



**Asia-Pacific
Economic Cooperation**

2015/HLPD-STHE/017
Session 5-2

Multiple Perspectives: Academic, Government and Private Sector

Purpose: Information
Submitted by: United States



APEC
PHILIPPINES
2 0 1 5

**High Level Policy Dialogue on Science and
Technology in Higher Education
Manila, Philippines
13-14 August 2015**

Ensuring Relevance, Utilization, and Contribution of Products of S&T in Higher Education to Economic Development in the APEC Region on Health Systems



Multiple Perspectives:

- Academic
- Government
- Private Sector



- What worked yesterday will not meet tomorrow's medical needs -



Elsevier has a unique vantage point on research & education



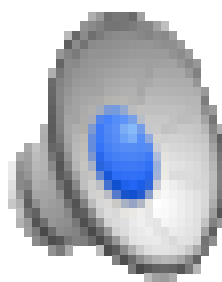
Each year

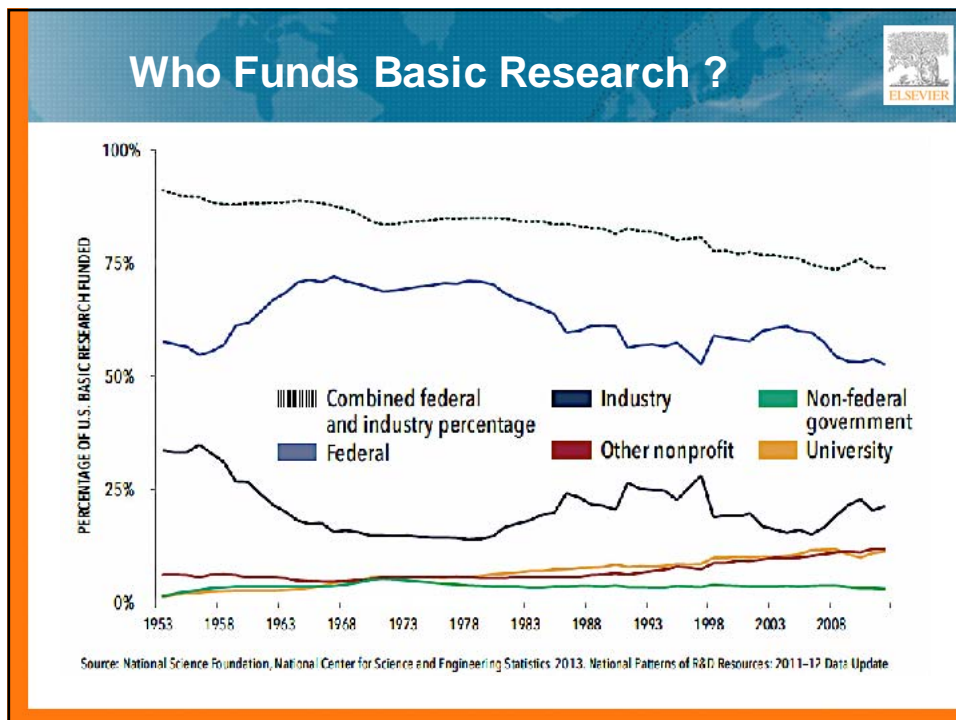
- 1 million article manuscripts received by ~2,400 journals (all offer Open Access options)
- 350,000 new articles published, in addition to 11M existing articles
- 2,000 new books published
- ScienceDirect: 750M digital article downloads
- Scopus: 56M records, 22,000 titles, 5,000 publishers, 700M citations, 150K Books
- SciVal: 75 trillion metrics values
- Grants: 7,000 sponsors, 20,000+ active opportunities, ~5M awarded grants
- Patents: >93m records, 100 patent offices
- Compounds: 22M compounds, 35M reactions; 3.3M molecular facts
- Drug information: 16k branded drugs; 12k generic drugs

Primary publishing

Derived and aggregated data

Discovery, Exchange, & Application, of New Knowledge





- What worked yesterday will not meet tomorrow's medical needs -

Driven by:

