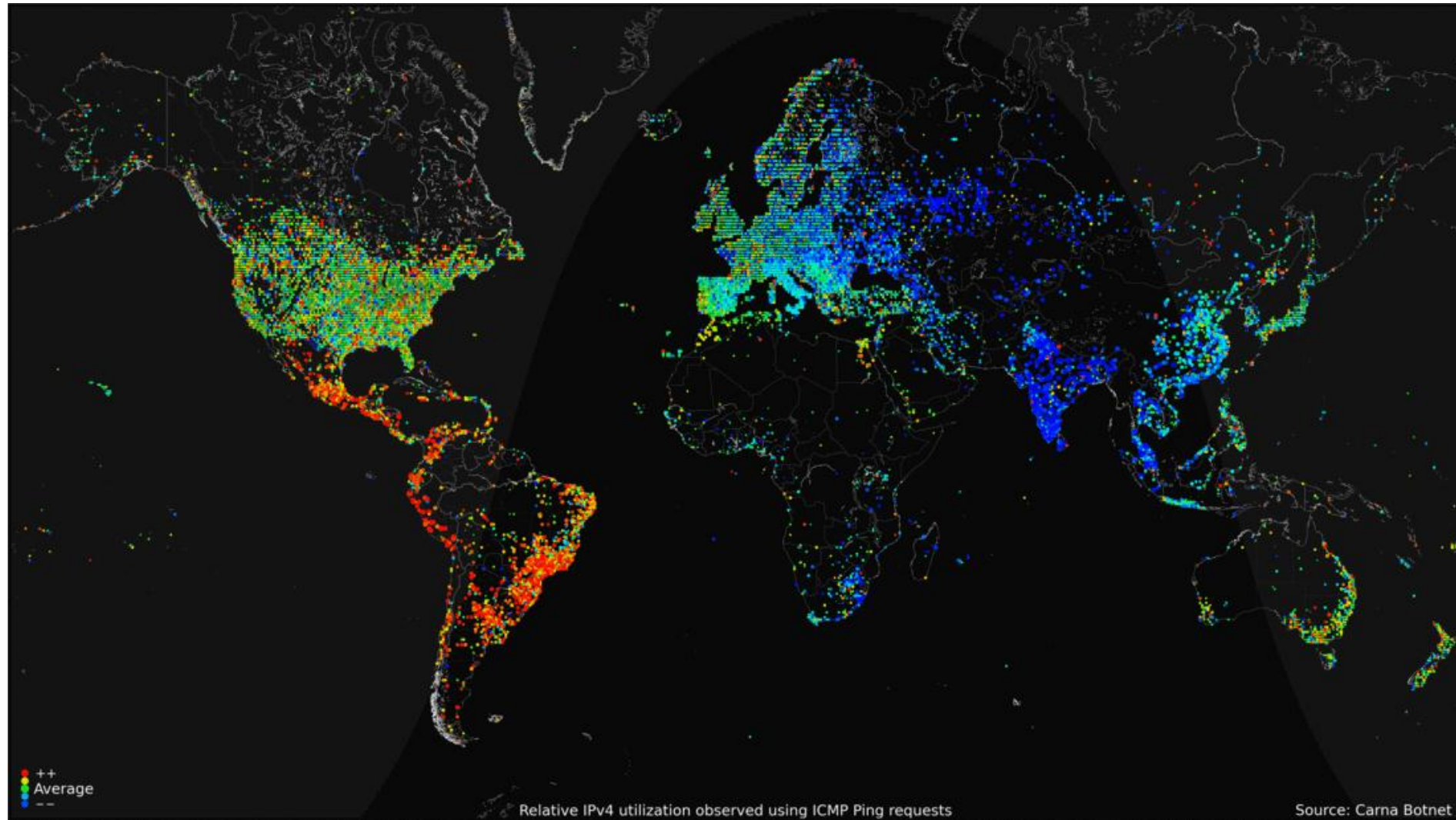
Source: McKinsey Global Institute

Global competitiveness & GDP (2012)



