

UNIVERSITIES 4.0

Ushering a New Age of Enlightenment

JULY 4-5, 2019 | CEBU, PHILIPPINES

Reconfiguring Standards and Metrics of Performance in University Research and Development in Industry 4.0

Raymond Girard Tan, Ph.D.

Vice-Chancellor for Research
De La Salle University

IN PARTNERSHIP WITH



IRIS

About the Speaker



Career highlights

- Professor of Chemical Engineering and University Fellow
- DLSU Vice-Chancellor for Research and Innovation
- 300+ publications, 5000+ citations and h -index = 40 (Scopus)
- Academician, Philippine National Academy of Science & Technology (NAST)
- BS and MS ChE, PhD ME (DLSU)
- Multiple scientific awards from the DOST, CHED, NAST, NRCP and PAASE
- Co-editor-in-chief of *Process Integration & Optimization for Sustainability* (Springer Nature) and subject editor of *Sustainable Production & Consumption* (IChemE/Elsevier)
- Member of the editorial boards of the journals *Clean Technologies & Environmental Policy* (Springer Nature) and *Int. J. of Supply Chain and Operations Resilience* (Inderscience)
- Co-author of *Input-Output Models for Sustainable Industrial Systems* (Springer Nature)
- Co-editor of *Recent Advances in Sustainable Process Design and Optimization* (World Scientific) and *Process Design Strategies for Biomass Conversion Systems* (Wiley)



Areas of interest

- Process systems engineering (PSE), process integration (PI), life cycle assessment (LCA), input-output (I-O) modelling, process graph (P-graph)

Reconfiguring Standards and Metrics of Performance in University Research and Development in Industry 4.0

Raymond R. Tan, Ph.D.

Vice-Chancellor for Research and Innovation
De La Salle University, Manila, Philippines





De La Salle University Manila, Philippines

"A leading learner-centered and research University bridging faith and scholarship, attuned to a sustainable Earth, and in the service of Church and society, especially the poor and marginalized."



- A private, comprehensive, non-stock/non-profit Catholic university founded in 1911
- Ranked **1st** among PH HEIs in number of Scopus-indexed publications 2014-2018.
- 400%** research output growth in 2010-2018
- THE World Ranking **801+**
- THE Emerging Economies Ranking **251+**
- THE Asia-Pacific Ranking **201+**
- THE Asian Ranking **251+**
- THE Impact Ranking **301+**
- THE Subject Ranking (Eng. & Tech.) **501+**
- QS World Ranking **801+**
- QS Asian Ranking **155**
- Scimago Institution Ranking **714**

Outline

- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

Outline

- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

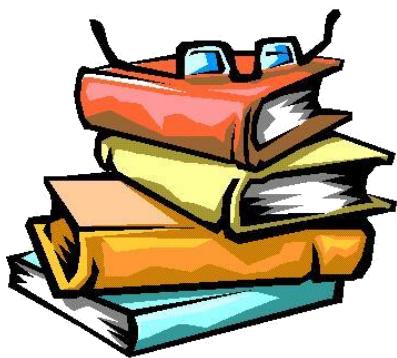
Important Trends that Affect Our HEIs

- Industry 4.0
- ASEAN integration
- Greater research emphasis in emerging economies
- Sustained PH economic growth (6+% annual GDP growth)
- Republic Act 10931
- K-12 reform in basic education

