German Data Forum
(RatSWD)

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RatSWD
Working Paper Series

Working Paper No. 159

Science Metrics:
The Issues and New Approaches

Julia Lane

September 2010

Federal Ministry
of Education
and Research

Working Paper Series of the German Data Forum (RatSWD)

The *RatSWD Working Papers* series was launched at the end of 2007. Since 2009, the series has been publishing exclusively conceptual and historical works dealing with the organization of the German statistical infrastructure and research infrastructure in the social, behavioral, and economic sciences. Papers that have appeared in the series deal primarily with the organization of Germany's official statistical system, government agency research, and academic research infrastructure, as well as directly with the work of the RatSWD. Papers addressing the aforementioned topics in other countries as well as supranational aspects are particularly welcome.

RatSWD Working Papers are non-exclusive, which means that there is nothing to prevent you from publishing your work in another venue as well: all papers can and should also appear in professionally, institutionally, and locally specialized journals. The *RatSWD Working Papers* are not available in bookstores but can be ordered online through the RatSWD.

In order to make the series more accessible to readers not fluent in German, the English section of the *RatSWD Working Papers* website presents only those papers published in English, while the the German section lists the complete contents of all issues in the series in chronological order.

Starting in 2009, some of the empirical research papers that originally appeared in the *RatSWD Working Papers* series will be published in the series *RatSWD Research Notes*.

The views expressed in the *RatSWD Working Papers* are exclusively the opinions of their authors and not those of the RatSWD.

Contact: German Data Forum (RatSWD) | Mohrenstraße 58 | 10117 Berlin | office@ratswd.de

This paper documents the presentation slides of the 1st Distinguished Lecture of the German Data Forum (RatSWD), held on 15th September 2010 at the DIW Berlin.

Science Metrics: The Issues and New Approaches

Julia Lane

This presentation represents the views of the author and not of the institution she represents.

Overview

- Why Metrics Matter
- Conceptual Framework
  - The scientific challenge
  - The empirical challenge
- What's Being Done in the US: STAR METRICS
  - What it is
  - Structure
  - Measuring outcomes: The Role of Incentives
  - Examining impact: The Role of Social and Domain Scientists

Why metrics matter

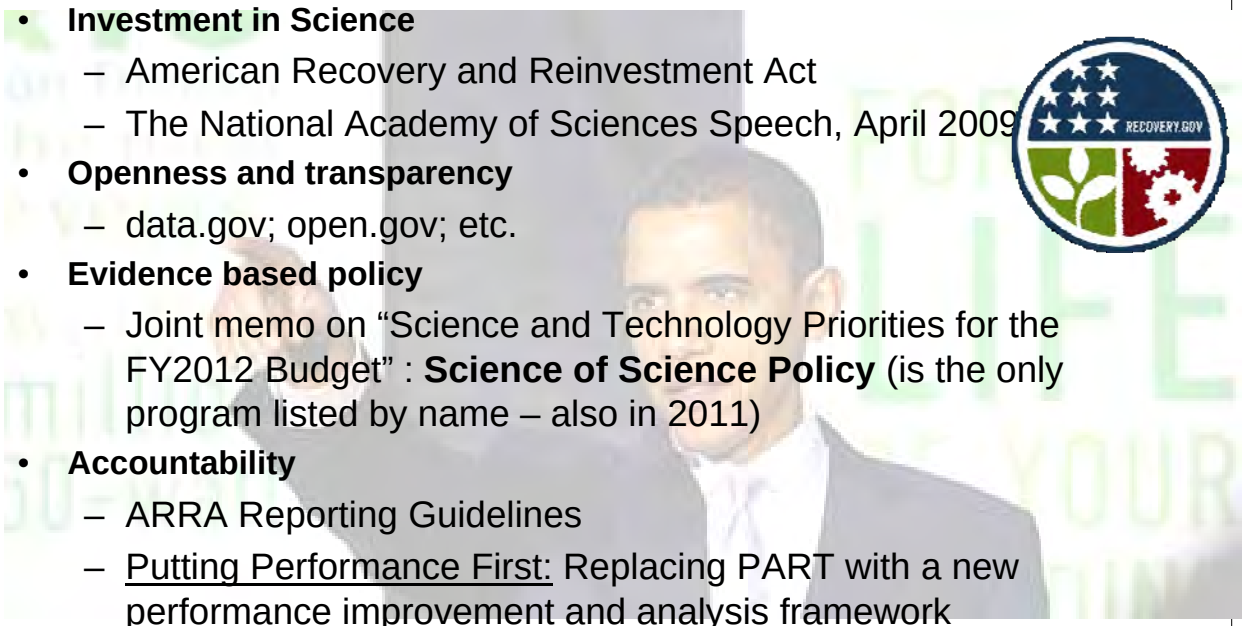
- Government
  - Advance basic science
  - Improve wellbeing of citizens