Sources: World Economic Forum; IMF; *The Economist*

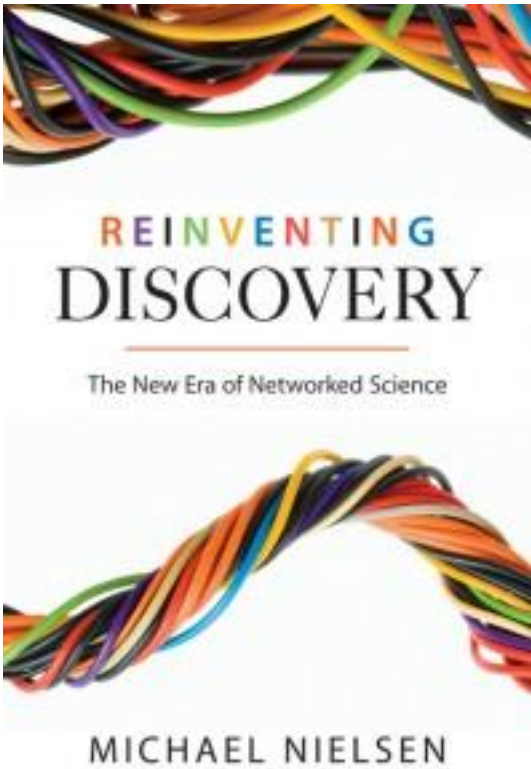
Enhanced communications



http://email.about.com/od/emailtrivia/f/emails_per_day.htm

<http://motherboard.vice.com/blog/this-is-most-detailed-picture-internet-ever>

R&D collaboration & global distribution intensifying



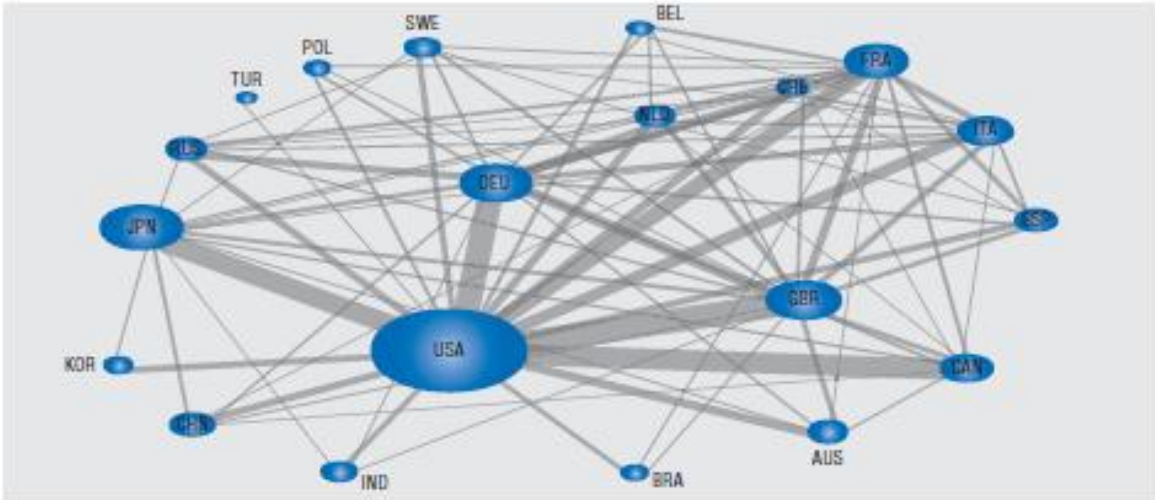
Intensifying collaboration in research

New players are emerging in the research landscape (the size of the bubble reflects the number of scientific publications) and collaboration is intensifying (the thickness of the link reflects the intensity of collaboration, i.e. co-authorships).

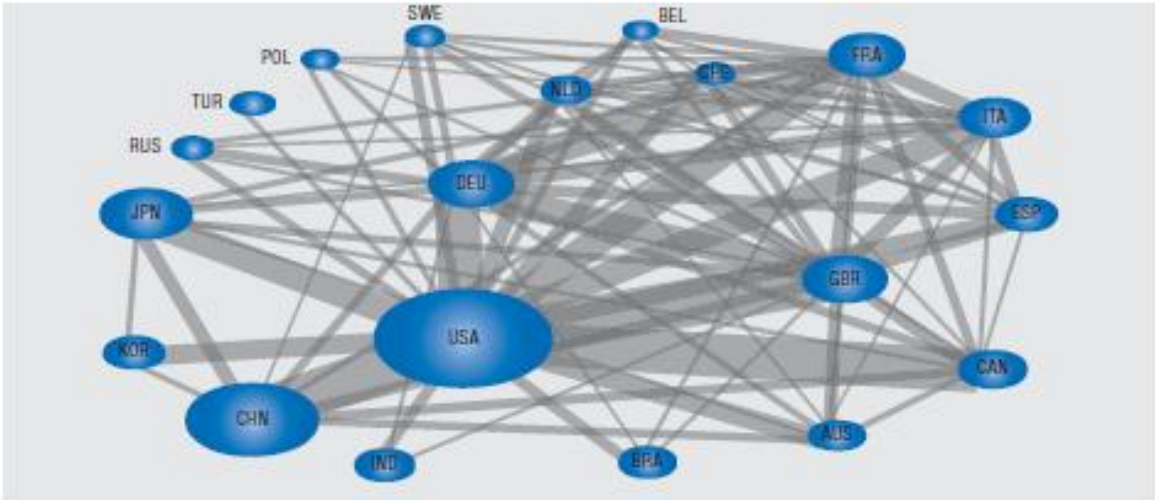
Scientific articles and co-authorship, 1998 and 2009