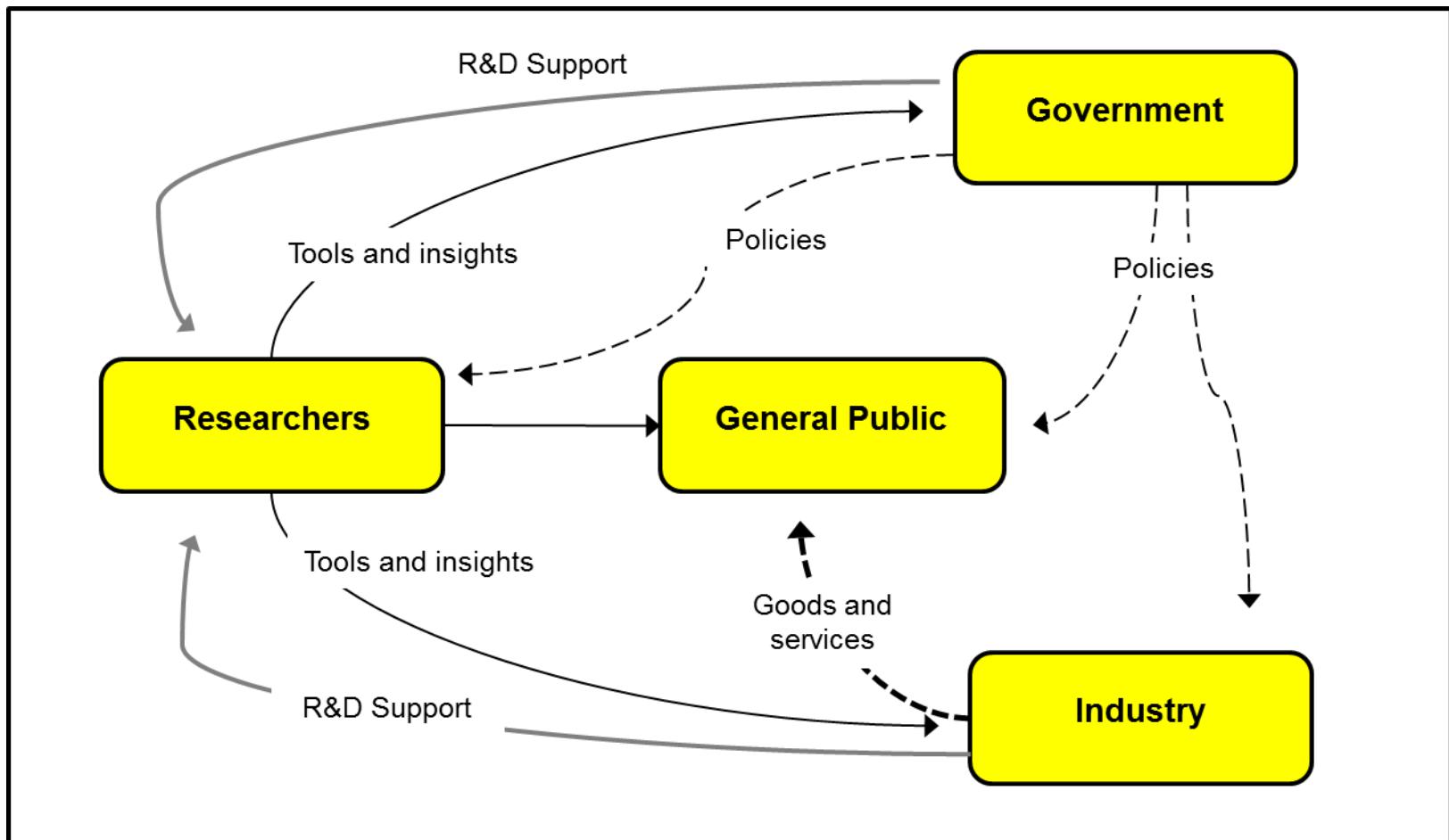
Roles of Academia

Academic institutions have three main functions:

- Transmit knowledge
- Create knowledge
- Act as a public knowledge resource



Interdependencies: Researchers and Society



Philippines 2018 GII Rank

(Source: www.globalinnovationindex.org)



Criterion	2018 Rank
Overall	73*
R&D expenditure	97
PCT patents	97
Scientific articles	120
*From 83rd in 2015	

