Current Health and Future Wellbeing of the American Research University

Research University Futures Consortium

Dr. Brad Fenwick
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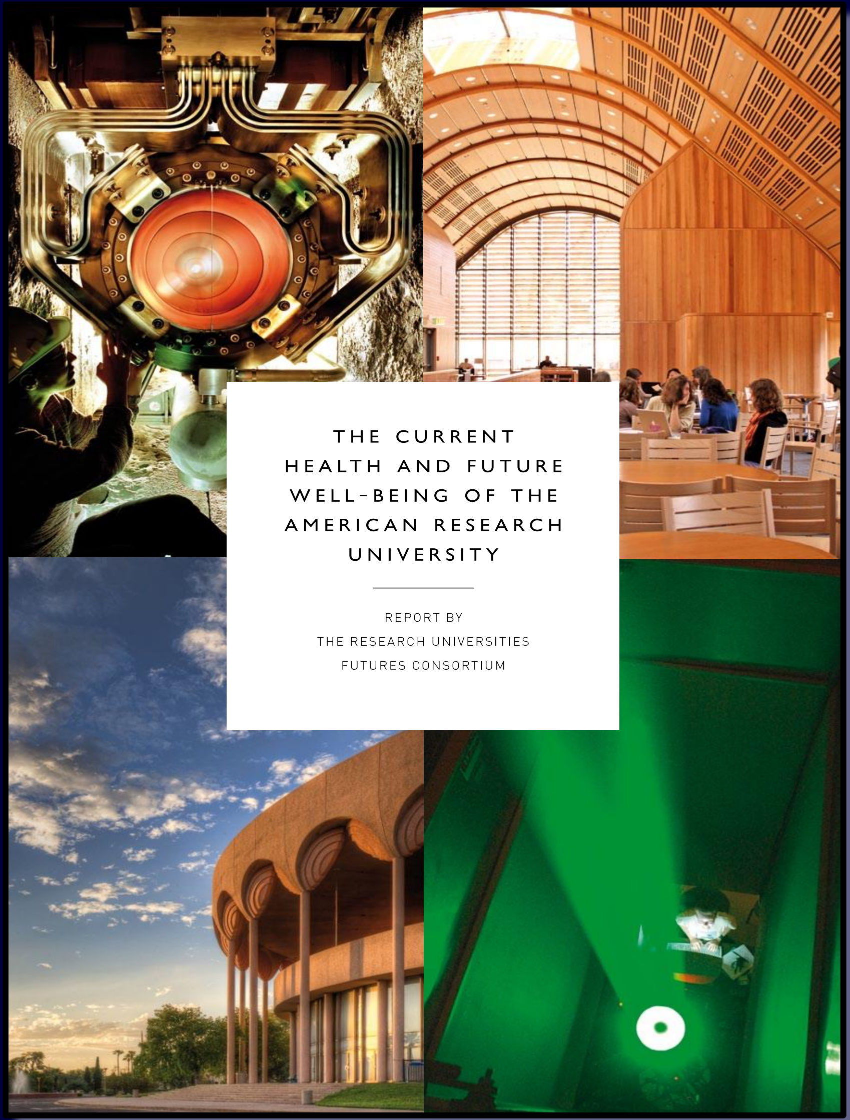
"Academic Research is going through a lasting transformational change of historic scope and scale."

"A smooth sea never made for a skillful sailor"



THE RESEARCH UNIVERSITIES FUTURES CONSORTIUM

HOME | AIMS OF THE STUDY | MEMBERS OF THE CONSORTIUM | RESOURCES | CONTACT US

Welcome to the Research Universities Futures Consortium

What is "The Current Health and Future Well-Being of the American Research University" study?

Developing and managing a research portfolio is not easy. There are many points of failure and the benefits are often not immediately obvious. The research grants and contracts landscape is competitive and globalized and the competition is only likely to intensify as a result of the current U.S. financial budget situation. In recent years, research has become more international and more interdisciplinary, making the management of research funding an increasingly complex task. On a broader level, universities are heavily regulated and scrutinized by governments and other sponsors who seek transparency and value for their investment.

Using a bottom up approach, this study aims to understand the current academic research landscape and to envision the future. This study seeks to first identify common challenges faced by leading research institutions and then to develop and recommend solutions. While there were many individual findings worth discussing, the most important of these were consolidated and reported as six key findings. Naturally, the findings vary in priority between universities. Key Findings are 'Hyper-competition', 'Compliance', 'Research Quality and Impact', 'Planning and Decision Support', 'Value of the Research University', and Fragility of Research Administration' and its key conclusions include the need for collaboration, shared metrics and a required shift of focus to productivity, rather than size.

This is a community driven effort coordinated by Dr. Brad Fenwick (University of Tennessee) and involved 25 of the nation's top research universities, with support from Elsevier. Collectively the universities of the Consortium have annual research expenditures of more than $9 billion which includes external grants and contracts as well as self-funded research, and educates thousands of students in all fields. All the information gathered and produced will be made freely available to the academic community, research sponsors, and the public via published reports and presentations. Confidential information provided by individual institutions will be strictly maintained.

The Current Health and Future Well-Being of the American Research University

You can download the report here.

Or you can visit our resources page to view all of the resources.

Click for the press release.

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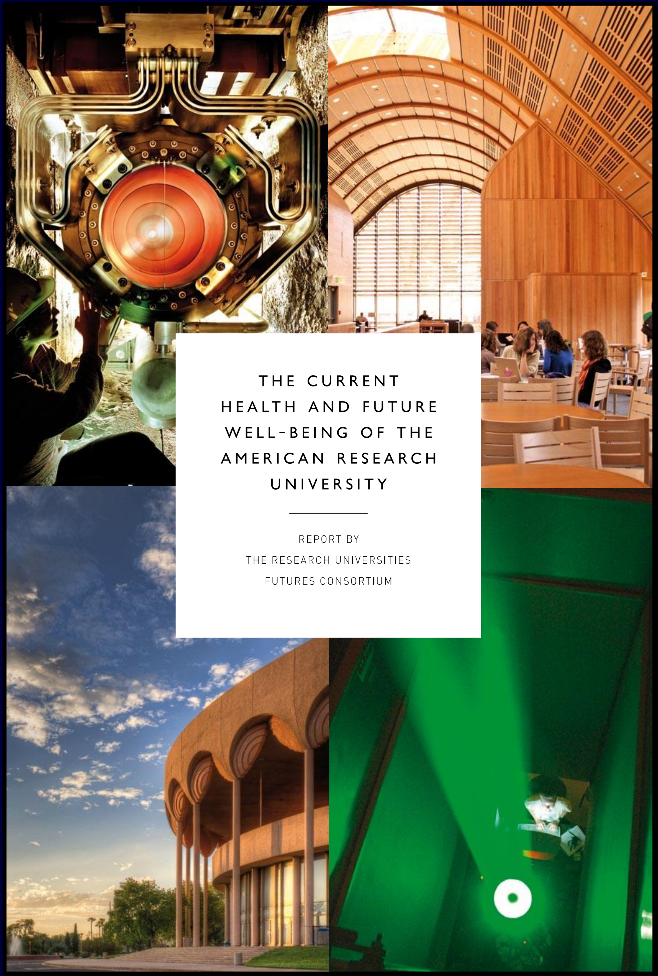
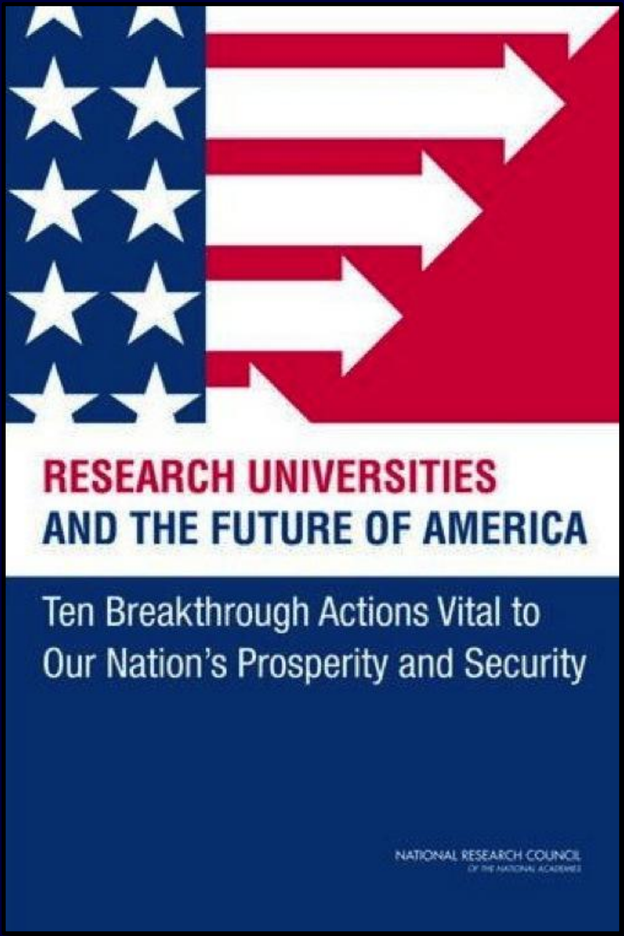

THE CURRENT HEALTH AND FUTURE WELL-BEING OF THE AMERICAN RESEARCH UNIVERSITY
REPORT BY THE RESEARCH UNIVERSITIES FUTURES CONSORTIUM


RESEARCH UNIVERSITIES AND THE FUTURE OF AMERICA
Ten Breakthrough Actions Vital to Our Nation's Prosperity and Security
NATIONAL RESEARCH COUNCIL