- ✓ Population growth and demographic shifts
- ✓ Technological advances (access to data)
- ✓ Increases in expectations (greater exposure)
- ✓ Economic disruption of disease
- ✓ Economic benefits of a healthy population

High cost of medical education and research:

- ✓ Years of formal education / clinical training
- ✓ Increased specialization
- ✓ Limited educational capacity
- ✓ Selective admissions






Experiments and Innovations



- ✓ Evidence based medicine and education
- ✓ Problem base education (flipped classes)
- ✓ Translational research – medicine



WORLD
ECONOMIC
FORUM

COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

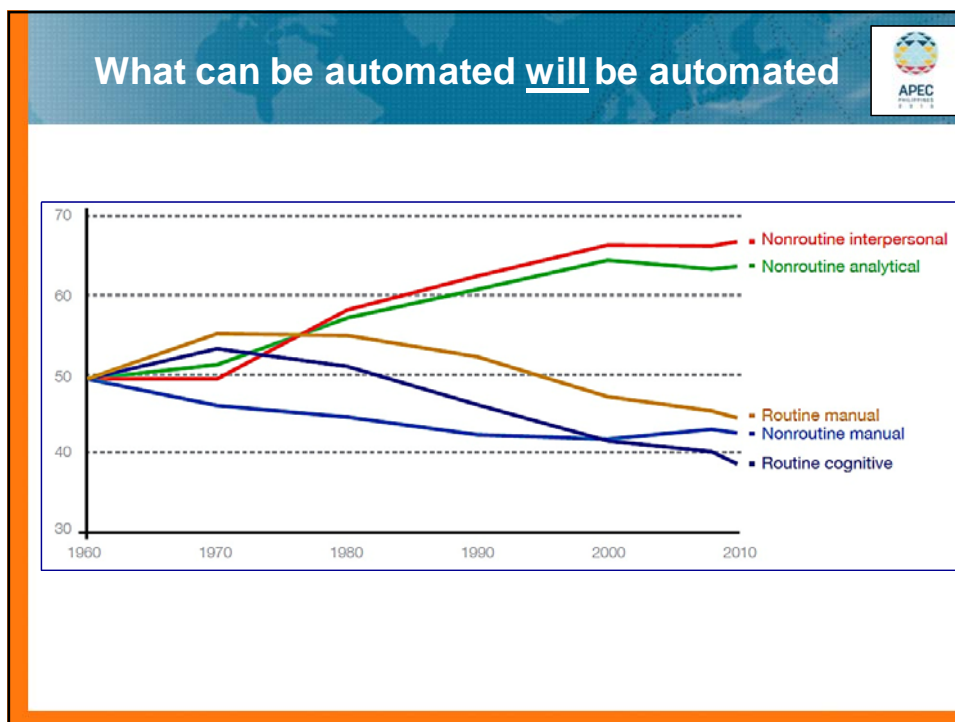


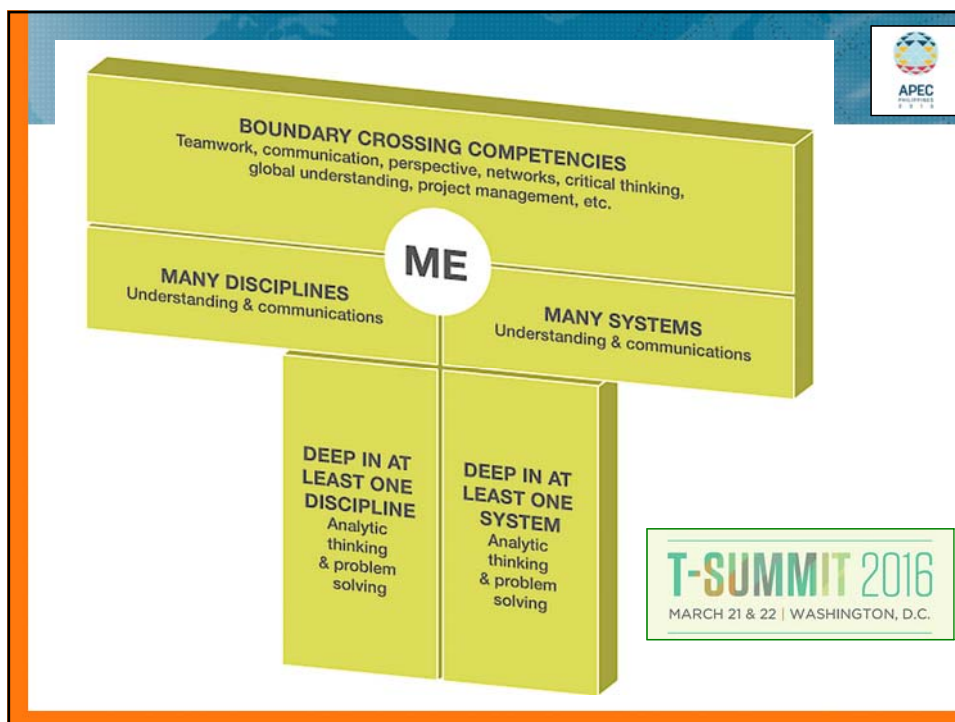
Industry Agenda

New Vision for Education Unlocking the Potential of Technology

Prepared in collaboration with The Boston Consulting Group







Experiments and Innovations

- ✓ Evidence based medicine and education
- ✓ Problem base education (flipped classes)