Numbers based on whole counts

1998



2009

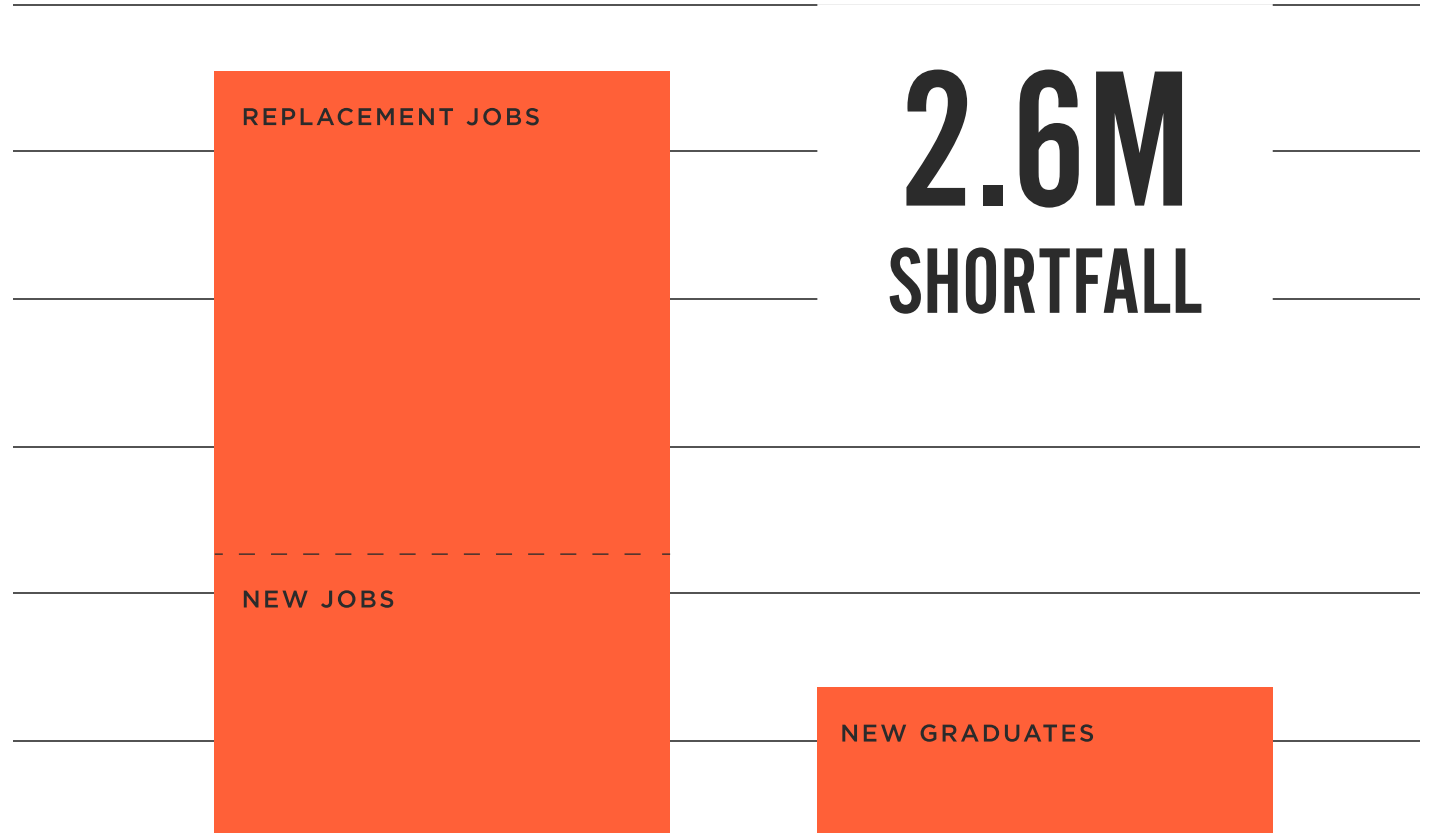


Source: OECD, calculations based on Scopus Custom Data, Elsevier, December 2010.

STEM SUPPLY CRISIS (US)