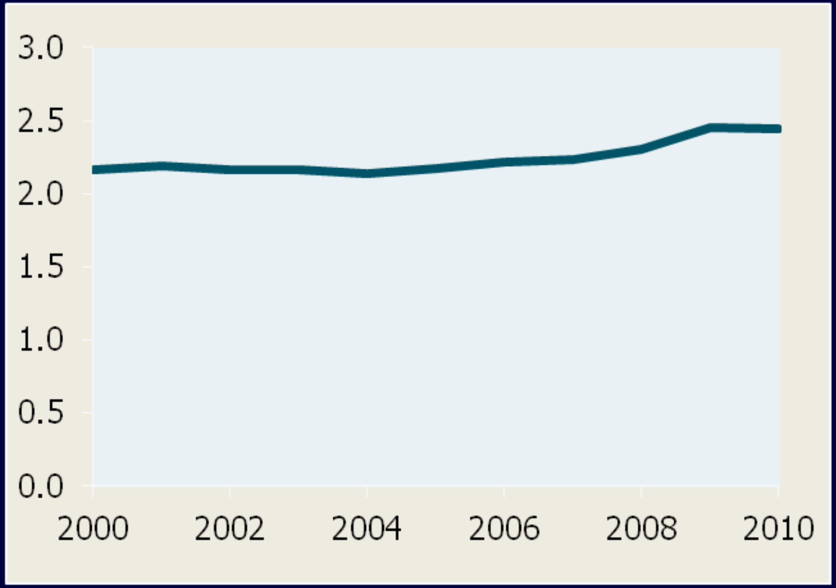
Current Health and the Future Well-Being of the American Research University

(Research University Futures Consortium)

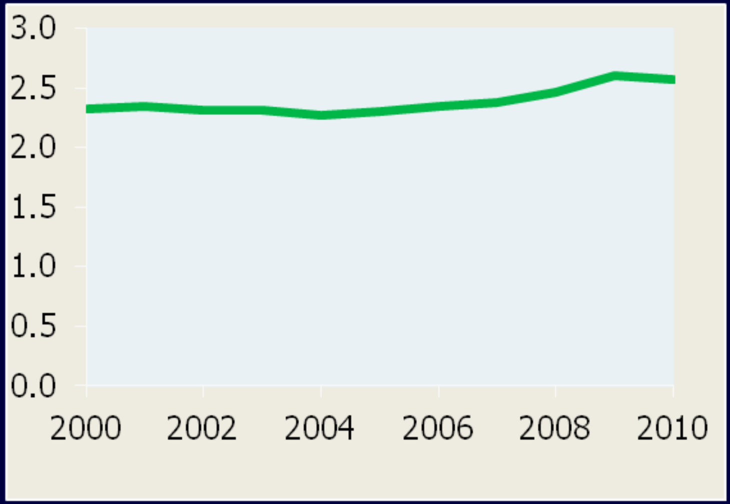
- Background, Context, Motivation
- Project Overview and Methods
- First Phase: Key Findings
- Next Steps – Phase Two

R&D spending as % of GDP has been relatively stable in developed markets, and is increasing in developing ones

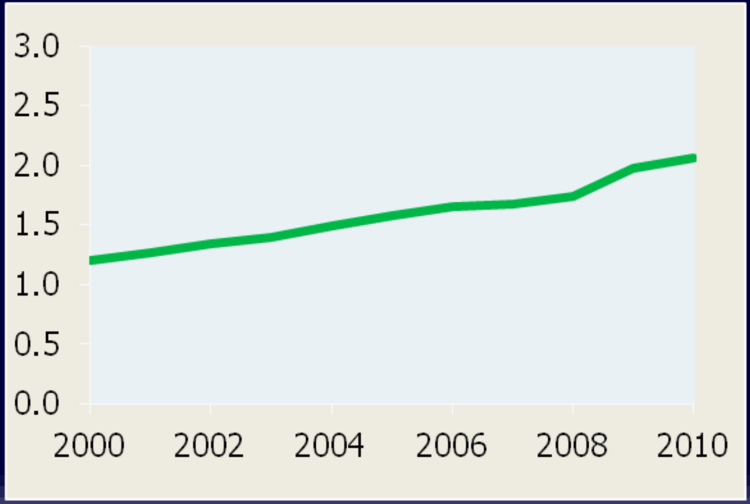
Gross Expenditure on R&D (GERD) as % of GDP - Total



GERD as % of GDP – Developed Counties



GERD as % of GDP – Developing Counties

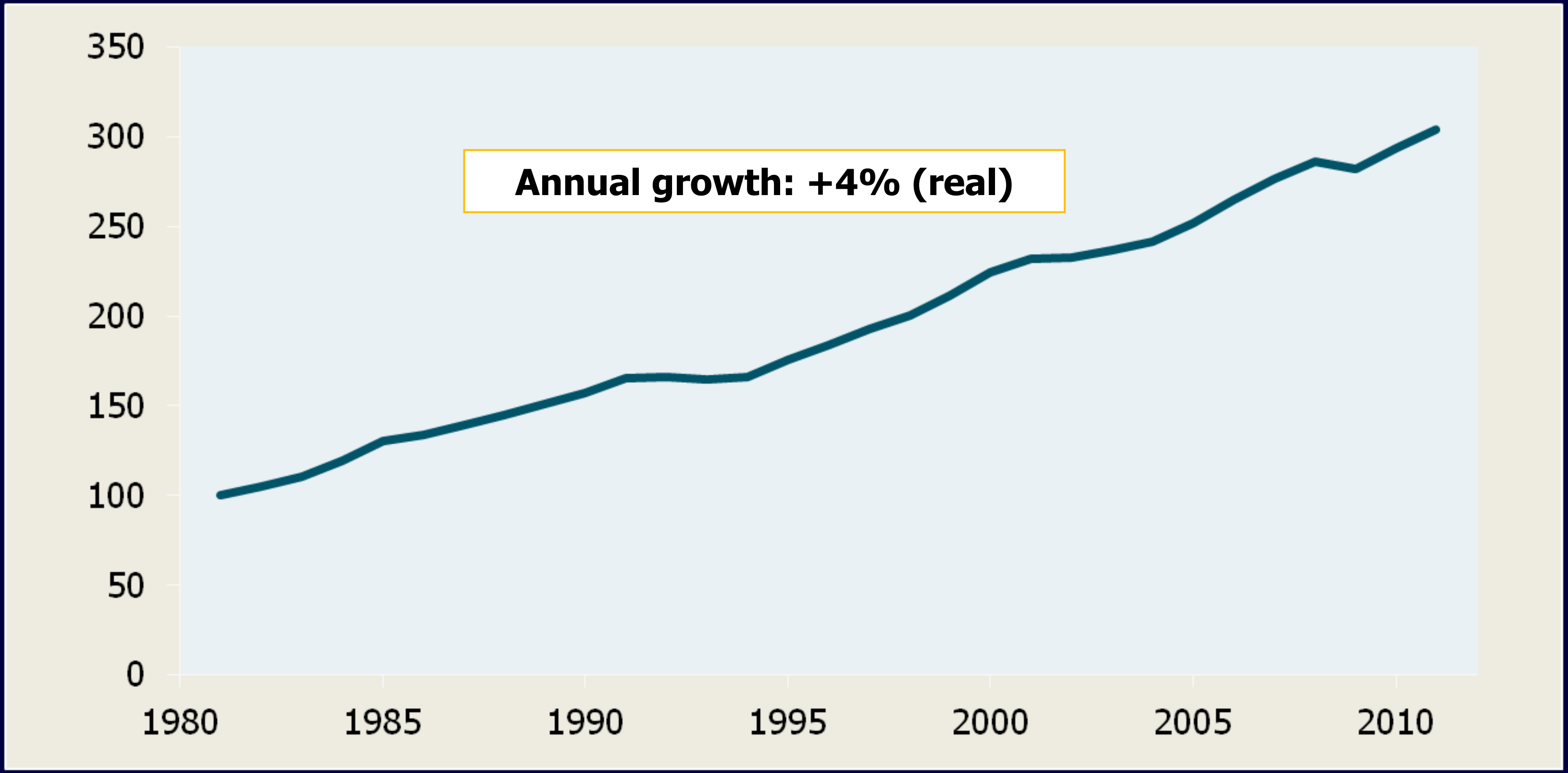


Source: OECD
Developed markets include US, Japan, and EU27
Developing markets include China and S. Korea

World Research is Large and has been Growing

Global R&D spending: $1.2 trillion in 2010

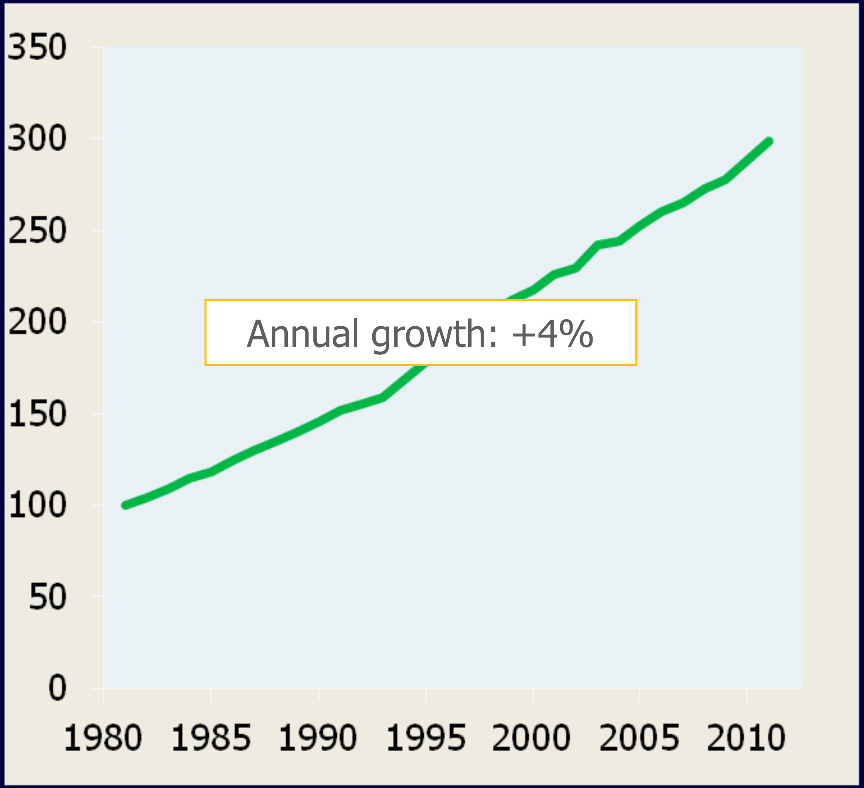
Spending on R&D – OECD countries*
Indexed values; 100 = Spend in 1981