- ✓ Translational research – medicine
- ✓ Just in time / use in case learning

Doctor or Google?









WebMDsymptomchecker

Take the first step and see what could be causing your symptoms. Then learn about possible next steps.

For

Gender Male Female

Age

Zip code


Email

Stay informed with the latest health news and features from WebMD. Get our Month's Health Newsletter delivered right to your inbox. By clicking Submit, I agree to the WebMD Privacy Policy.


If you are a WebMD member, [sign in](#) to save your Symptom Checker history.



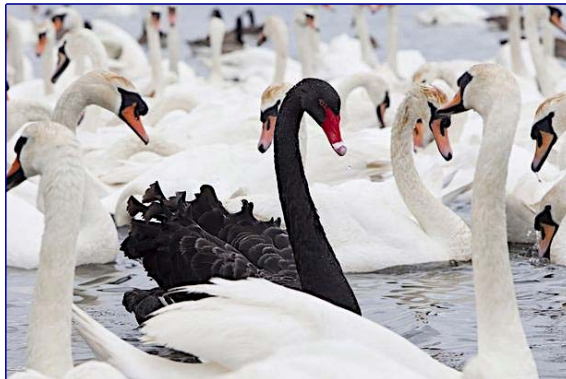
Experiments and Innovations



- ✓ Evidence based medicine and education
- ✓ Problem base education (flipped classes)
- ✓ Translational research – medicine
- ✓ Just in time learning
- ✓ Big (massive) data



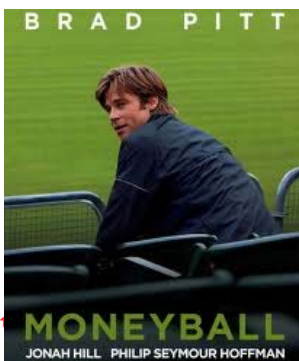
Big Data - A Black Swan Evolution or Revolution?



The Wall Street Journal called out “Big Data” as one of three game changer or ‘black swan’ technologies that will transform the future.