STEM occupations
job growth, 2008-
2018

*STEM Report,
Georgetown Center on
Education and the
Workforce*

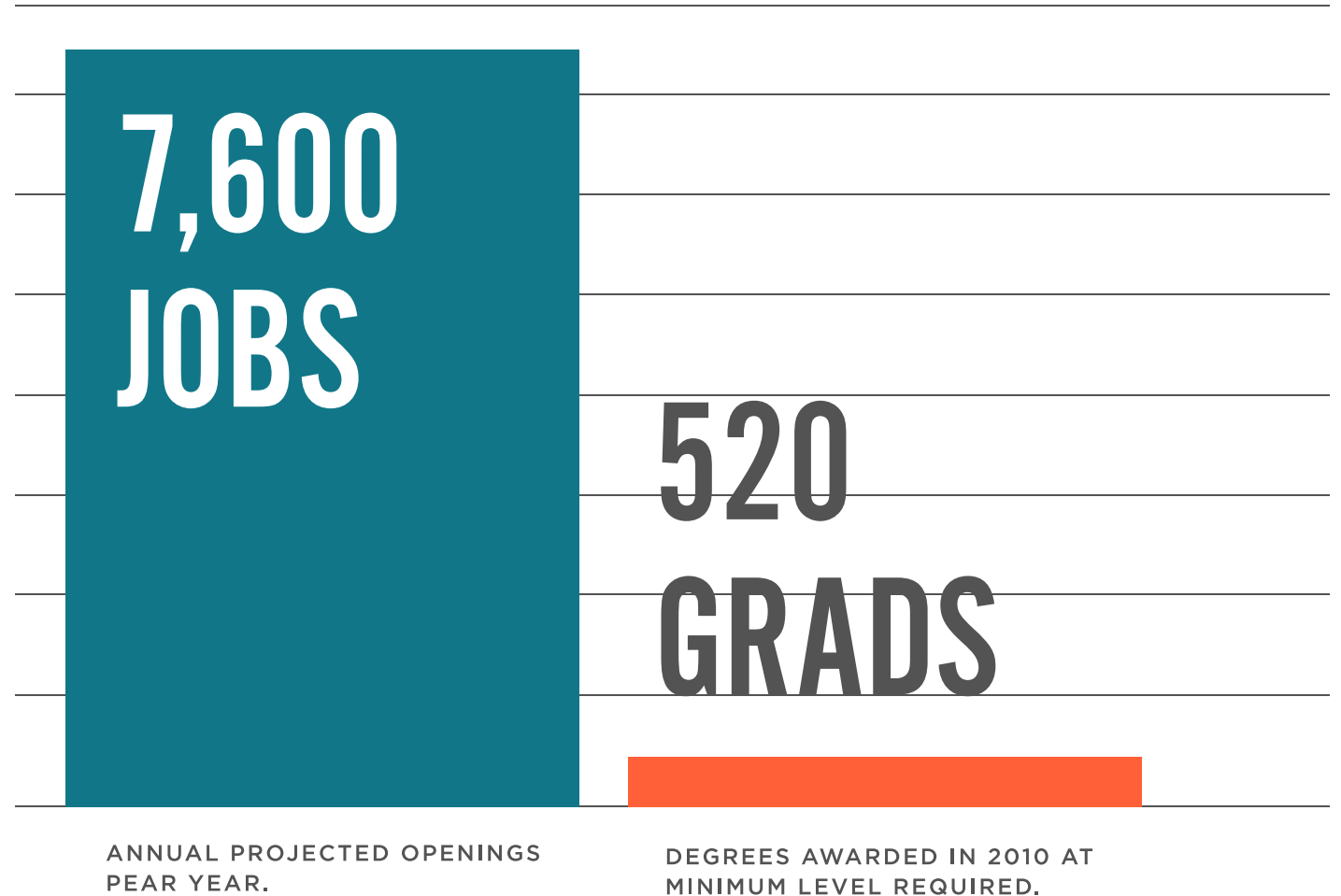


SKILLS GAP

Computer software
programming in
California.

<http://www.cpec.ca.gov/FiscalData/StepsDetail.asp?CIP=14>

- Jobs
- Graduates



PROGRAMS
ARE
LOSING UP
TO 50%
OF
MATRICULATI
NG

OF

The talent challenge

% of candidates considered suitable for hire¹

Of 100 graduates with the correct degree, how many could you employ if you had demand for all?

		Engineer	Finance/accounting	Generalist
Central and Eastern Europe	Hungary	50	50	30
	Czech Republic	50	40	20
	Poland	50	30	15
	Russia	10	20	10
Asia	Malaysia	35	25	20
	India	25	15	10
	Philippines	20	30	25
	China	10	15	3
Latin America	Mexico ²	20	25	11
	Brazil	13	13	8

¹Suitability rates empirically based on 83 interviews with human-resources (HR) professionals working in countries shown.

²Mexico is the only country where interview results were adjusted—to 20% (from 42%) for engineers and to 25% (from 35%) for finance/accounting employees—since interview base was thinner and risk of misunderstandings high.

Source: Interviews with HR managers, HR agencies, and heads of global-resourcing centers; McKinsey Global Institute analysis


Latin America Numbers

- 57% of students in the social sciences, 16% in engineering
 - 3 psychology students for each engineering student

“Las universidades (en la región) se han convertido en vacas sagradas... cuando deben ser pilar fundamental para preparar a los países para tener los conocimientos y habilidades para competir en un mercado mundial”

Andrés Oppenheimer, 2010

- R&D is mainly conducted in universities, disconnected with the market needs
- Obsession with past history
- Politics
- Long vacations
- Arrogance?