  => Affects level of funding
- Funding agencies
  - Want to identify and fund good science

  => Affects type of funding
- Academic institutions
  - Want to hire and retain good scientists
  - Want to demonstrate impact

  => Affects who does science

Administration Interest



- **Investment in Science**
  - American Recovery and Reinvestment Act
  - The National Academy of Sciences Speech, April 2009
- **Openness and transparency**
  - data.gov; open.gov; etc.
- **Evidence based policy**
  - Joint memo on "Science and Technology Priorities for the FY2012 Budget" : **Science of Science Policy** (is the only program listed by name – also in 2011)
- **Accountability**
  - ARRA Reporting Guidelines
  - Putting Performance First: Replacing PART with a new performance improvement and analysis framework

Administration Interest

Agencies, in cooperation with OSTP and OMB, should develop and sustain datasets to better document Federal science, technology, and innovation investments and to make these data open to the public in accessible, useful formats. Agencies should develop and regularly update their data sharing policies for research performers and create incentives for sharing data publicly in interoperable formats to ensure maximum value, consistent with privacy, national security, and confidentiality concerns.

Agencies should develop outcome-oriented goals for their science, technology, and innovation activities, establish timelines for evaluating the performance of these activities, and target investments toward high-performing programs in their budget submissions. Agencies should support the development and use of "science of science policy" tools that can improve management of their R&D portfolios and better assess the impact of their science, technology, and innovation investments.

FY12 Orszag-Holdren Memo, July 21 2010; reiterates August 4, 2009 memo;
Science of Science Policy is only program mentioned by name

Congressional Interest

Public Interest

Jobs Matter


When Counting Jobs Isn't Enough

Mean what you say

PARTY OF ONE

THE WALL STREET JOURNAL.

HEALTH INDUSTRY | AUGUST 12, 2010

Science Stimulus Funds Called Wasteful

By LOUISE RADNOFSKY

(Please see Corrections & Amplifications item below)

Economic-stimulus funds for scientific research are becoming a political target for Republican skeptics who say they have identified some grants as evidence of wasteful spending.

The National Institutes of Health and National Science Foundation received $13 billion between them from the stimulus package for extra grants to researchers, upgrades to facilities and professional development activities for scientists. The science spending includes funding for public-health studies, social-science research and overseas travel, which Republicans say have failed to create jobs.

The stimulus package passed in February 2009 has a current estimated price tag of $862 billion.

Sens. Tom Coburn (R., Okla.) and John McCain (R., Ariz.), most notably, have criticized a range of stimulus spending as failing to address what they say is the immediate priority of creating jobs in the U.S. They have publicized lists of what they consider nonessential or frivolous projects.

Much of the NIH's $10 billion share of the money has been spent on research into cancer, heart and other diseases. Funding for a range of other studies on substance abuse and public health has raised eyebrows, including research into whether female college students are more likely to engage in casual sex after drinking alcohol, the reasons why young men don't use condoms correctly, how methamphetamine enhances the motivation for female rats' sexual behavior and "obesity and psychosocial adjustment during adolescence."

The NIH is pushing back, arguing that it is supporting work on important issues, and that substance abuse is one of them. The agency's director, Francis Collins, said, "I don't know if the critics want us to experiment with humans, or just give up on the problem of drug addiction, but we aren't going to do either."