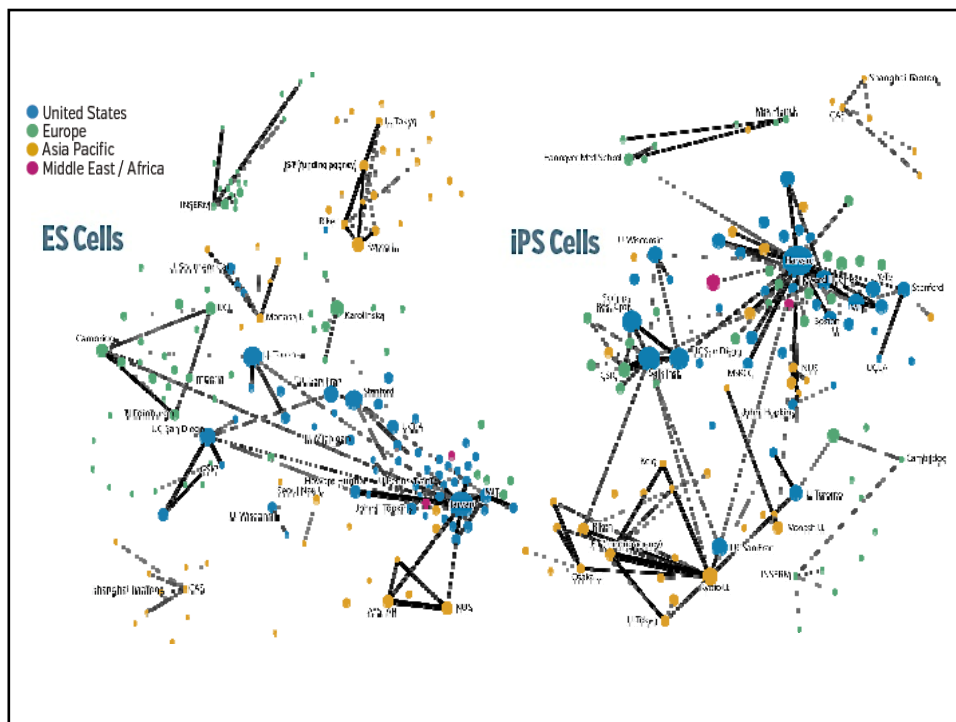
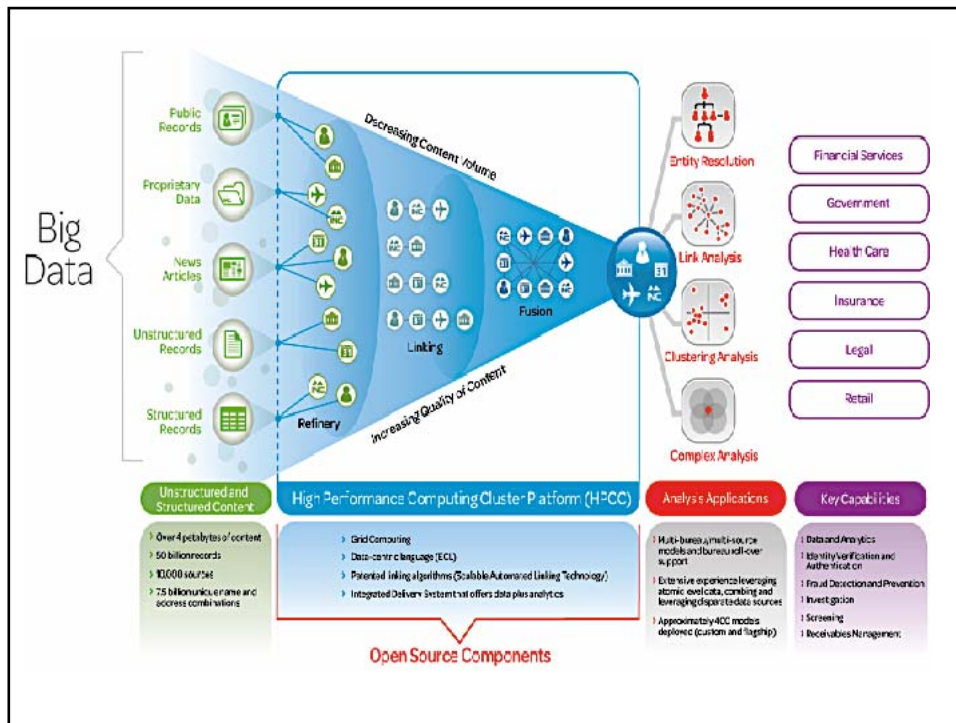
Practically every major sector of the economy and scientific enterprise is thinking about (or rekindling) the idea of Big Data as key to solving important problems in and across disciplines.