Scientific Roots of Innovation

The screenshot shows a journal article from the journal 'Research Policy'. The top header includes the journal title 'Research Policy', the volume information '48 (2019) 1362–1372', and the publisher 'Elsevier'. Below the header, there's a decorative illustration of two figures under a tree, followed by the Elsevier logo. The main title of the article is 'Scientific novelty and technological impact'. The authors listed are Reinhilde Veugelers^{a,b,c,*}, Jian Wang^{a,d}. The article is categorized under 'ARTICLE INFO' with keywords: 'Keywords: Industry science links, Technology transfer, Scientific novelty, Technological impact'. The abstract section begins with: 'This paper explores the complex relationship between scientific novelty and technological impact. We measure novel science as publications which make new combinations of prior knowledge, as reflected in new combinations of journals in their references, and trace links between science and technology by scientific references in patent applications. We draw on all the Web of Science SCIE journal articles published in 2001 and all the patents in PATSTAT (October 2013 edition). We find that the small proportion of scientific publications which score on novelty, particularly the 1% highly novel scientific publications in their field, are significantly and sizably more likely to have direct technological impact than comparable non-novel publications. In addition to this superior likelihood of direct impact, novel science also has a higher probability for indirect technological impact, being more likely to be cited by other scientific publications which have technological impact. Among the set of scientific publications cited at least once by patents, there are no additional significant differences in the speed or the intensity of the technological impact between novel and non-novel scientific prior art, but the technological impact from novel science is significantly broader and reaching new technology fields previously not impacted by its scientific discipline. Novel science is also more likely to lead to patents which are themselves novel.'

- Scientific discoveries are the basis of deep technological innovations.
- Such breakthroughs underlie modern products and services that we take for granted.

“Novel science is also more likely to lead to patents which are themselves novel.”

Scientific Roots of the Touchscreen

Touch Displays: A Programmed Man-Machine Interface

By E. A. JOHNSON

Royal Radar Establishment, Malvern

1. Introduction

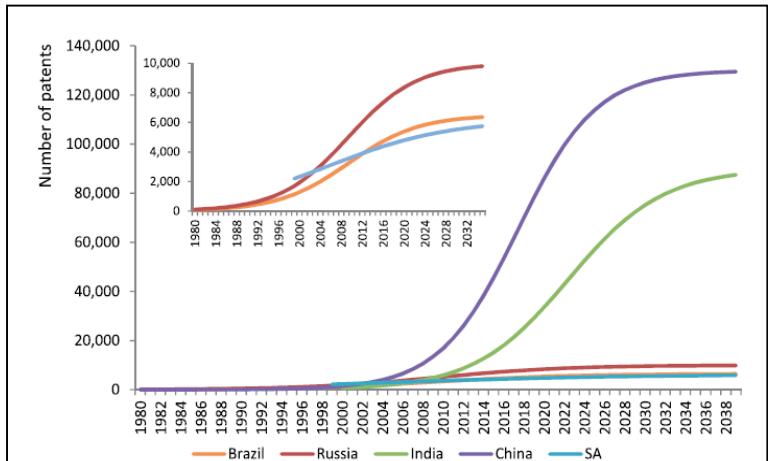
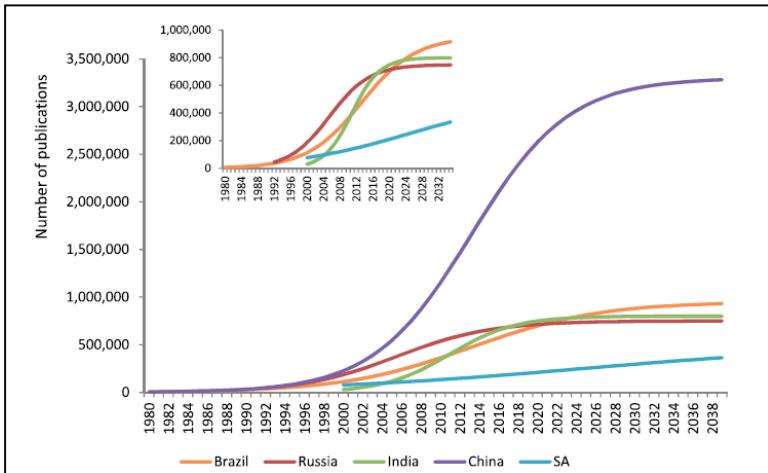
A very large number of so-called automatic data-processing systems require the co-operation of human operators to achieve satisfactory operation. In many of these systems it is necessary to reduce operator reaction time to a minimum, which in turn demands an arrangement where the man-machine communications are optimized. This requires that the methods of presenting information to, and receiving instructions from, the operator should be rapid and easy.

2. The General Problem of Man-Machine Communication

For the presentation of information to the operator the system generally

- The ubiquitous modern touchscreen can be traced to early work in the 1960s.
- Johnson's 1967 article in *Ergonomics* reports some of the early R&D.