** $PPP, 2000 constant currencies*
Source: OECD, Battelle

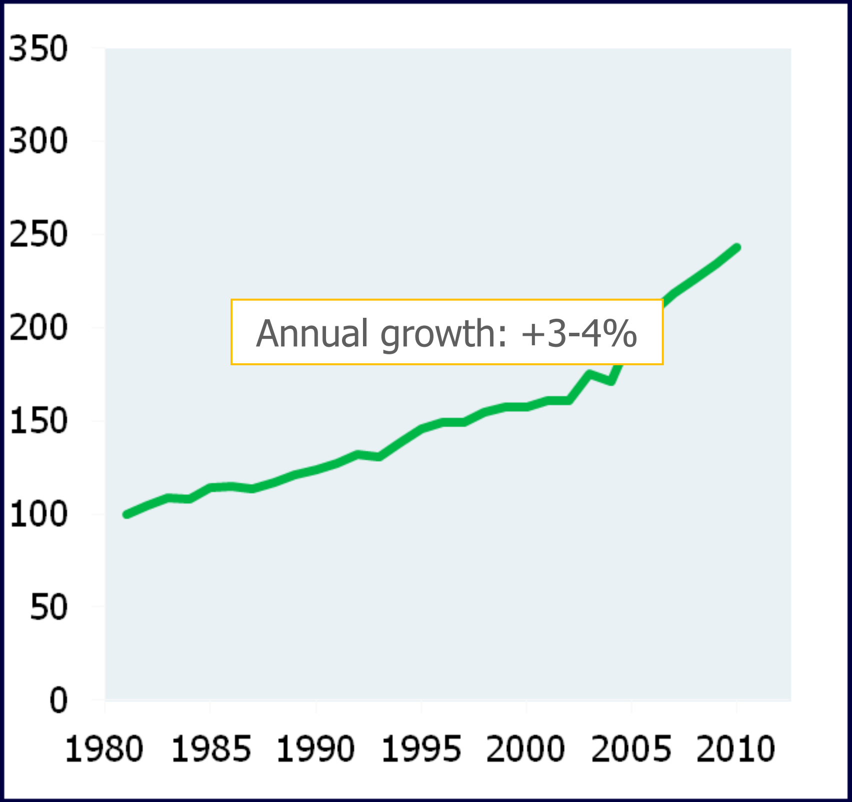
Growth in R&D Spending Drives Research Activity

Number of researchers – OECD countries
Indexed values; 100 = Number of researchers in 1981



Global number of researchers:
7 million in 2010

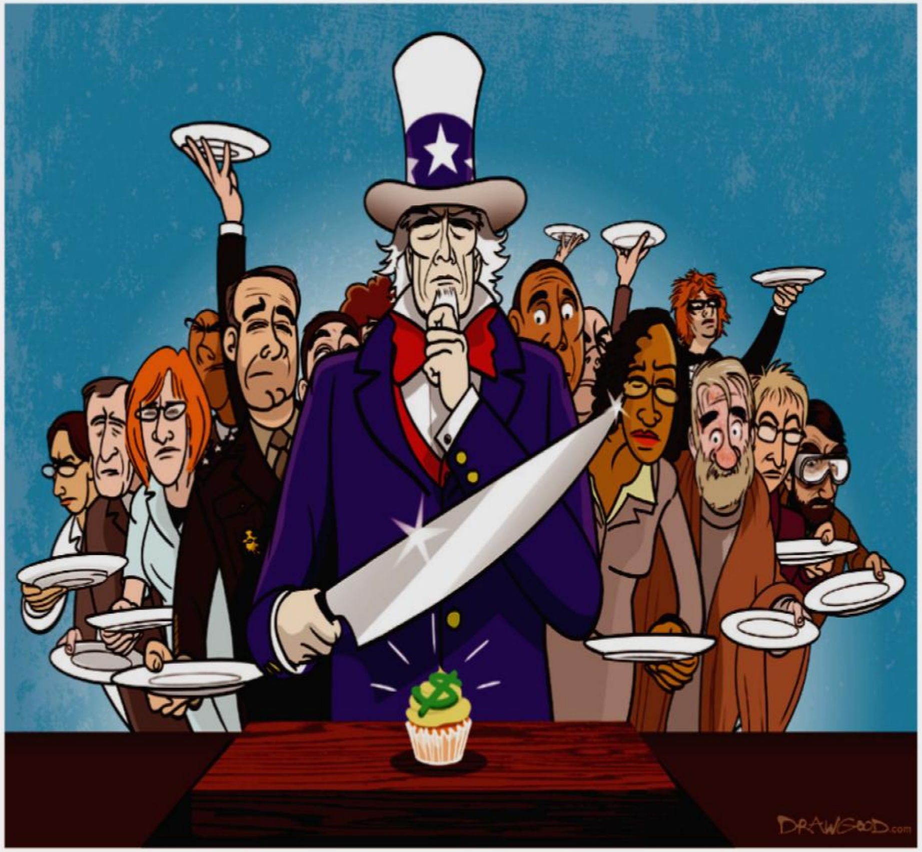
Number of research articles published
Indexed values; 100 = Number of articles in 1981