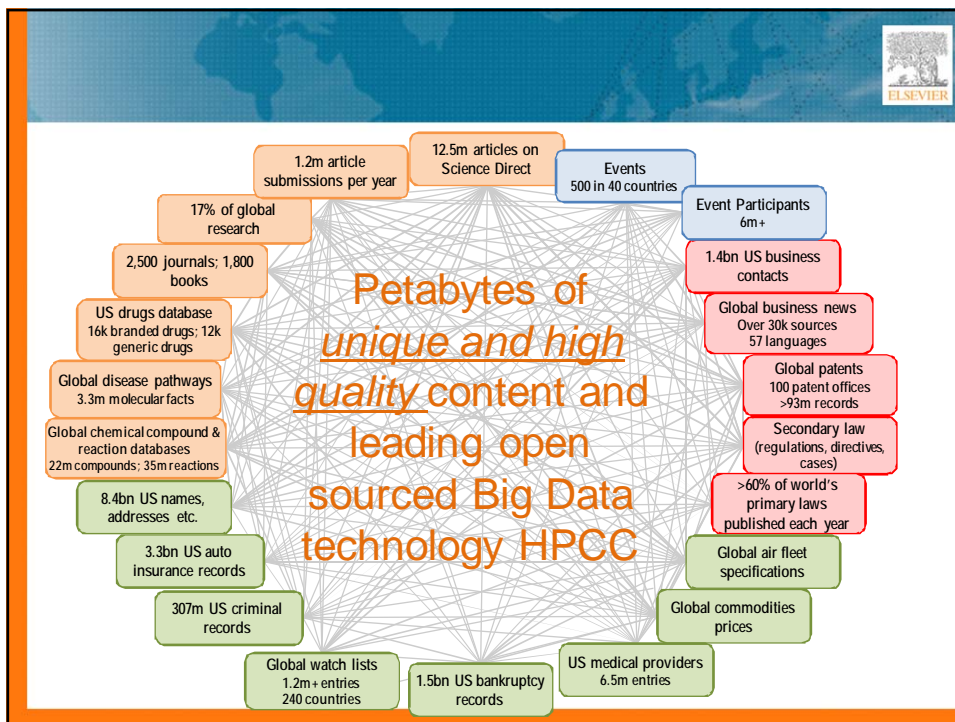
Harnessing Big Data Is Our Opportunity



“A Team of Experts is not an Expert Team without Data”







IBM Acquires Merge Healthcare To Upgrade Watson Medical Capabilities

By **Ted Ranosa**, Tech Times | August 8, 7:03 AM

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American technology company IBM announced that it will purchase medical image company Merge Healthcare Inc. for \$1 billion and combine it with its own health analytics division that is powered by the IBM Watson supercomputer.


IBM Corp. announced that it has agreed to purchase medical image company Merge Healthcare Inc. for the price of \$1 billion and combine it with the company's newly established health analytics division that is powered by its Watson supercomputer.

The technology company said that it plans to acquire images and data collected from Merge Healthcare's own medical imaging management system and combine them with IBM Watson's cloud-based health care computing program.

Watson's system is designed to analyze large volumes of data, interpret complex questions stated in natural language and provide answers to these questions based on available evidence.

Putting it all together, Big Data





Key activities	Outputs
1. Define priorities, survey existing initiatives, identify gaps	•Data management plan
2. Identify workflows, barriers	•Tools to capture and share metadata
3. Standardize nomenclature and vocabularies	•Workflows and best practices per field
4. Define what data to archive and where	•Archived data •Documented processes
5. Indexing, registration and linking	•Linked data and published references for discovery, disambiguation and replication
6. Exposing, sharing and annotating analyses	•Documented availability to allow analytics
7. Identify a wide set of mechanisms and measures	•Pipelines to RIS •Impact reports at researcher, lab and institution levels

One Health - Human / Animal / Environment







One Health

Big Medicine Data = Genomics









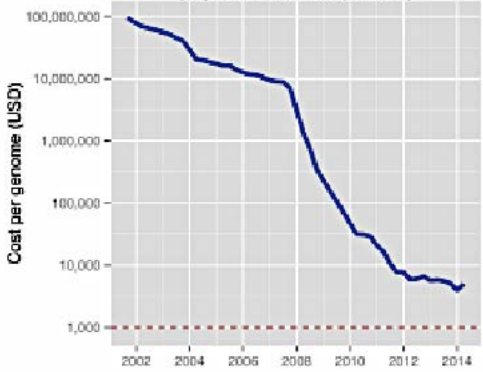


Big Medicine Data = Genomics





Genome sequencing cost as estimated by NHGRI (September 2001 to April 2014)