Most of the $3 billion of National Science Foundation spending has gone to energy or climate-related research, or work in fields such as astronomy, chemistry and engineering. The agency is also supporting some social-science projects that are unlikely to reap economic rewards in the foreseeable future, such as the documentation of indigenous languages that are nearly extinct, including video recordings of Tlingit conversations in Alaska and analysis of the grammar of Hiaki, an Arizona dialect.

International Interest

EU2009.CZ

České předsednictví v Radě EU

Czech Presidency of the Council of the EU

Présidence tchèque du Conseil de l'UE

2009

EUFORDIA Conclusions and Recommendations

The **EU**ropean **FO**rum on **R**esearch and **D**evelopment **I**mpact **A**ssessment (EUFORDIA) was held under the Czech Presidency of the Council of the EU in Prague on 24 – 25 February, 2009. The conference was organized by the Ministry of Education, Youth and Sports of the Czech Republic and the Technology Centre of the Academy of Science of the Czech Republic. The conference was attended by more than 260 participants.

EUFORDIA dealt with:

- the recent 6th Framework Programme (FP6) ex-post evaluation organized by the European Commission
- examples of national FP6 impact assessment studies from Sweden, Spain and the Czech Republic
- methodological issues concerning impact assessment and evaluation of R&D programmes
- world-wide experiences with R&D programme evaluation

Following the presentations and a panel discussion, the participants arrived at the conclusions listed below:

1. The FP6 evaluation report demonstrates the progress made by the European Commission in recent years in developing its approach to the evaluation of the RTD Framework Programmes (FP). EUFORDIA welcomes the FP6 evaluation report and lends its support to its recommendations.
2. Getting robust data on the FPs in terms of participation and results is the foundation for any evaluation. EUFORDIA invites the European Commission to establish a database of project results, which, to the possible extent, should be based on open access and available so that independent experts can carry out further studies and analyses.
3. With a view to increase comparability and compatibility between the evaluations of national R&D programmes, EUFORDIA encourages the Member States to further strengthen their collaboration in this field by exchanging "good practices" concerning issues such as methods for conducting research evaluation studies or the definition of appropriate indicators.

The global challenge

As world league tables gain influence they need to reflect the multi-faceted nature of universities' activities, says Seeram Ramakrishna

NEWS FEATURE

What science is really worth

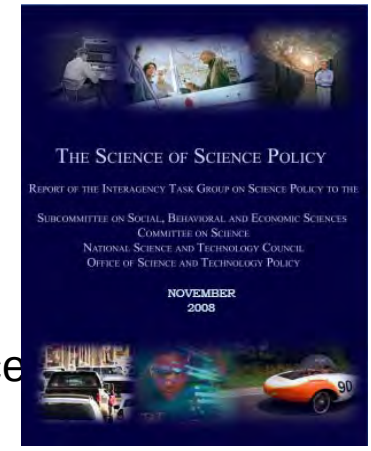
Spending on science is one of the best ways to generate jobs and economic growth, say research advocates. But as **Colin Macilwain** reports, the evidence behind such claims is patchy.

Scientists Can Provide a 'Black Box' Answer

ROMAN AUGURS: Roman augurs foretell the future by observing the behavior of hens

Or…Start To Develop A Scientific Framework

- Science of Science Policy Interagency Task Group
- The SoSP Roadmap
  - Published in November, 2008
  - Four guiding themes
  - Ten key questions
- December, 2008 Workshop
  - Engage the current community of practice
  - Interactive evaluation of Roadmap



Research Challenge: Conceptual

Need to describe and measure the creation, transmission and adoption of knowledge

Table 1: Three Distinct Tasks Arising in the Analysis of Causal Models

Task	Description	Requirements
1	Defining the Set of Hypotheticals or Counterfactuals	A Scientific Theory
2	Identifying Causal Parameters from Hypothetical Population Data	Mathematical Analysis of Point or Set Identification
3	Identifying Parameters from Real Data	Estimation and Testing Theory