Number of research articles:
>1.5 million in 2010

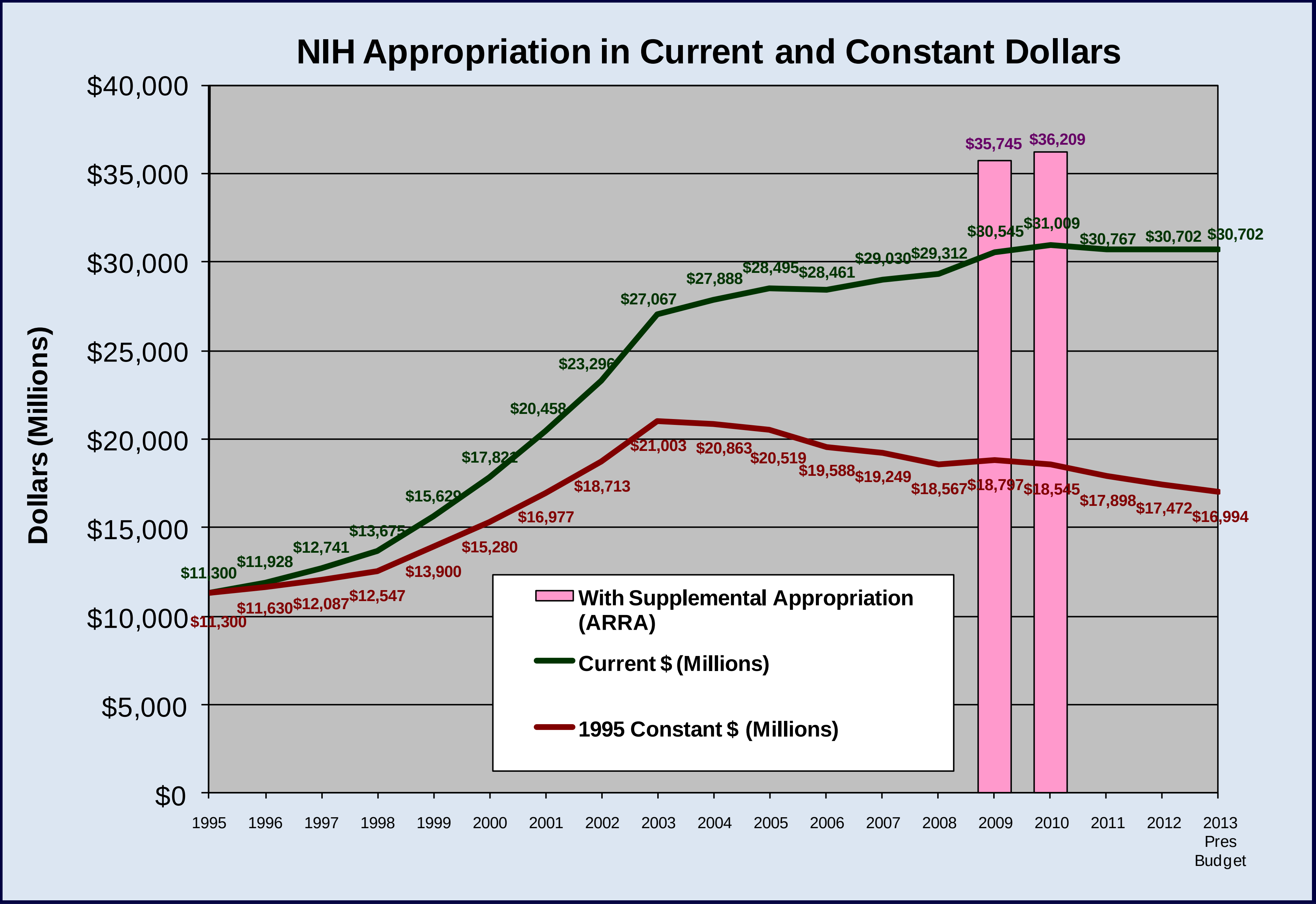
Source: OECD; ISI; Scopus

ILLUSTRATIONS BY PETE ELLIS/DRAWGOOD.COM

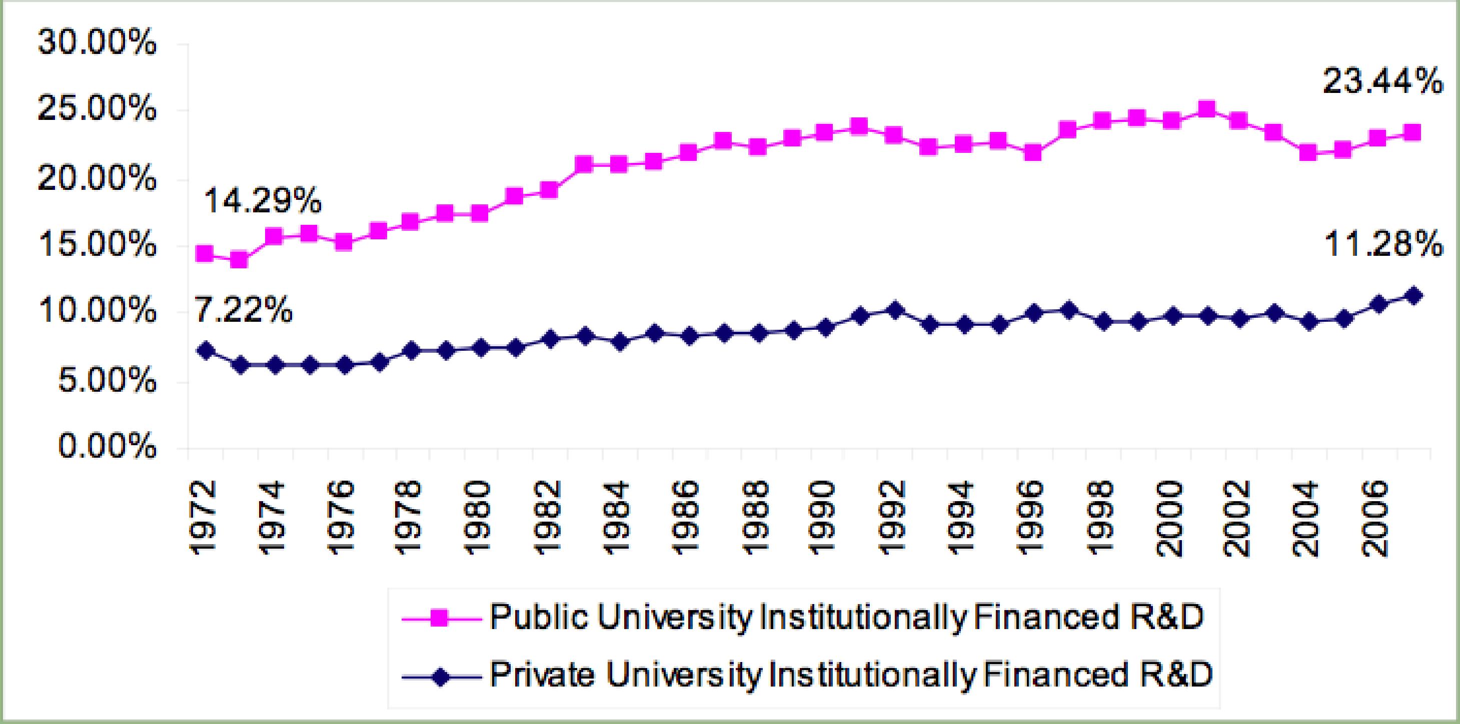


Crunch time for US science

Researchers must make a stronger case for funding in the face of a perfect storm of budget cuts and eroding political support, says **Jay Gulledge**.


NIH Appropriation in Current and Constant Dollars
Dollars (Millions)
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013 Pres Budget
$35,745
$36,209
$11,300
$11,928
$12,741
$13,675
$15,629
$17,821
$20,458
$23,296
$27,067
$27,888
$28,495
$28,461
$29,030
$29,312
$30,545
$31,009
$30,767
$30,702
$30,702
$11,300
$11,630
$12,087
$12,547
$13,900
$15,280
$16,977
$18,713
$21,003
$20,863
$20,519
$19,588
$19,249
$18,567
$18,797
$18,545
$17,898
$17,472
$16,994
With Supplemental Appropriation (ARRA)
Current $ (Millions)
1995 Constant $ (Millions)