BRICS Innovation Trends



- Typical publication volume exceeds patents by a factor of about 50.
- Growth trends span comparable multi-decade time horizons

Journal of Informetrics 9 (2015) 90–101
Contents lists available at ScienceDirect
Journal of Informetrics
journal homepage: www.elsevier.com/locate/joi

CrossMark

Trajectories of science and technology and their co-evolution in BRICS: Insights from publication and patent analysis

Chan-Yuan Wong ^{a,*}, Lili Wang ^{b,1}

^a Department of Science and Technology Studies, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
^b UNU-MERIT, Keizer Karelplein 19, 6211 TC Maastricht, The Netherlands

ARTICLE INFO

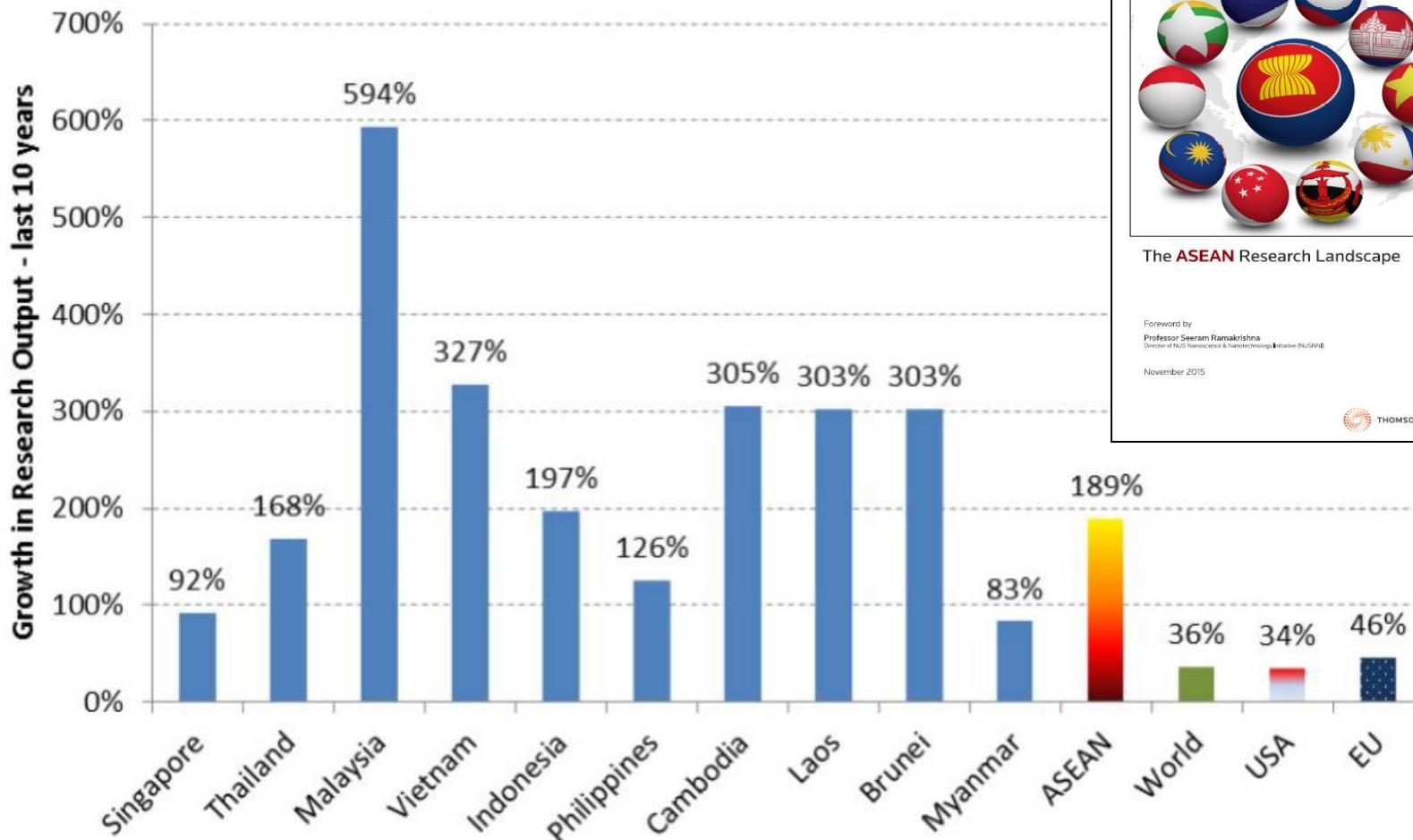
ABSTRACT

Outline

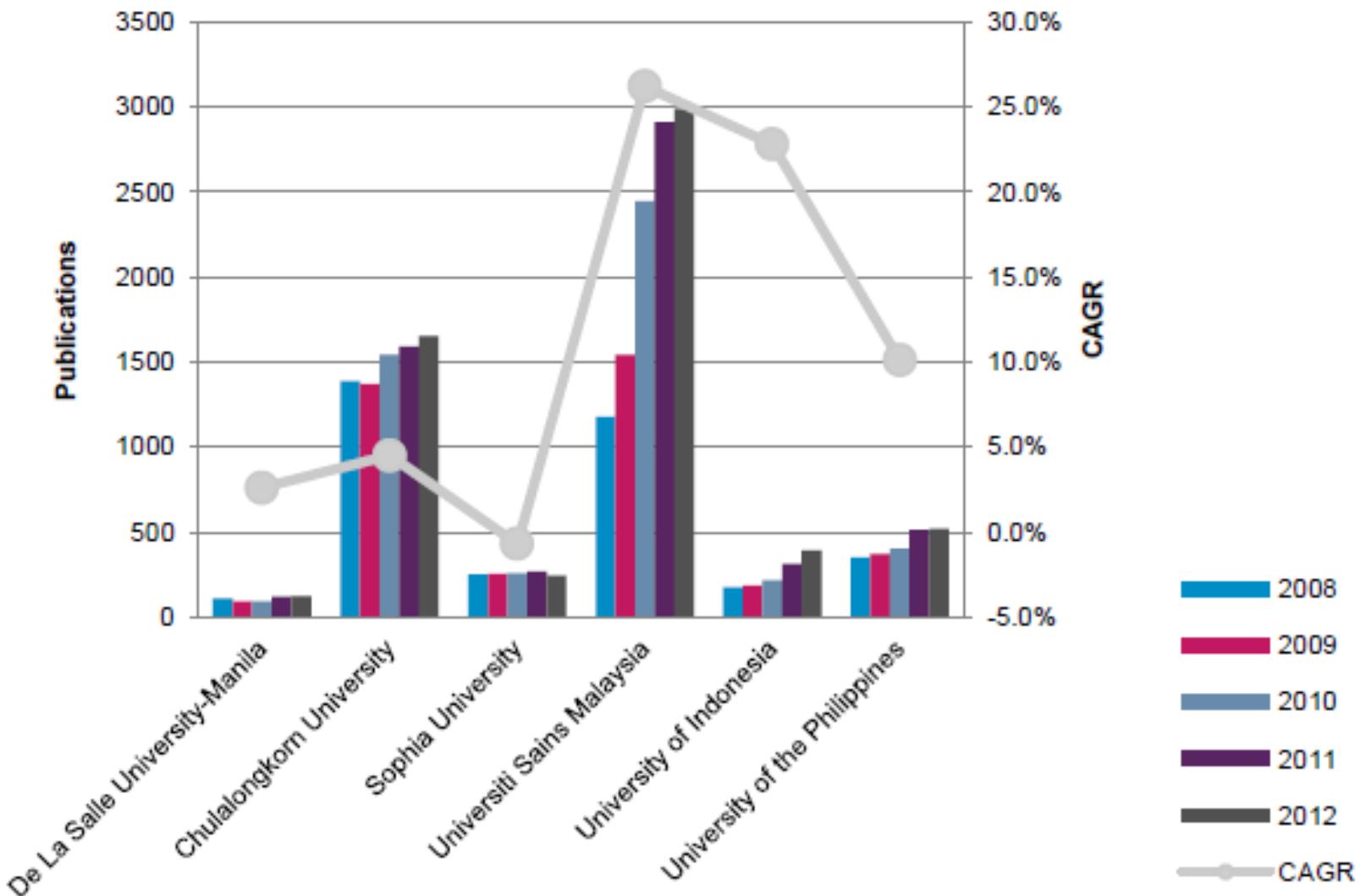
- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

Research Growth in ASEAN and Beyond

(Source: Thomson Reuters)



Output Levels and Asian Benchmarks



Outline

- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

A Brief Rationale for Rankings

- Rankings provide a global scorecard for comparative assessment of institutions.
- Such information is crucial for decision-making involving international mobility, partnerships and linkages.
- Rankings are “low-resolution” and are not intended to replace in-depth assessments within countries (e.g., by CHED).