Year	Cost per genome (USD)
2002	~100,000,000
2004	~10,000,000
2006	~1,000,000
2008	~100,000
2010	~10,000
2012	~1,000
2014	~500

- ✓ Current Capacity = 13 quadrillion DNA bases/year
- ✓ Predicted to Sequence 1-Billion people in next 20 years (3 Exabytes of data).

Big Data - Research Productivity / Impact



Scopus is the **largest abstract and citation database** of peer-reviewed research literature from **around the world**.

Scopus

- Database w/ **best regional and global coverage**
- ...while still ensuring very **high quality content**



Over **54 million records**, 23 million patents from 100 patent offices worldwide

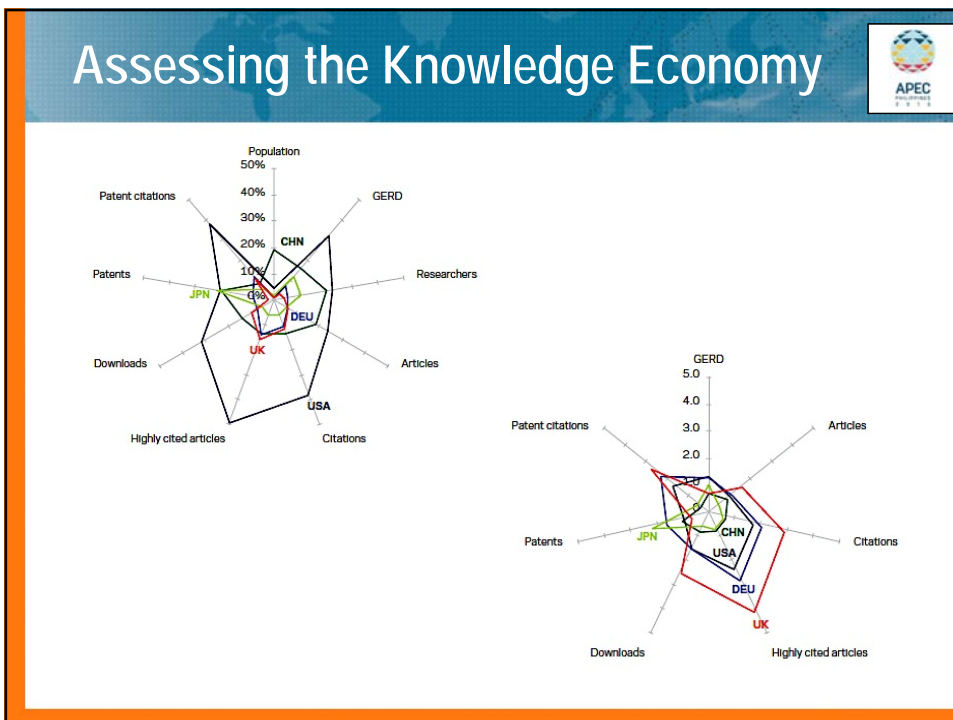
Over **21,900 titles** from more than **5,000 international publishers**.

Titles from **105 different countries** in all geographical regions,
40 "local" languages covered


All content is vigorously vetted by an independent, 15-person, international board of experts called the Content Selection and Advisory Board (CSAB)