Heckman, 2008, Econometric Causality, NBER working paper 13934, 2008

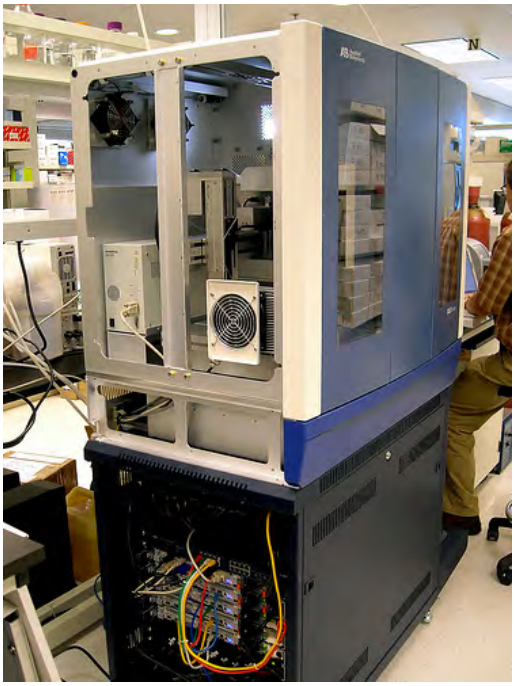
Research Challenges: Conceptual

- How to describe creation of knowledge?
  - Unit of analysis
  - Input measures
- How to describe transmission?
  - Networks
  - Technology
- How to describe adoption?
  - Lags
  - Proximal causes
- What structural model?
  - Linear
  - Outcome measures
- Fundamental challenge: Establishing counterfactuals
  - Selection bias
  - Random assignment not an option

Research Challenges: Empirical

- Data Infrastructure
  - Science agencies have balkanized proposal and award administration systems
  - Unit of analysis is awards – while appropriate unit is individuals
  - Typically limited data on postdocs, graduate students, undergraduate students
  - Limited data on subawards
  - Information captured only during funding period
  - Information typically captured manually, sporadically and in unstructured format
  - Outputs not linked to inputs or infrastructure investments in a systematic way.
  - Data not captured on people who DON'T get funded, so difficult to establish counterfactual
- Heterogeneous sources of outcomes
- Changing nature of scientific communication
- Scientific Attribution
  - Name disambiguation
  - Global enterprise

If we can automate the DNA sequencing, we can describe science investments!



STAR METRICS

Science and Technology in America's Reinvestment – Measuring the EffecTs of Research on Innovation, Competitiveness and Science

What is STAR METRICS?

1. Data Infrastructure to capture impact of science investments.
2. Collaborative identification of data and data sources
3. Explicit integration of domain and social scientists in development of metrics

Basic Approach

Creating the Frame

- Start with basic unit of analysis
  - Science is done by scientists. Need to identify universe of individuals funded by federal agencies (PI, co-PI, RAs, graduate students etc.)
- Capture Inputs using existing data

Measuring outcomes

- Scientific
- Social
- Economic
- Workforce

Creating the Frame

Academic Grantee Institutions

Federal S&T Funding Agencies

Based on Existing Record Reporting

UIA 1017 (Rev. 1-06)

PICA ELITE

Wage Detail Report

STATE OF MICHIGAN, DEPARTMENT OF LABOR & ECONOMIC GROWTH
UNEMPLOYMENT INSURANCE AGENCY
See reverse side for detailed instructions and penalty provisions

Authorized by MCL 421.1, et seq.