Ranks of Selected Philippine HEIs

Institution	2019 THE WUR/AUR	2020 QS WUR	2019 QS AUR
UP	501+/101+	356	72
DLSU	801+/251+	801+	155
ADMU	n/a	601+	115
UST	n/a	801+	162
USC	n/a	n/a	301+
MU	n/a	n/a	401+
MSU-IIT	n/a	n/a	451+
SU	n/a	n/a	451+

Research and QS World Rankings

(www.topuniversities.com/qs-world-university-rankings/methodology)

Research Components:

*“Academics may *not* be well positioned to comment on teaching standards at other institutions, but it is well within their remit to have a view on where the most significant research is currently taking place...”*

“Citations... are the best understood and most widely accepted measure of research strength.”

Criterion	%
Academic peer survey	40
Employer survey	10
F:S ratio	20
Citations per faculty	20
International faculty	5
International students	5

Research and QS World Rankings

(www.topuniversities.com/qs-world-university-rankings/methodology)

Research Components:

Criterion	%
Academic peer survey	40
Employer survey	10
F:S ratio	20
Citations per faculty	20
International faculty	5
International students	5

“Academics may *not* be well positioned to comment on teaching standards at other institutions, but it is well within their remit to have a view on where the most significant research is currently taking place...”

“Citations... are the best understood and most widely accepted measure of *research strength*.”

Research and QS World Rankings

(www.topuniversities.com/qs-world-university-rankings/methodology)

Research Components:

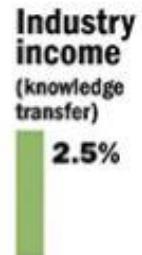
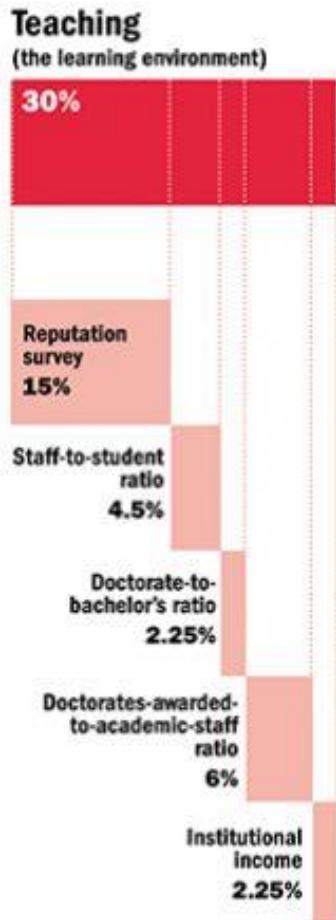
Criterion	%
Academic peer survey	40
Employer survey	10
F:S ratio	20
Citations per faculty	20
International faculty	5
International students	5

*“Academics may *not* be well positioned to comment on teaching standards at other institutions, but it is well within their remit to have a view on where the most significant research is currently taking place...”*

“Citations... are the best understood and most widely accepted measure of research strength.”

Times Higher Ed. WUR Criteria and Weights

(www.timeshighereducation.com/world-university-rankings/methodology-world-university-rankings-2019)



Broad Indicators with ASEAN Benchmarks

Selected peer institutions to show:

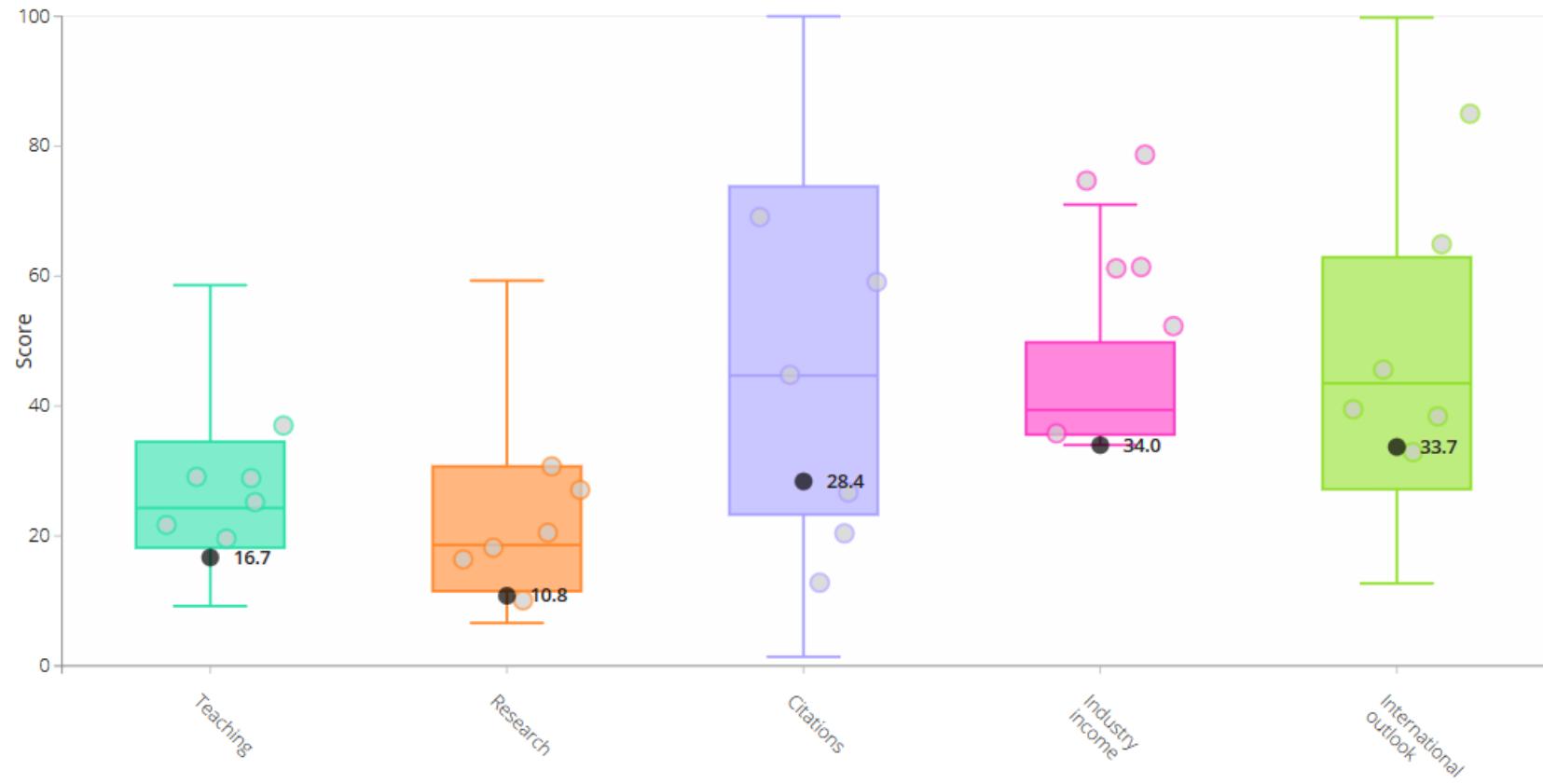
- Chulalongkorn University
- Universitas Gadjah Mada
- Mahidol University
- University of Malaya
- University of the Philippines
- Universiti Teknologi Petronas