Percent of Academic R&D Financed with Institutional Funds



Association of Public and Land-Grant Universities


International Comparative
Performance of the UK
Research Base - 2011
A report prepared for the Department of
Business, Innovation and Skills.
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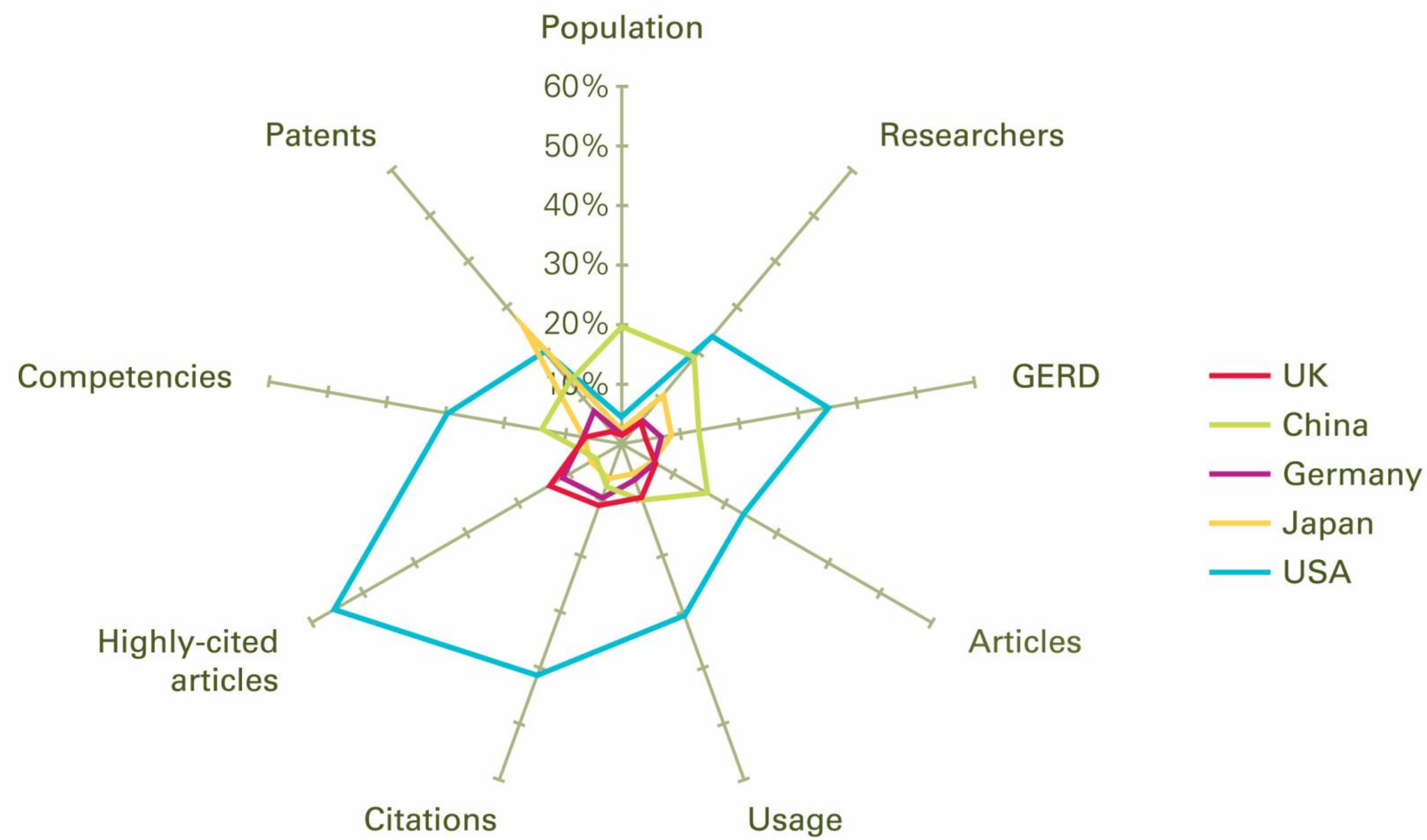
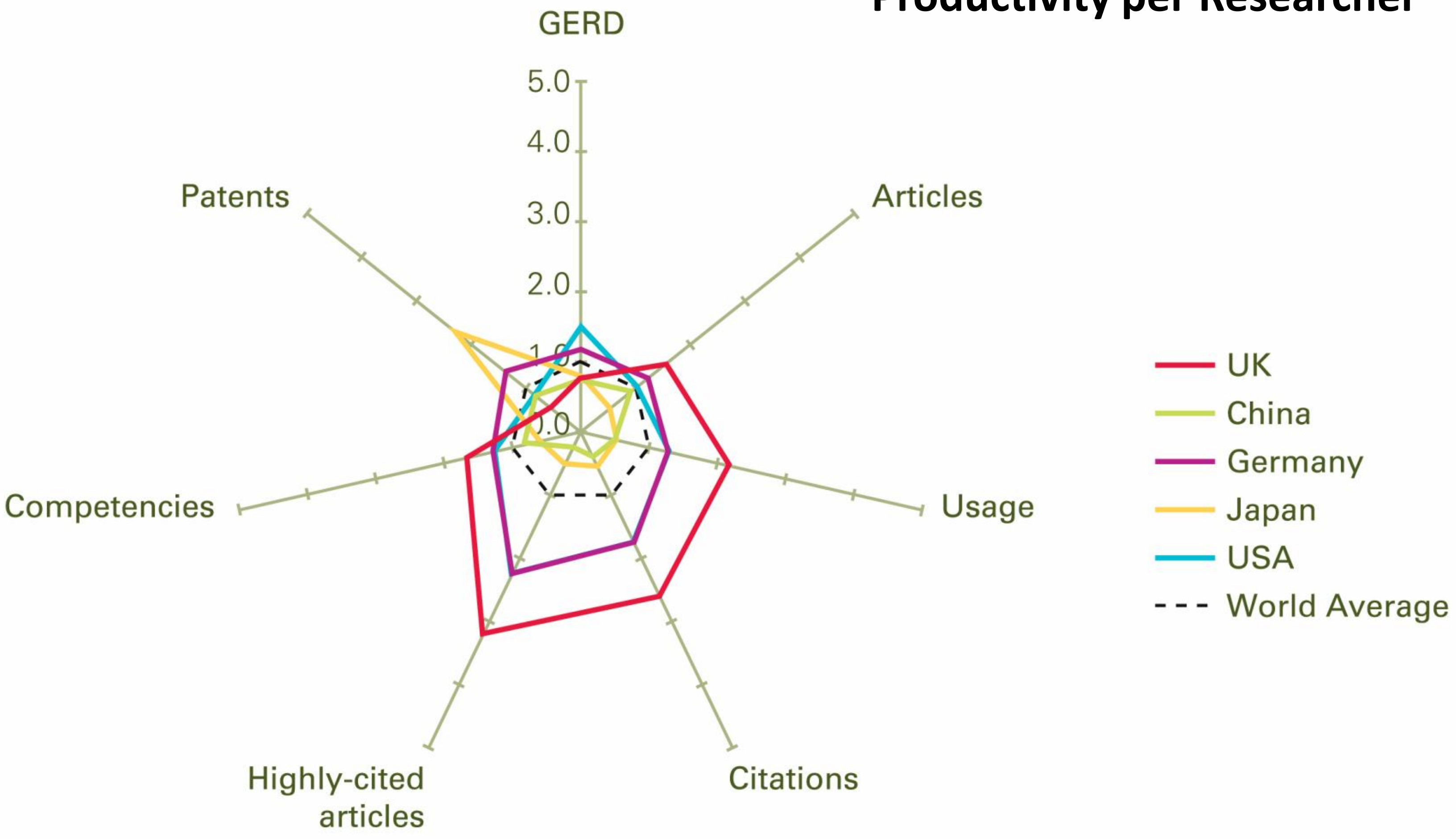
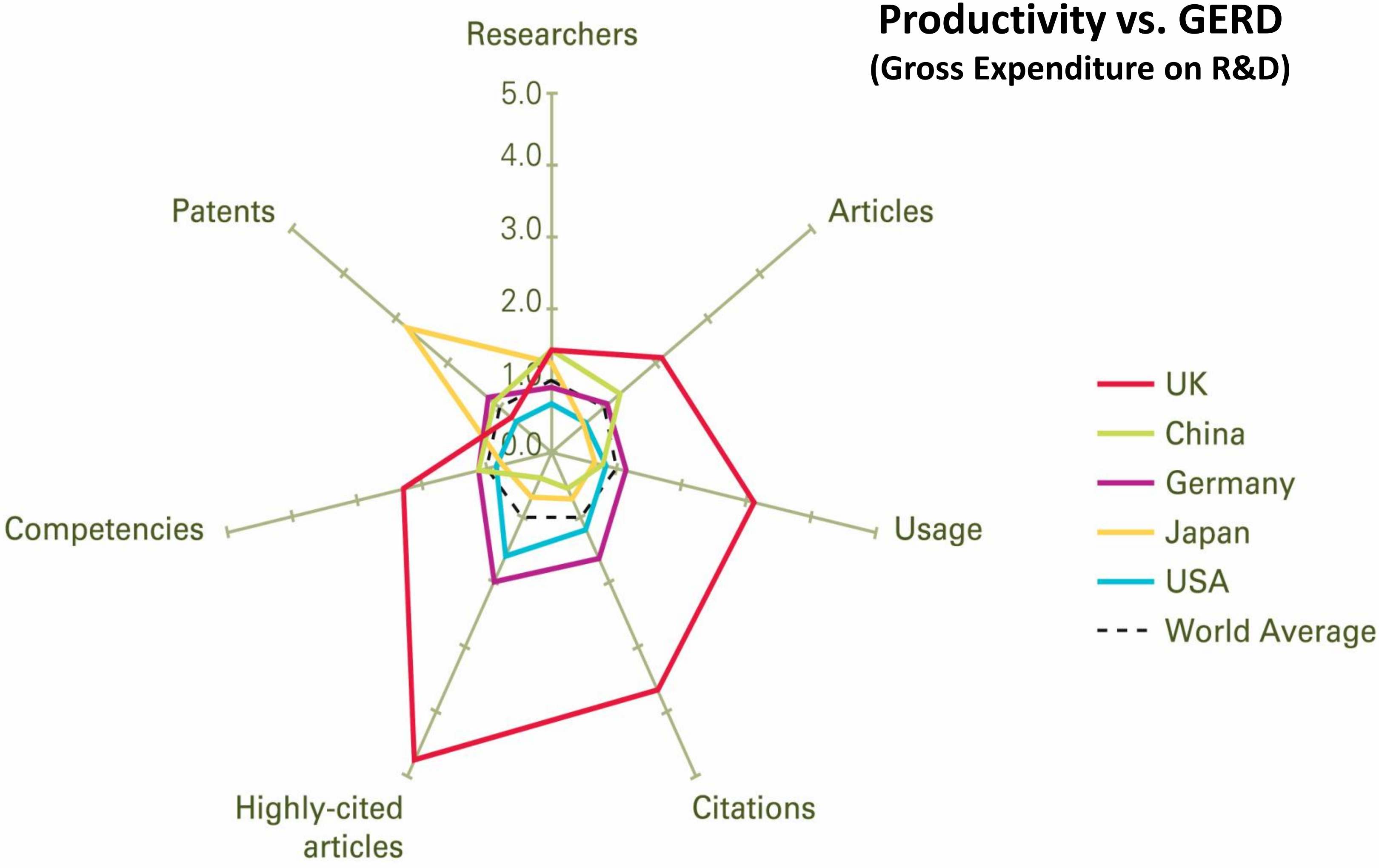


Population
60%
50%
40%
30%
20%
10%
Researchers
GERD
Articles
Usage
Citations
Highly-cited articles
Competencies
Patents
UK
China
Germany
Japan
USA

Productivity per Researcher



Productivity vs. GERD
(Gross Expenditure on R&D)

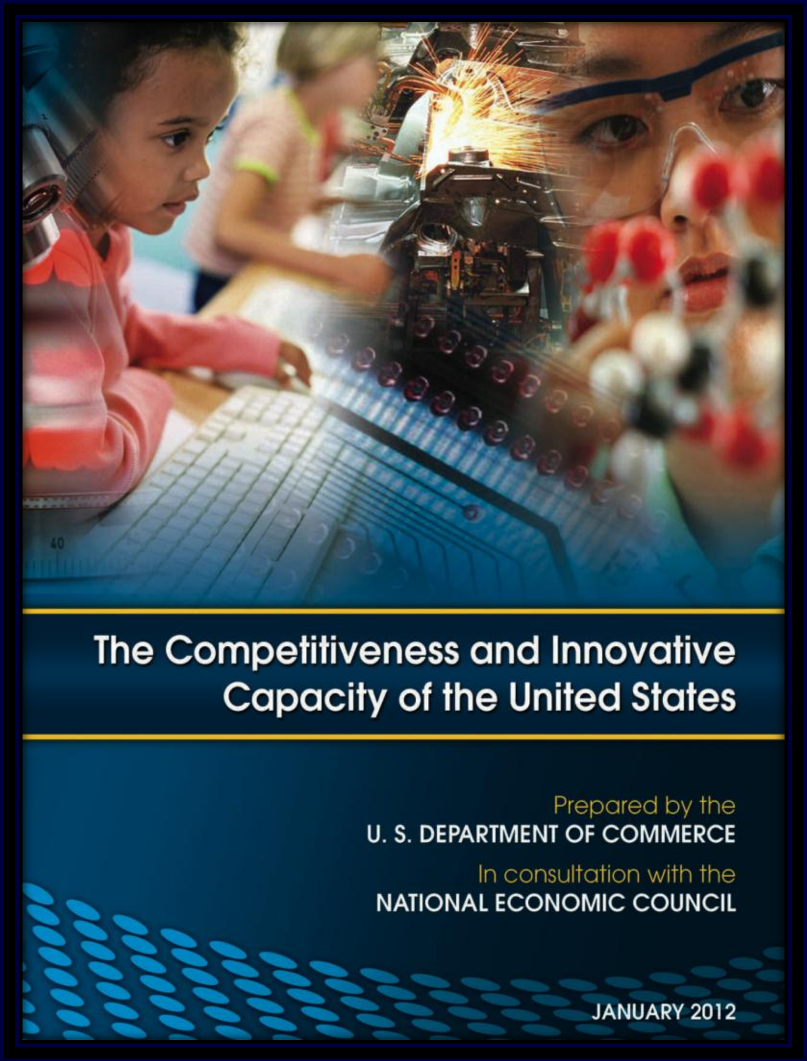


From Outputs to Productivity

Charles Holliday, former chief executive of DuPont Chemical and President of the Board of City Bank, chairs the National Research Council – Committee on Research (a panel of 22 university and corporate leaders).

When pushed to support continued, if not additional Federal and State funding, his response, "***I want ways of measuring the productivity of research universities***."

The issue is not whether universities are of value, but are they operating at "*maximum productivity*"?



Develop ways to measure the value and effectiveness of research investment.

"In order to ensure that R&D funding is being spent wisely, it is crucial that meaningful measurement tools are developed to track the effectiveness of this spending. Currently, such measures generally do not exist or are not collected on a regular, systematic basis."