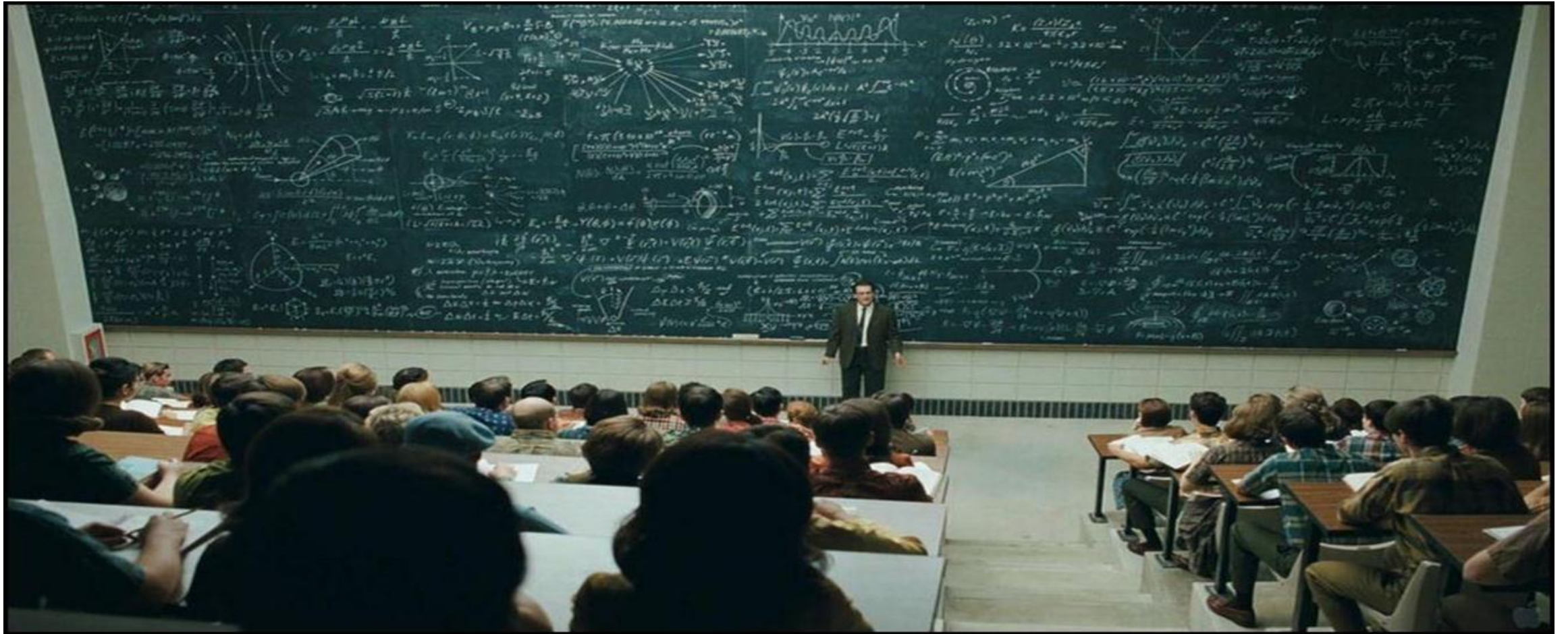


*“In the spirit of honoring traditions,
universities hang on to past
practices imperiling their future.”*

Clayton Christensen
Harvard University



87%!



US Dept of Education, 2001

SOY DIPLOMADO POR CAMBRIDGE EN BIOMÉTRICA MOLE-
CULAR, DOCTOR CUM LAUDE EN FÍSICA CUÁNTICA,
MÁSTER POR OXFORD, MEDALLA DE ORO EN EL CON-
GRESO DE EMPRENDEDORES DE NUEVA YORK,
PRIMERO DE PROMOCIÓN EN INGENIERÍA ESPACIAL...

BIEN, ¿Y USTED QUÉ SABE HACER?

The world does not have enough engineers and those graduating do not possess the competencies needed.