PICA ELITE

BY USING "ALIGNMENT BOXES" TYPED & LINE PRINTED DATA WILL FALL WITHIN ALL FIELDS

Report Quarter Ending: **Return by:**

Mail original form to: *(Do not mail a copy)*

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UIA Account Number

Multi-Unit

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STATUS	DELETE (X)	SOCIAL SECURITY NUMBER	EMPLOYEE NAME LAST NAME	EMPLOYEE NAME FIRST NAME	GROSS WAGES PAID THIS QUARTER
					$
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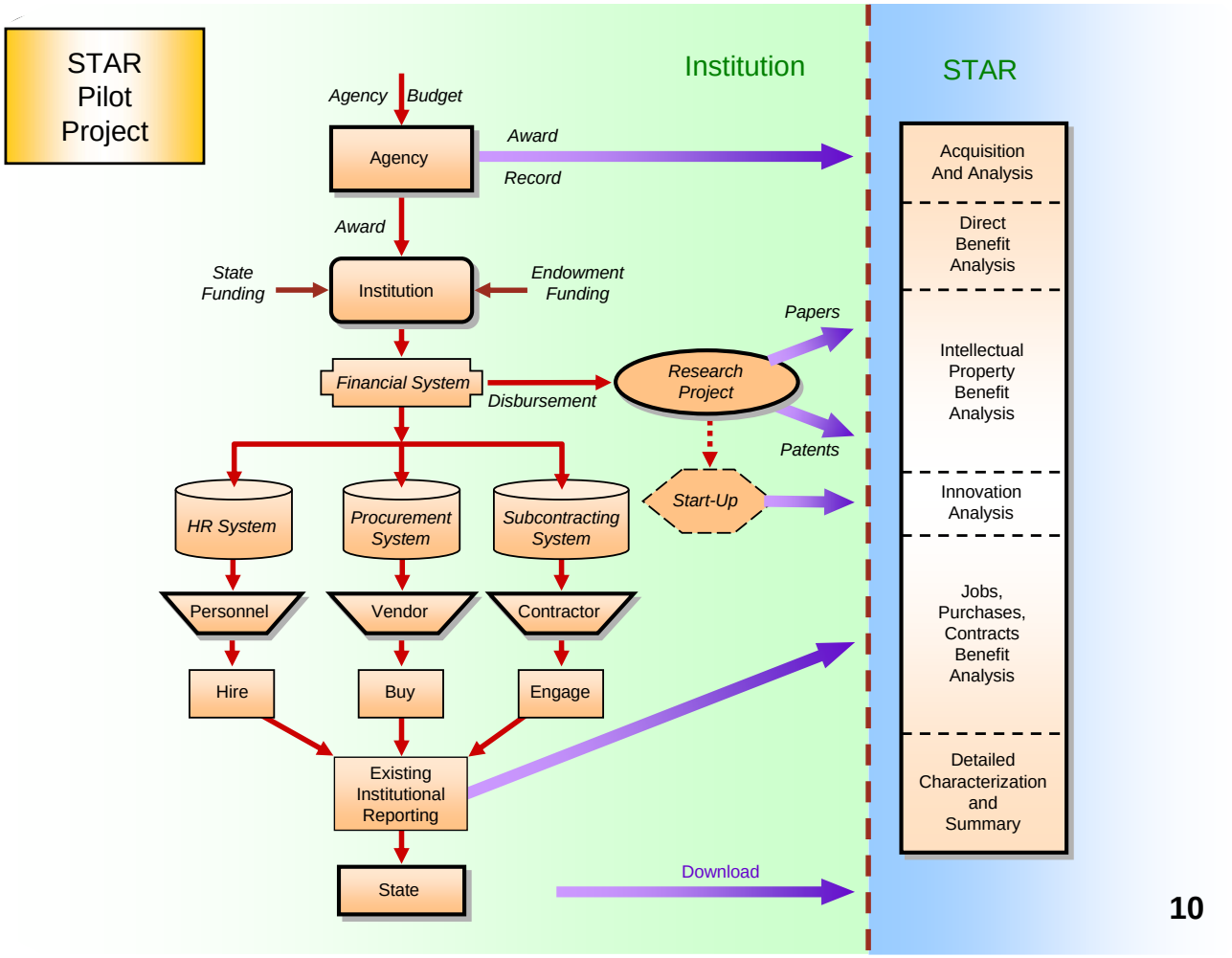


Creating the Frame (and measuring jobs)

Data Elements

14 administrative data elements from awards, grants, HR or finance systems are provided to STAR Metrics on a quarterly basis…