Research Program Development and Administration

"An Increasingly Complex Business"

- Hypercompetitive, Interdisciplinary, Globalized
- Increasing Institutional Expectations
- Multiple Points of Failure (known and unknown)
- Regulated and Scrutinized (compliance)
- Increasing Reporting (ARRA)
- Underappreciated Management / Leadership Challenges
- Growing Levels of Frustration
- No Easy Solutions

"Control your own destiny or someone else will." Jack Welch

http://www.researchdatatools.com

UK Study: Exploratory
21 Universities (54% of funding)
"Semi-structured" Confidential Interviews
Workshops

Findings:

- ✓ Identified common set of information needs.
- ✓ Identified key performance indicators.
- ✓ Need for high level frameworks regarding data collection and sharing.
- ✓ Lack of uniformity in data collection and reporting (collecting and measuring because we can, not because it is important).
- ✓ No IT strategy or one that is owned and guarded by the IT department.
- ✓ Historical and reactive data rather than information that anticipates change and informs decisions.

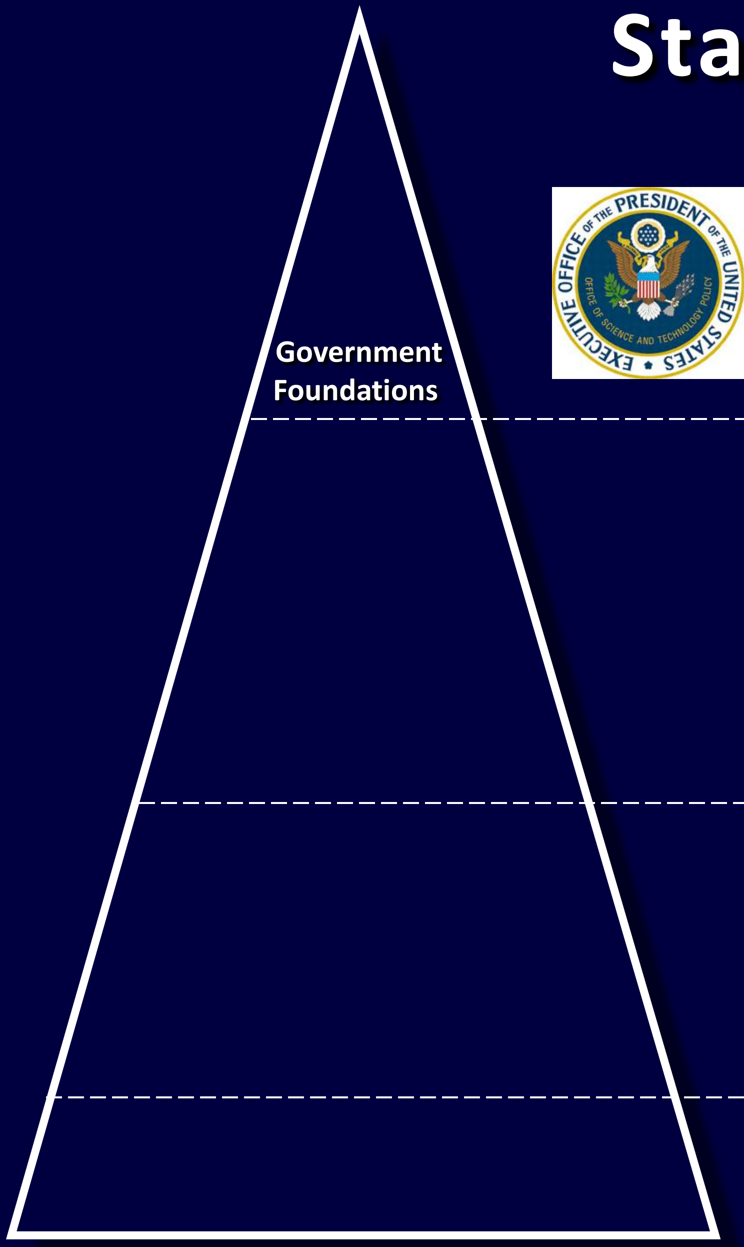
Value: Exceptionally well received by the academic community, funders, and suppliers.

Follow-up: Second "Solution-Driven" Project

"Futures" Project Goals

- Initiate and contribute to a discussion on a national academic research & graduate education strategy.
- Phase I: Assess the current and future challenges and barriers to sustain and enhance university based research and training.
- Phase II: Develop solutions and pathways for their implementation.
- Find a Sponsor.

Stakeholder Map

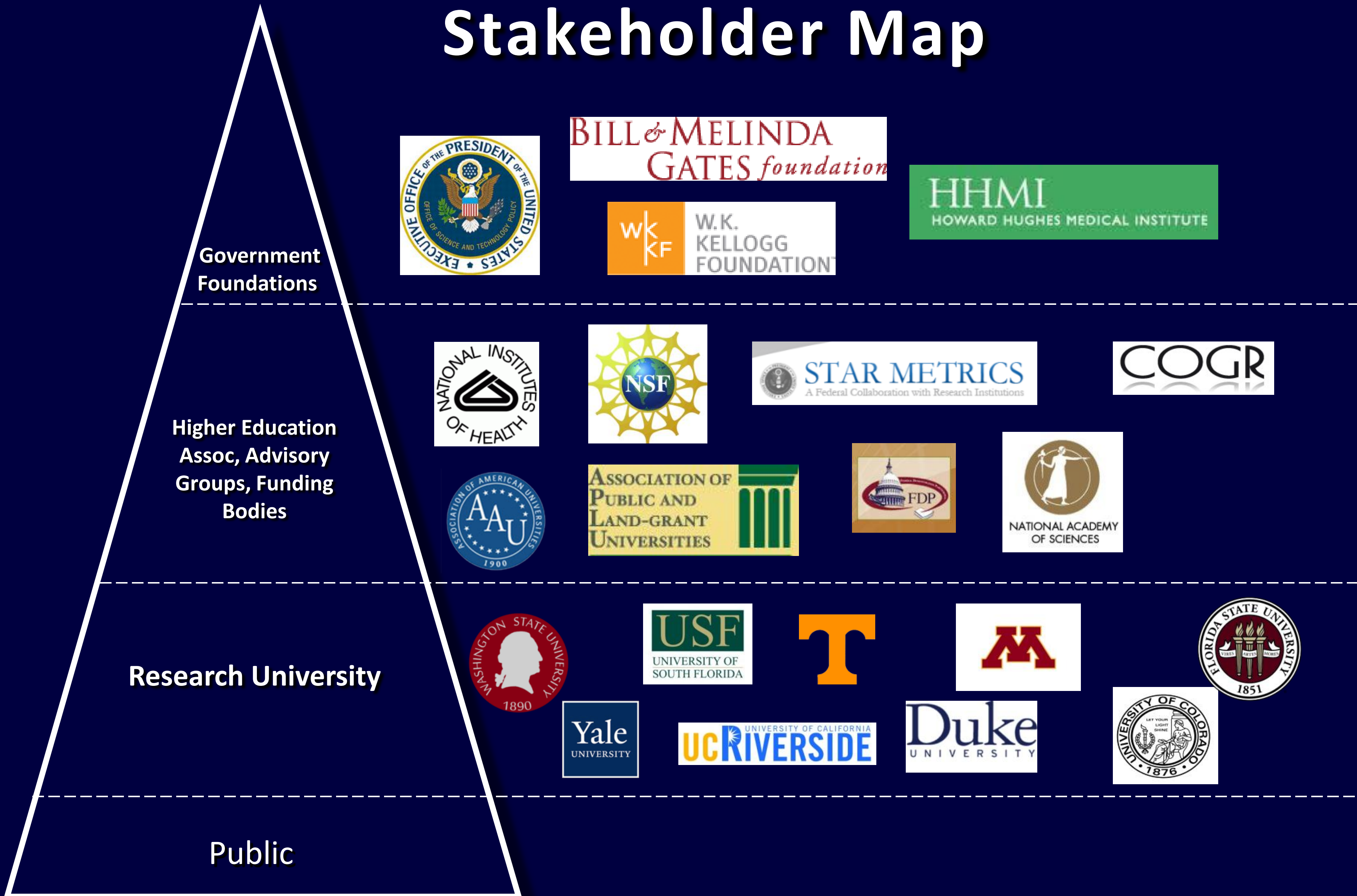


Stakeholder Map

Government
Foundations

Higher Education
Assoc, Advisory
Groups, Funding
Bodies

Stakeholder Map



Phase I: Purpose and Objectives

- ✓ Not a system, solution-driven, or problem specific study (Exploratory).
- ✓ Develop an understanding of evolving institutional needs (information intelligence, leadership, strategy, and tactics) that are independent of specific disciplines or institutional type.
- ✓ A broader understanding and wider appreciation of the challenges related to research program development and administration.
- ✓ A bottom-ups understanding of current research management systems and the leadership landscape and challenges.
- ✓ Focus on how management and performance data is being gathered and used to inform strategic decisions and evaluate success (rankings) .

Sponsor

- The world's leading publisher of science and health information, serving more than 30 million scientists, students and health and information professionals worldwide.
- Global community of 7,000 journal editors; 70,000 editorial board members; 300,000 reviewers and 600,000 authors.
- Publishes around 2,000 journals and close to 20,000 books and major reference works.

Why would they do this?

Study Design and Implementation

- ✓ University visits (25, public and private).
- ✓ Confidential discussion interviews with Vice President/Chancellor for Research, directors of research offices, IT directors, and staff responsible for the administration of research.
- ✓ High level links and contacts in major stakeholder organizations.
- ✓ Workshop and group discussions with project participants and others.
- ✓ Publication and wide dissemination of summary findings through freely available printed reports, web resources, and meeting presentations.
- ✓ Next step…develop solutions.




Research University Futures Consortium

Private:

- Emory
- Vanderbilt
- Yale
- Rochester
- Carnegie Mellon
- Wash U St. Louis
- Duke

Large Public:

- Georgia Tech
- Ohio State
- Penn State
- Maryland
- Minnesota
- Texas
- UCOP

Public:

- Arizona State
- Colorado State
- Florida State
- UC Riverside
- Kansas
- Kentucky
- South Florida
- Wash. State
- Utah
- Georgia
- Tennessee

25 Universities (Research > $9B+)

The report outlines 6 overarching themes that provide a framework for understanding the current conditions faced by American research institutions and threatens the future of many.