The problem



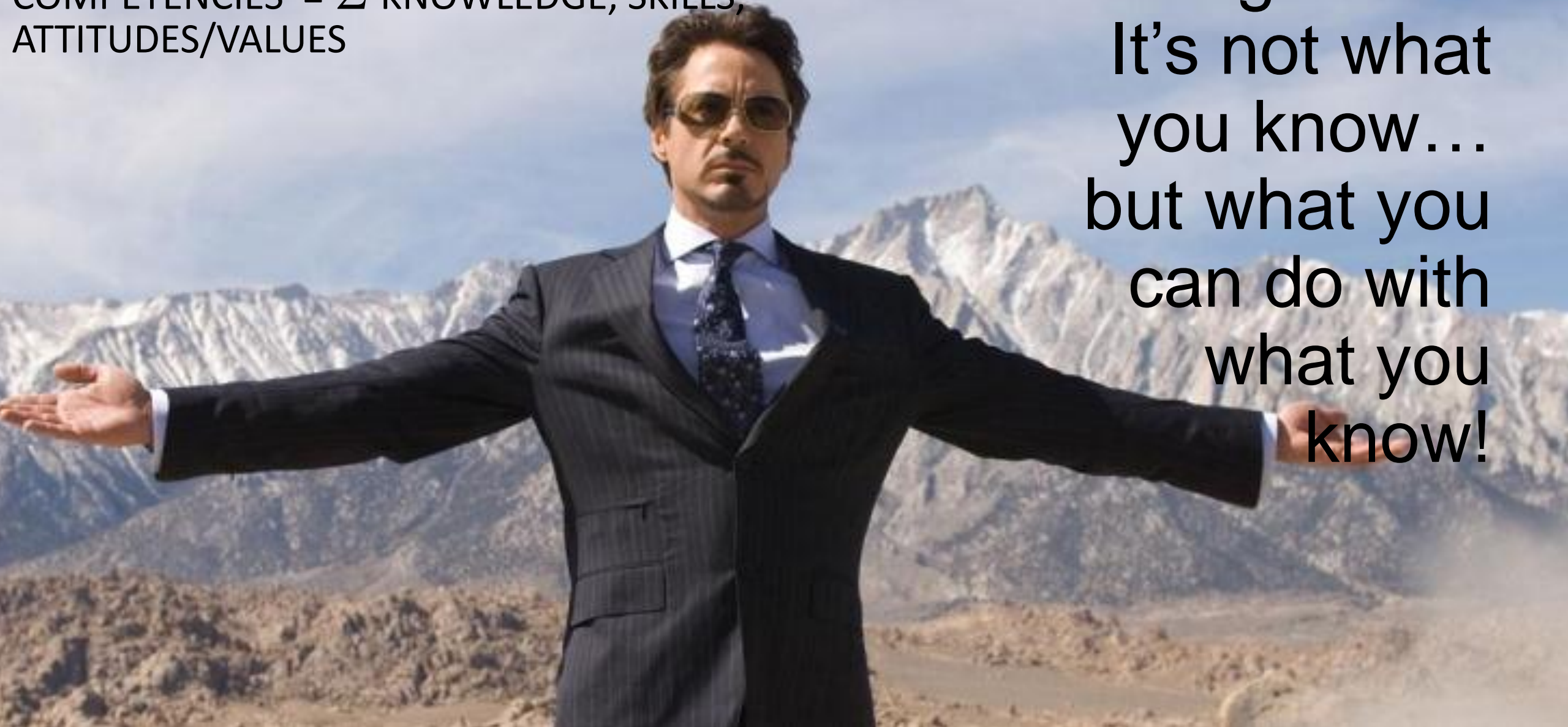
WE NEED A NEW BREED OF ENGINEER

Diverse, interdisciplinary, & all flavors of creative.

A locally pertinent but globally competitive engineer.

COMPETENCIES = Σ KNOWLEDGE, SKILLS,
ATTITUDES/VALUES

For engineers:
It's not what
you know...
but what you
can do with
what you
know!



So... we need to

1. Redefine the learning experience
2. Bridge the skills gap
3. Improve student ROI

A new university.

A proposal

To solve the perception gap

APPEAL TO A
BROADER
AUDIENCE BY
PROMOTING THE
ALLURE OF
MODERN
ENGINEERING



From 3D Printing to Music to Embedded Systems Development, our short-form course offerings, workshops, and community events provide gateways for new talent—weaving creativity, technology, and fun inextricably together.

To address the learning experience gap

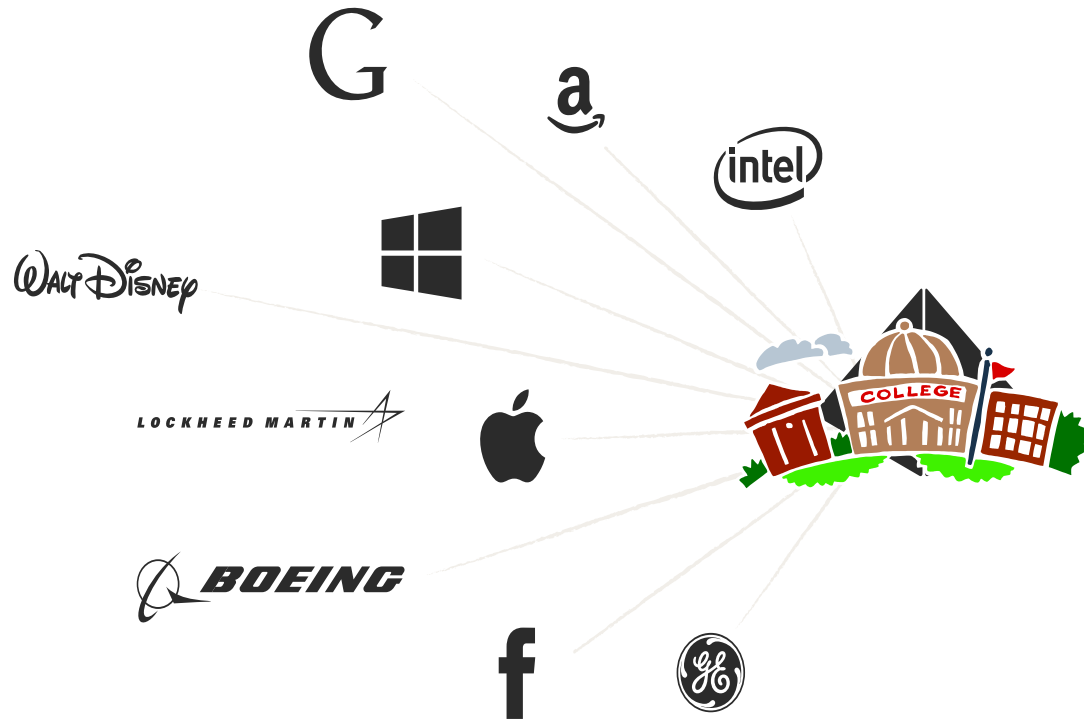
PROGRAMS THAT ARE BASED ON PRACTICE AND SKILLS, NOT THEORY AND ROTE MEMORIZATION

Address ALL learning styles. Use project-based learning. Engage students and professors in collaboration and teamwork that fuel meaningful engagement and fun.