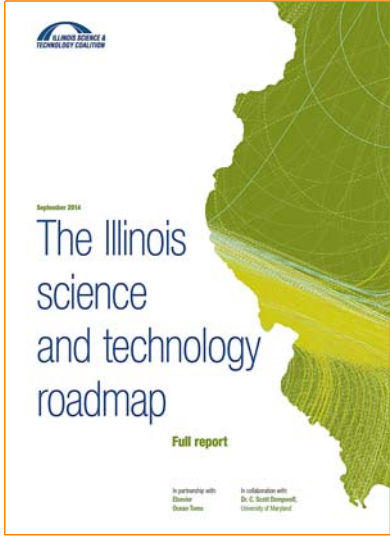
Assessing the Knowledge Economy






Assessing the Knowledge Economy







The Illinois science and technology roadmap
Full report



Mapping Research and Innovation Understanding Amsterdam's Competitive Advantage

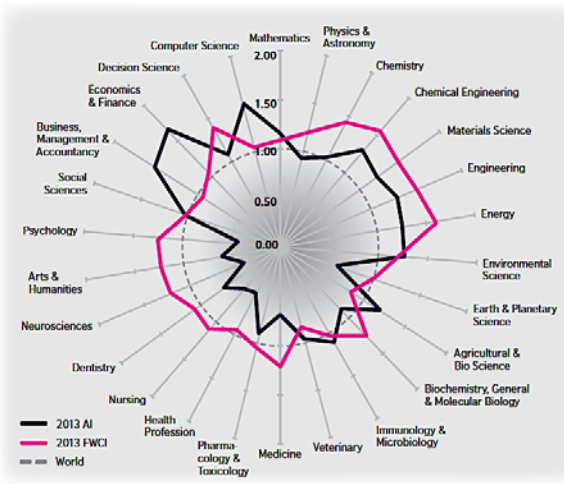
Assessing the Knowledge Economy





Research Performance in South-East Asia
Executive Summary
May 2015

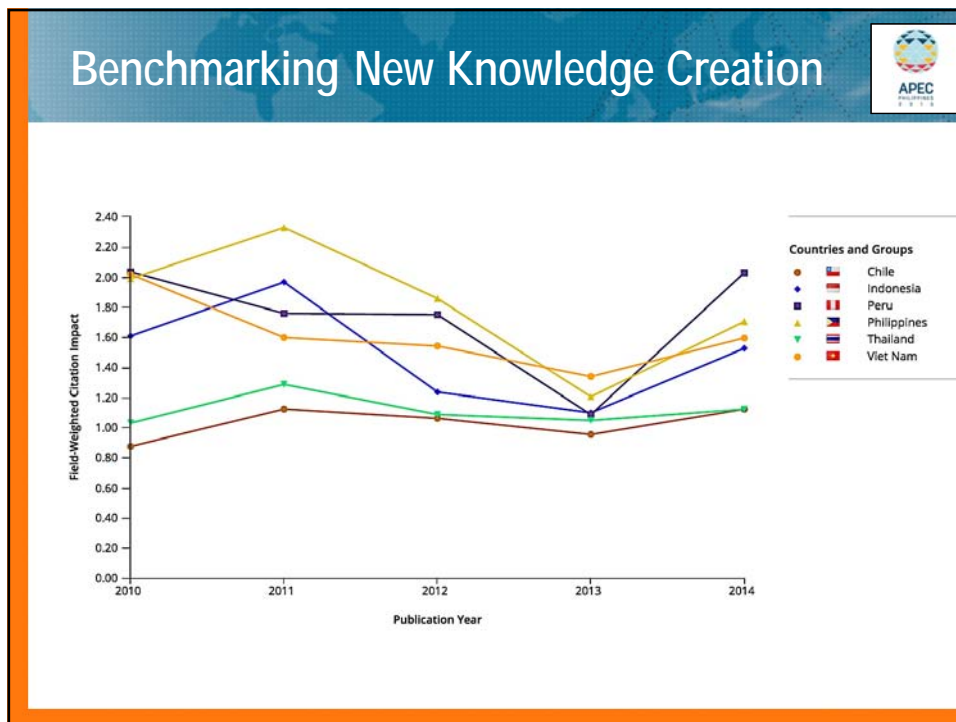
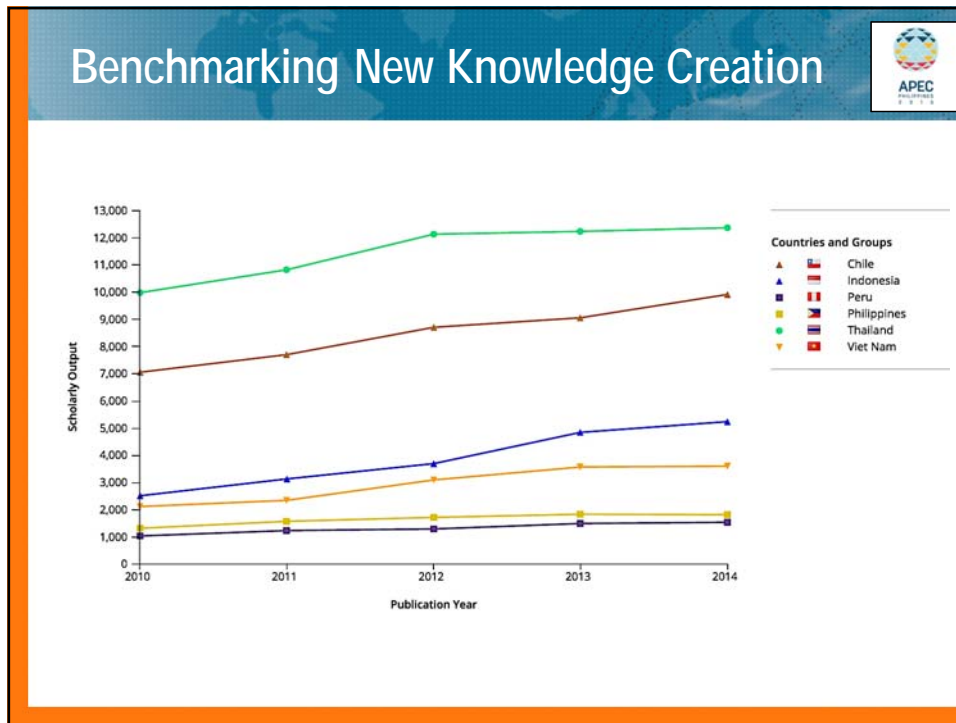
Chart 1: 2013 ASEAN Activity Index and Field-Weighted Citation Impact