1. Scarcity of resources has led to a hypercompetitive environment and increased the complexity of managing academic research activities.
2. Growth of government regulation and reporting requirements have diverted faculty from research activities and compounded institutional financial stress.
3. Assessment and impact analysis relies on departments or colleges/centers rather than being done in a systematic fashion at the institutional level.
4. Enabling the highest impact research requires current and predictive data to assess programs and evaluate key opportunities in a resource constrained environment. While universities have developed a range of systems and processes to collect and evaluate research information, most of these efforts are deemed inadequate or insufficiently credible to support well-informed strategic decisions.
5. A better story for translating the value of the research university is needed to articulate how research conducted at academic institutions serves society, contributes to local and regional economies, and promotes national innovation and security.
6. The fragility of research administration (management) and leadership is not fully understood within the university community or by sponsors and stakeholders. As the number and complexity of research programs increase, the capacity of systems and operational support often lag, putting the research enterprise for the institution as a whole at risk.

Key Finding 1:

Scarcity of resources has led to a hypercompetitive environment and increased the complexity of managing academic research activities.

"Winner-take-all" **- Arms Race**

Small difference in performance translates into large difference in rewards. Unsuccessful competitors have little to show from the investment.

"An auction where everyone pays, but only the winner benefits."

Economics of Higher Education

"The Red Queen"

"…it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"

Through the Looking Glass, Lewis Carroll

Economics of Higher Education

"The Red Queen"

"…it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"

Through the Looking Glass, Lewis Carroll

The result is that all contestants "*RUN HARDER TO STAY IN THE SAME PLACE*" and those who choose not to play or can no longer afford the game, quickly slip out of the market.

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Run Smarter – Not Harder

Key Finding 2:

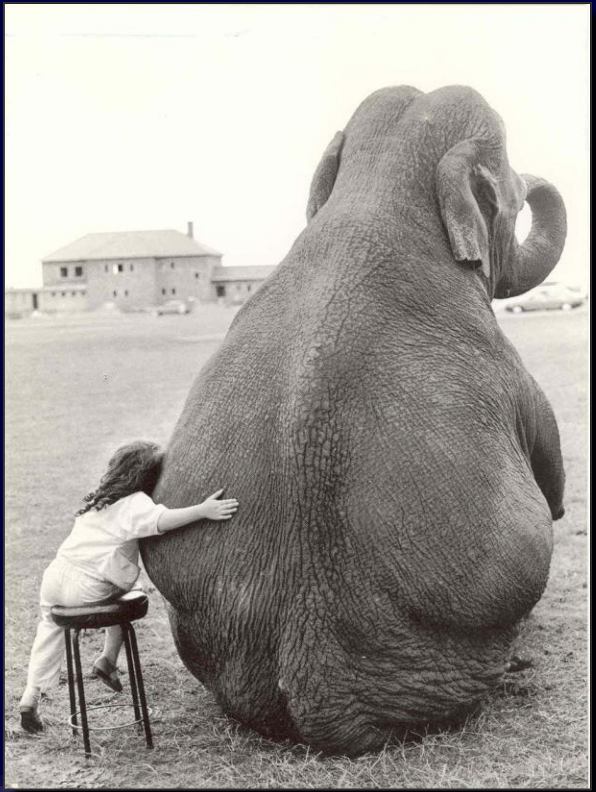
Growth of government regulation and reporting requirements have diverted faculty from research activities and compounded institutional financial stress.

"Overhead calculations and negotiations are not uniformly applied, promote behaviors that may not be prudent, and create an uneven playing field."

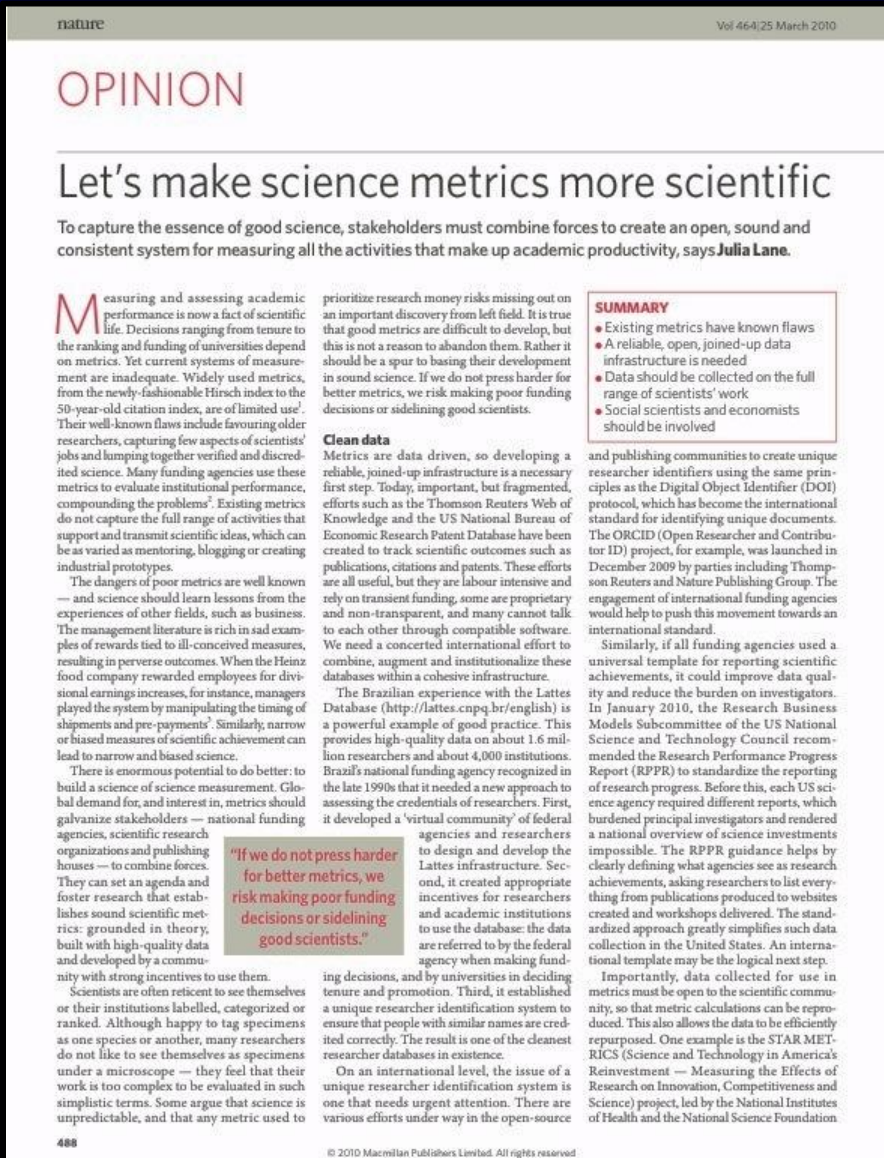
Key Finding 3:

Assessment and impact analysis relies on departments or colleges/centers rather than being done in a systematic fashion at the institutional level.

"Research is irrationally only measured as an output, number of grants and dollars awarded. This fails to recognize the costs to produce these and whether or not is was efficient or wasteful. And, is has little relation to quality or impact."



"STAR METRICS"



OPINION

Let's make science metrics more scientific

To capture the essence of good science, stakeholders must combine forces to create an open, sound and consistent system for measuring all the activities that make up academic productivity, says **Julia Lane**.

Measuring and assessing academic performance is now a fact of scientific life. Decisions ranging from tenure to the ranking and funding of universities depend on metrics. Yet current systems of measurement are inadequate. Widely used metrics, from the newly-fashionable Hirsch index to the 50-year-old citation index, are of limited use[1]. Their well-known flaws include favouring older researchers, capturing few aspects of scientists' jobs and lumping together verified and discredited science. Many funding agencies use these metrics to evaluate institutional performance, compounding the problems[2]. Existing metrics do not capture the full range of activities that support and transmit scientific ideas, which can be as varied as mentoring, blogging or creating industrial prototypes.

The dangers of poor metrics are well known — and science should learn lessons from the experiences of other fields, such as business. The management literature is rich in sad examples of rewards tied to ill-conceived measures, resulting in perverse outcomes. When the Heinz food company rewarded employees for divisional earnings increases, for instance, managers played the system by manipulating the timing of shipments and pre-payments[3]. Similarly, narrow or biased measures of scientific achievement can lead to narrow and biased science.

There is enormous potential to do better: to build a science of science measurement. Global demand for, and interest in, metrics should galvanize stakeholders — national funding agencies, scientific research organizations and publishing houses — to combine forces. They can set an agenda and foster research that establishes sound scientific metrics: grounded in theory, built with high-quality data and developed by a community with strong incentives to use them.

Scientists are often reticent to see themselves or their institutions labelled, categorized or ranked. Although happy to tag specimens as one species or another, many researchers do not like to see themselves as specimens under a microscope — they feel that their work is too complex to be evaluated in such simplistic terms. Some argue that science is unpredictable, and that any metric used to prioritize research money risks missing out on an important discovery from left field. It is true that good metrics are difficult to develop, but this is not a reason to abandon them. Rather it should be a spur to basing their development in sound science. If we do not press harder for better metrics, we risk making poor funding decisions or sidelining good scientists.

"If we do not press harder for better metrics, we risk making poor funding decisions or sidelining good scientists."

Clean data

Metrics are data driven, so developing a reliable, joined-up infrastructure is a necessary first step. Today, important, but fragmented, efforts such as the Thomson Reuters Web of Knowledge and the US National Bureau of Economic Research Patent Database have been created to track scientific outcomes such as publications, citations and patents. These efforts are all useful, but they are labour intensive and rely on transient funding, some are proprietary and non-transparent, and many cannot talk to each other through compatible software. We need a concerted international effort to combine, augment and institutionalize these databases within a cohesive infrastructure.