Whether students are on campus or away, harness technology to scale education offerings and rapidly adapt and serve an expansive audience.



To solve the needs gap



INDUSTRY-ALIGNED PROGRAMS THAT MAP LEARNING OUTCOMES TO HIRING NEEDS (NOW & IN THE FUTURE)

Engineering programs that map directly to high-growth and diverse industries such as big data, green energy, and high tech.

With a faculty of leading practitioners facilitating industry-tied 'real world' projects and internships, students hit the ground running.

To improve student ROI



Attract students to programs that can guarantee worthy employment and get them through the learning experience successfully.



HANDS ON & PROJECT-BASED

A blurred office scene with people working at desks. In the foreground, a wooden desk holds various items including a red level, a calculator, and rolled-up blueprints. The background shows several people sitting at desks, some looking at computers. The overall atmosphere is professional and collaborative.

T(H)INKER SPACE



PROFESSOR REDEEM

FACULTY

20% TIME TO
DO OTHER
STUFF
(CONSULTING)

NO
TENURE

FIND
PROJECTS &
INTERNSHIPS
FOR
STUDENTS

LEARN
HOW TO
TEACH

MENTOR

SABBATICALS IN
INDUSTRY

RESEARCH
SCHOLARSHIP
ENGAGEMENT



DIVERSE
BACKGROUNDS

OUT OF
THE BOX
EXPERIENCE

role model

SEEK EXCELLENCE
THROUGH CONTINUOUS
IMPROVEMENT

Key performance metrics for learning analytics



COLLABORATIVE & FUN



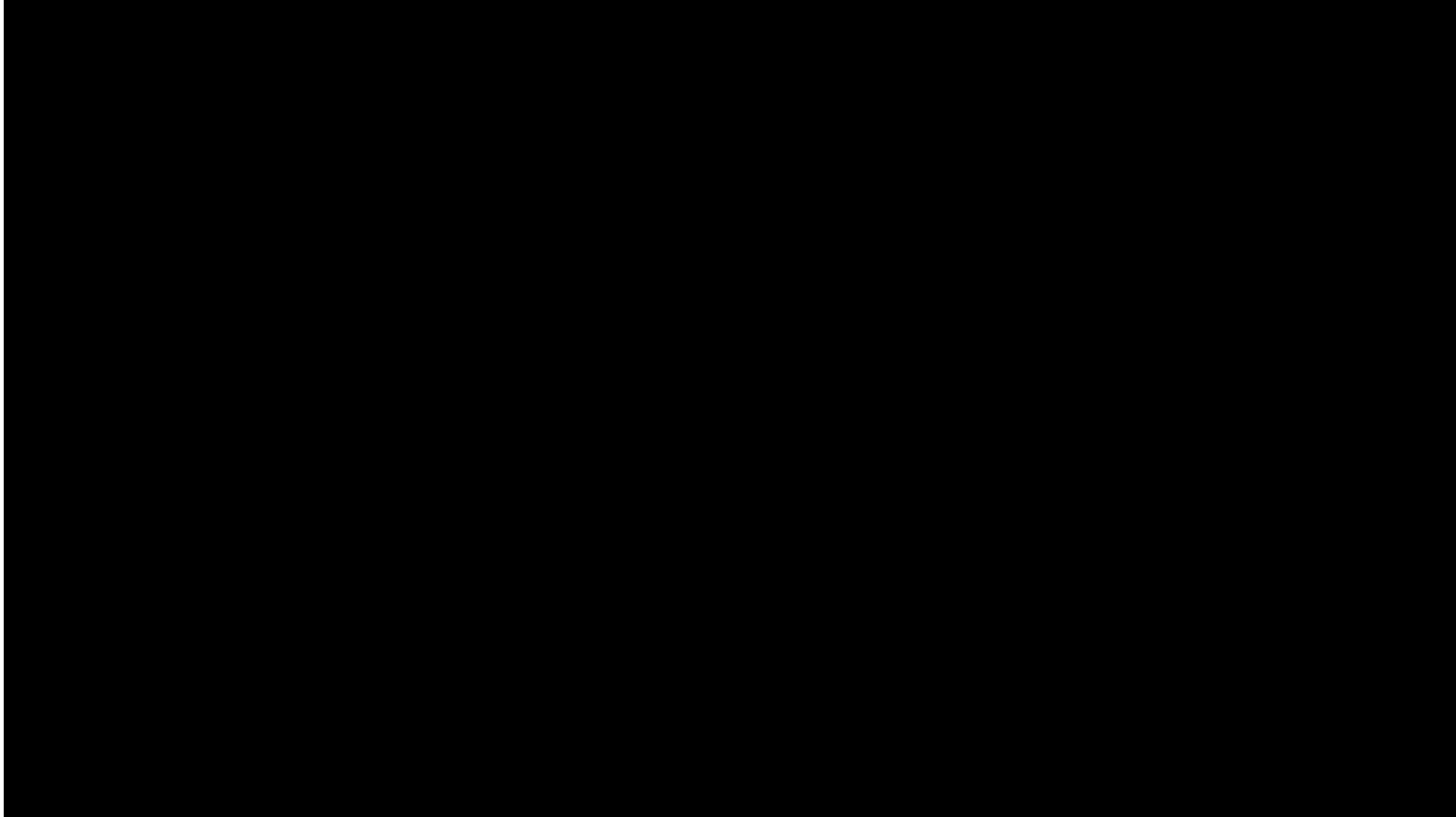
Summary

The skills gap and disconnect between traditional education and industry is widening.

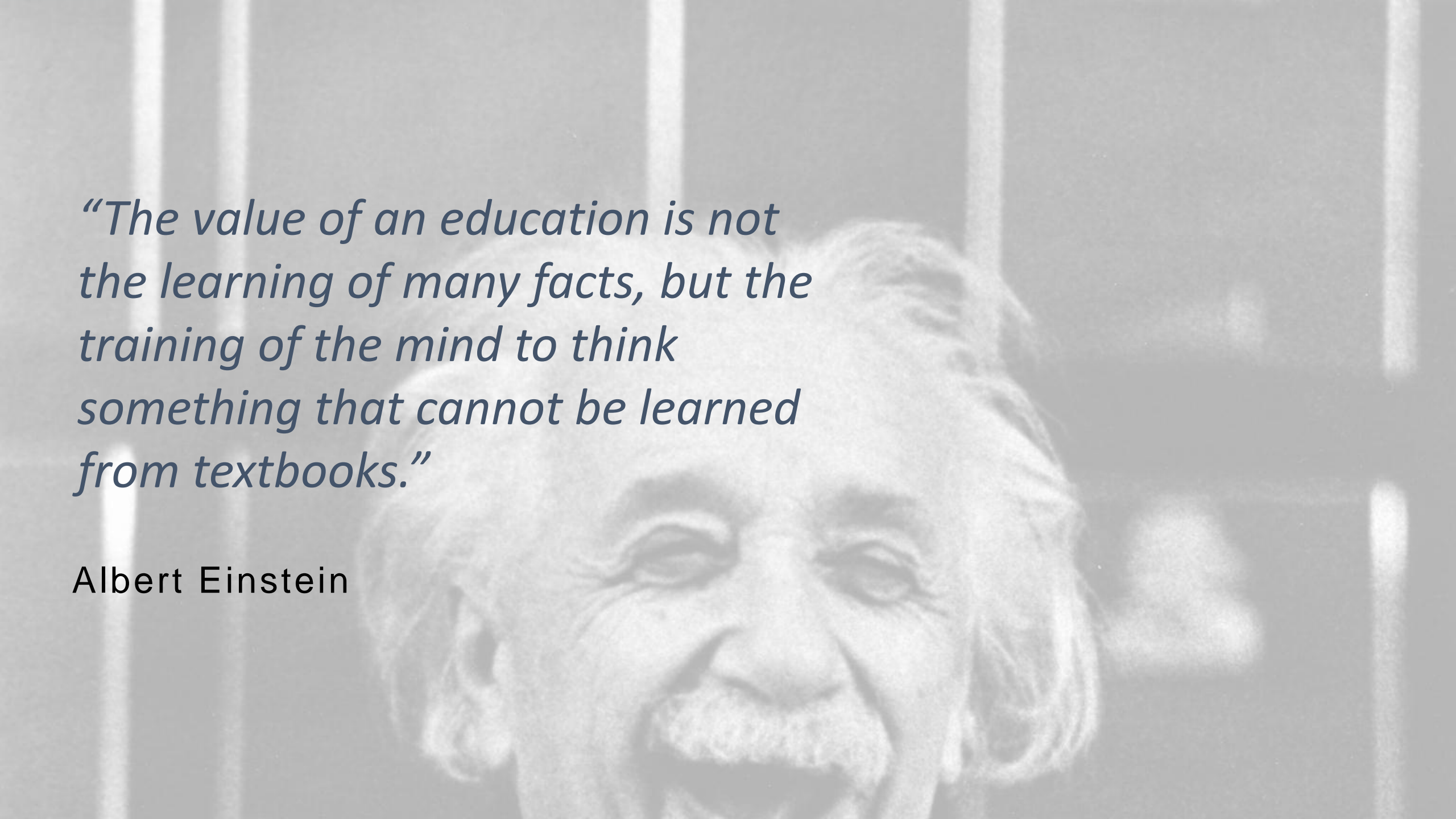
We should bridge the gap at scale by partnering with industry to redefine the education experience, while simultaneously attracting a vast new breed of highly-creative and diverse talent.

All with a dash of pizzazz.





Now GalvanizeU



“The value of an education is not the learning of many facts, but the training of the mind to think something that cannot be learned from textbooks.”

Albert Einstein