Field	2013 AI (Black Line)	2013 FWCI (Pink Line)	World (Grey Dotted)
Computer Science	1.8	1.5	1.0
Mathematics	1.5	1.2	1.0
Physics & Astronomy	1.2	1.0	1.0
Chemistry	1.0	0.8	1.0
Chemical Engineering	0.8	0.6	1.0
Materials Science	0.6	0.4	1.0
Engineering	0.5	0.3	1.0
Energy	0.4	0.2	1.0
Environmental Science	0.3	0.1	1.0
Earth & Planetary Science	0.2	0.1	1.0
Agricultural & Bio Science	0.1	0.0	1.0
Biochemistry, General & Molecular Biology	0.1	0.0	1.0
Immunology & Microbiology	0.1	0.0	1.0
Veterinary	0.1	0.0	1.0
Medicine	0.1	0.0	1.0
Pharmacology & Toxicology	0.1	0.0	1.0
Health Profession	0.1	0.0	1.0
Nursing	0.1	0.0	1.0
Dentistry	0.1	0.0	1.0
Neurosciences	0.1	0.0	1.0
Arts & Humanities	0.1	0.0	1.0
Psychology	0.1	0.0	1.0
Social Sciences	0.1	0.0	1.0
Business, Management & Accountancy	0.1	0.0	1.0
Economics & Finance	0.1	0.0	1.0
Decision Science	0.1	0.0	1.0







Biomedical Research - Medical Education Big Data



Medical Learning and Practice is evolving rapidly to meet current and future needs.

Biomedical Research is producing new knowledge at an increasing rate.

Biomedical Big Data is more than just very large data or large number of sources.

- ✓ Structure and Unstructured Data
- ✓ Data Analysis and Combined Analysis

Biomedical Big Data provides spectacular opportunities.

- ✓ New Insights and Directions
- ✓ Increased Accuracy and Levels of Precision

Biomedical Big Data is diverse and complex.

- ✓ Genetic, Social, Environmental, Phenotypic

Biomedical Big Data faces many challenges.

- ✓ Amount of Information (What to Keep?)
- ✓ Organization and Access
- ✓ Training

THANK YOU!