The Brazilian experience with the Lattes Database (http://lattes.cnpq.br/english) is a powerful example of good practice. This provides high-quality data on about 1.6 million researchers and about 4,000 institutions. Brazil's national funding agency recognized in the late 1990s that it needed a new approach to assessing the credentials of researchers. First, it developed a 'virtual community' of federal agencies and researchers to design and develop the Lattes infrastructure. Second, it created appropriate incentives for researchers and academic institutions to use the database: the data are referred to by the federal agency when making funding decisions, and by universities in deciding tenure and promotion. Third, it established a unique researcher identification system to ensure that people with similar names are credited correctly. The result is one of the cleanest researcher databases in existence.

On an international level, the issue of a unique researcher identification system is one that needs urgent attention. There are various efforts under way in the open-source and publishing communities to create unique researcher identifiers using the same principles as the Digital Object Identifier (DOI) protocol, which has become the international standard for identifying unique documents. The ORCID (Open Researcher and Contributor ID) project, for example, was launched in December 2009 by parties including Thompson Reuters and Nature Publishing Group. The engagement of international funding agencies would help to push this movement towards an international standard.

Similarly, if all funding agencies used a universal template for reporting scientific achievements, it could improve data quality and reduce the burden on investigators. In January 2010, the Research Business Models Subcommittee of the US National Science and Technology Council recommended the Research Performance Progress Report (RPPR) to standardize the reporting of research progress. Before this, each US science agency required different reports, which burdened principal investigators and rendered a national overview of science investments impossible. The RPPR guidance helps by clearly defining what agencies see as research achievements, asking researchers to list everything from publications produced to websites created and workshops delivered. The standardized approach greatly simplifies such data collection in the United States. An international template may be the logical next step.

Importantly, data collected for use in metrics must be open to the scientific community, so that metric calculations can be reproduced. This also allows the data to be efficiently repurposed. One example is the STAR METRICS (Science and Technology in America's Reinvestment — Measuring the Effects of Research on Innovation, Competitiveness and Science) project, led by the National Institutes of Health and the National Science Foundation

SUMMARY

- Existing metrics have known flaws
- A reliable, open, joined-up data infrastructure is needed
- Data should be collected on the full range of scientists' work
- Social scientists and economists should be involved

Science and **T**echnology for **A**merica's **R**einvestment

Measuring the **E**ffec**T**s of **R**esearch on **I**nnovation **C**ompetitiveness and **S**cience

Key Finding 4:

Enabling the highest impact research requires current and predictive data to assess programs and evaluate key opportunities in a resource constrained environment.

"Research administration and leadership is like playing chess blindfold…trying to make the right moves at the right time all without being able to see the board or the moves of the other player."

Key Finding 4:

Enabling the highest impact research requires current and predictive data to assess programs and evaluate key opportunities in a resource constrained environment.

While universities have developed a range of systems and processes to collect and evaluate research information, most of these efforts are deemed inadequate or insufficiently credible to support well-informed strategic decisions.

Key Finding 5:

A better story for translating the value of the research university is needed to articulate how research conducted at academic institutions serves society, contributes to local and regional economies, and promotes national innovation and security.

Key Finding 6:

The fragility of research administration (management) and leadership is not fully understood within the university community or by sponsors and stakeholders.

"There can be little doubt that the faculty would be more successful researchers if the research administration staff were trained, viewed and treated as professionals."

Key Finding 6:

The fragility of research administration (management) and leadership is not fully understood within the university community or by sponsors and stakeholders.

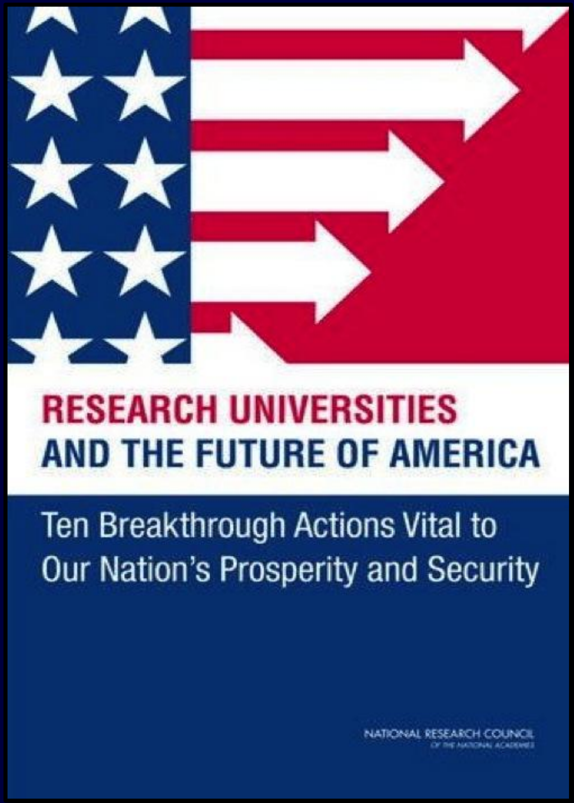
As the number and complexity of research programs increase, the capacity of systems and operational support often lag, putting the research enterprise for the institution as a whole at risk.

1. Limited funding, hyper-competition, need for greater cooperation between sponsors and universities.
2. Excessive regulation and reporting.
3. Lack of standard measures of performance, limited reward for efficiency and effectiveness.
4. Lack of reliable data to inform strategic decisions and resource allocations.
5. Failure to demonstrating and promoting the value of research.
6. Fragility of research administration and leadership.

Collaborative action is needed to address some of the key challenges such as the burden of compliance, erosion of public support of academic research as well as strengthening of research program development and administration.

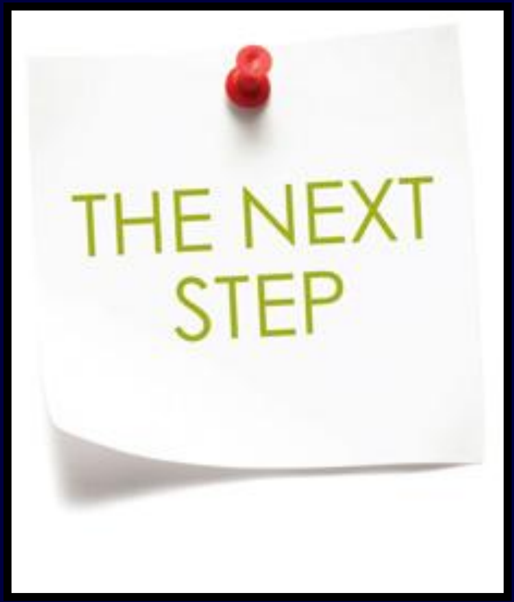
Furthermore, the reports outline how standard metrics, and current and forward-looking data, would play a critical role to realize this.

Finally, US academia could benefit from a cohesive national strategy, supporting a national research and innovation agenda.



1. Stable and effective policies, practices, and funding
2. Greater autonomy for public research universities
3. Strength the role of the business sector
4. *Increase cost-effectiveness and productivity*
5. Create a "Strategic Investment" program
6. Sponsors should cover the full cost of research
7. Reduce or eliminate unnecessary regulations
8. Improve the capacity of graduate programs
9. Universities take a strong role in K-12 and STEM
10. Enhance international students and scholars mobility

The Consortium has the intention to explore and develop solutions and implementation strategies as the next phase of its work.



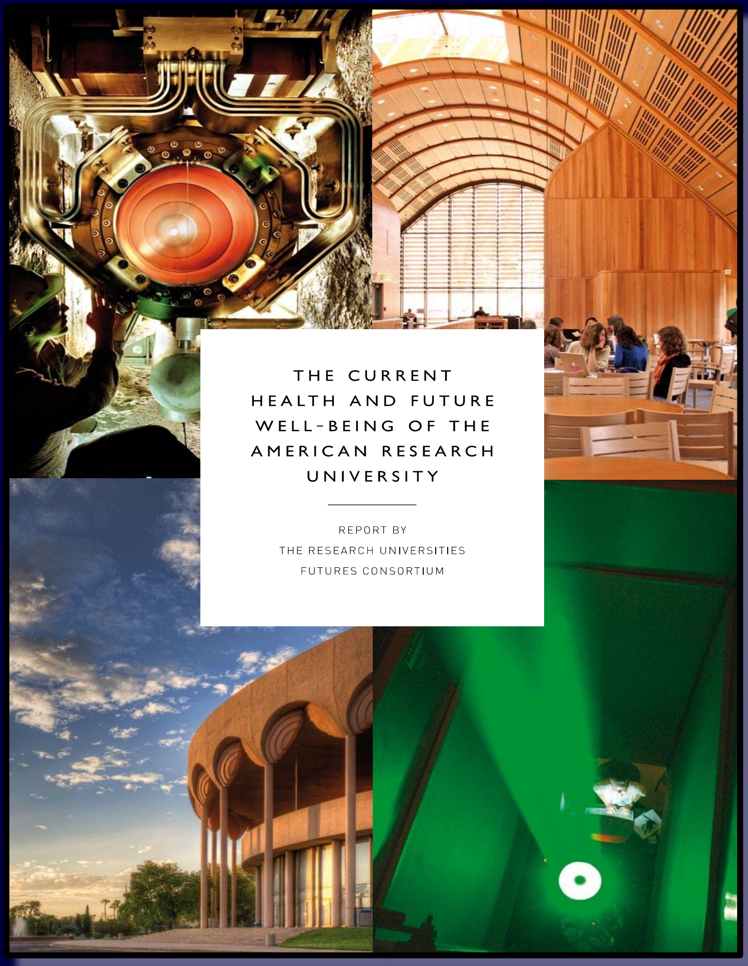
Phase II -- Next Steps:

Partner with other groups:

- NRC, A21-Taskforce, Research America, COGR, APLU, AAU, FDP, and others.

Form working groups to focus on the development and testing of solution that the consortium is particularly well positioned to address.

Open to additional members.



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