CLEAR LIST

ADD ALL PEERS

Region: Worldwide



Outline

- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

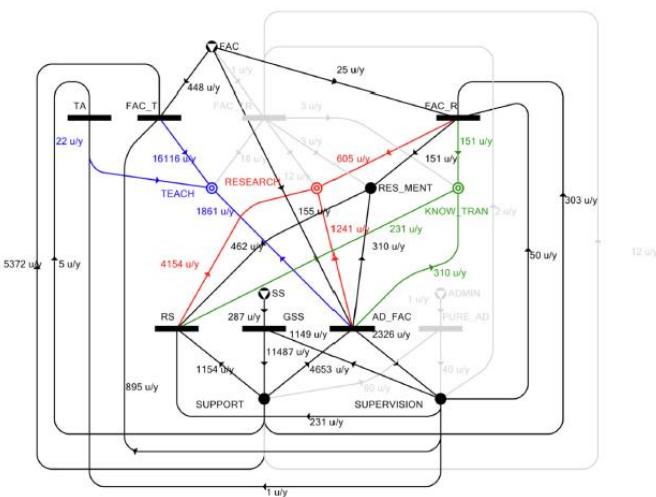
Some DLSU Best Practices

- Research workload equivalency for faculty
- Research requirements for career progression
- Research requirements embedded in degree programs
- Research support offices and facilities (labs, subscriptions)
- Internal funding for small projects and grant matching
- Productivity-based financial incentives
- Institutional network (HEIs, industry, government, alumni)

Managing Human Resource Implications



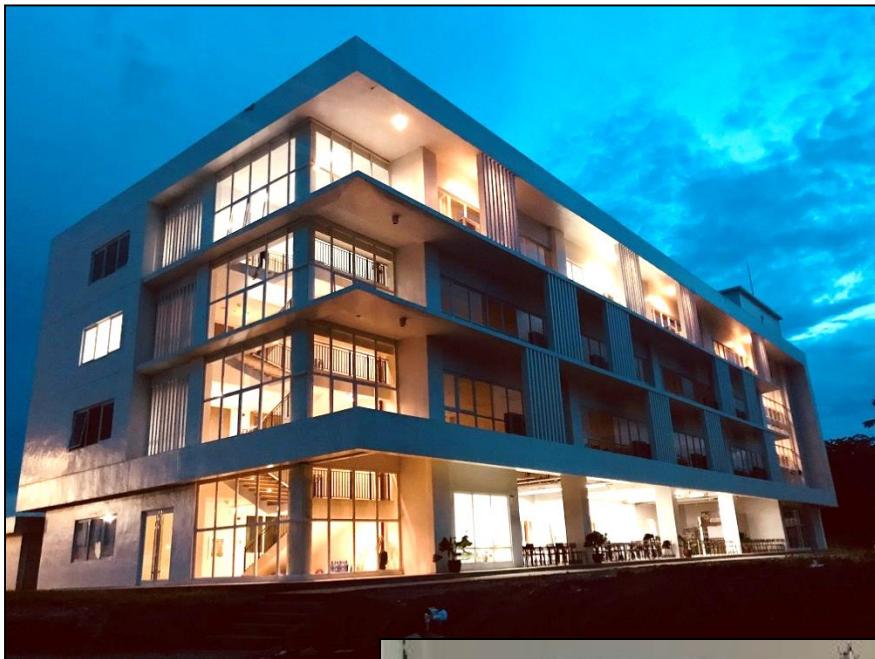
- ❑ Increased research output will require more HR inputs
 - ❑ Direct HR – faculty and research staff augmentation
 - ❑ Indirect HR – support staff augmentation



DLSU's Technology Business Incubator



DLSU Laguna Campus



- ❑ The 50-hectare DLSU Laguna Campus is strategically located in close proximity to Laguna Technopark.
- ❑ Selected industry locators lease campus space.
- ❑ Central Instrumentation Facility (CIF) to provide analytical services.



Outline

- ❑ Research and innovation in academia
- ❑ Regional landscape and implications for local HEIs
- ❑ Why rankings make sense
- ❑ DLSU best practices
- ❑ Concluding thoughts

Important Trends that Affect Our HEIs

- Industry 4.0
- ASEAN integration
- Greater research emphasis in emerging economies
- Sustained PH economic growth (6+% annual GDP growth)
- Republic Act 10931
- K-12 reform in basic education

Concluding Points

- Research is an integral component of quality tertiary education.
- Quality tertiary education is essential for building human and knowledge capital to drive Philippine development.
- Rankings provide an international benchmark for local HEIs seeking to improve.

Thanks for your attention

Comments and questions are welcome

Or contact me:

Raymond R. Tan, Ph.D.

e-mail: raymond.tan@dlsu.edu.ph