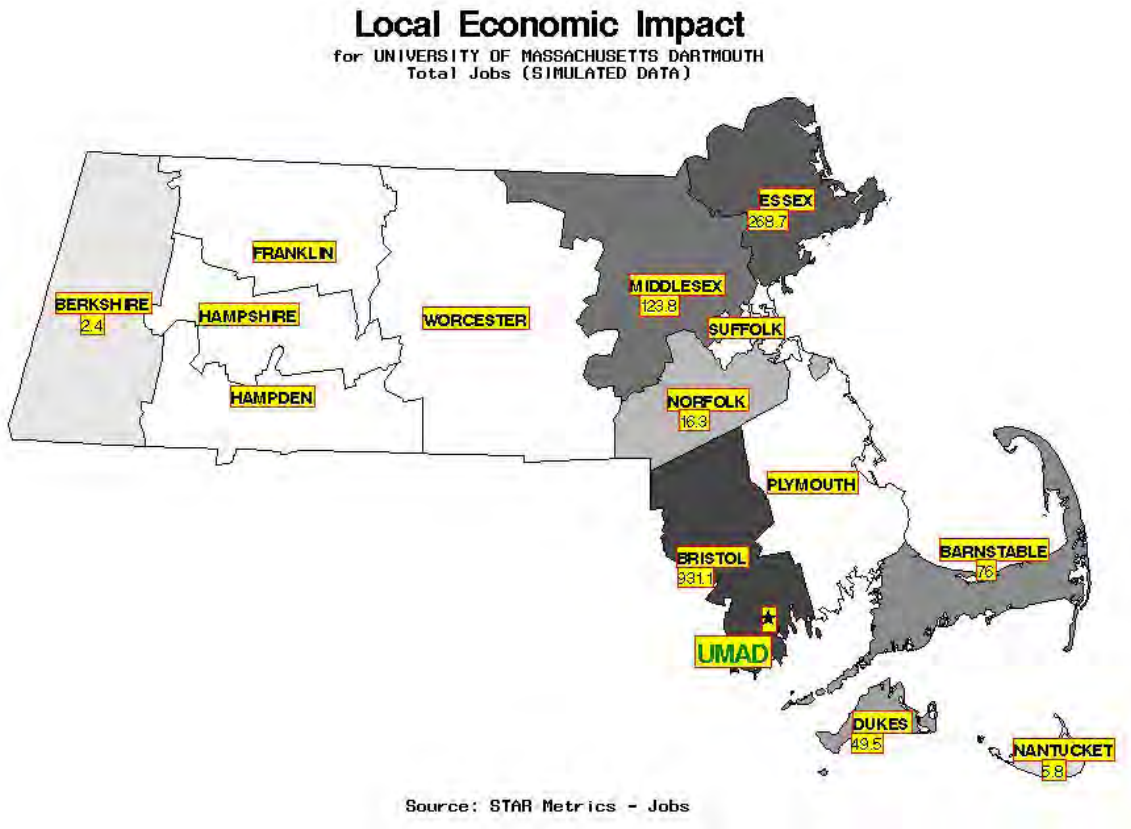
- Award data
- Payroll Staff Information
- Non-Payroll Charges
- Sub-awards
- Indirect Cost Rate Proposal

…will yield these Quarterly pre-calculated reports…

- **Stimulus FTE Jobs** (ARRA) – with and without Overhead Job calculations
- **FTE Jobs and Positions** – All awards (with and without Overhead)
- **FTE Sub-awards** – All awards (with and without Overhead)
- **Vendor FTE's (Jobs)** – All awards
- **Overhead Jobs** (calculated from Indirect Costs)

Star Metrics Phase 1 – 14 Requested Data Elements

Description	Element ID	Item	Data Source	Unit of Analysis	Purpose
Information on Scientists and Awards	1	De-identified Employee ID #	University	Individual	Job Metrics
	2	Federal Award ID #		Award	
	3	University Award ID #		Award	
	4	Overhead charged		Award	
	5	Occupational Classification		Individual	
	6	Proportion of time allocated to award		Individual	
	7	FTE status		Individual	
Information on Overhead	8	Proportion of overhead associated with salaries (from overhead cost proposal)	University	University	Job Metrics
Payments to vendors	2	Federal Award ID #	University	Award	Secondary Economic Impact
	9	University Award ID #		Award	
	10	Duns #		Vendor	
	11	Amount of Contract		Vendor	
Subcontracts and subawards	2	Federal Award ID #	University	Award	Secondary Economic Impact
	12	University Award ID #		Award	
	13	Duns #		Subcontractor	
	14	Amount of Contract		Subcontractor	

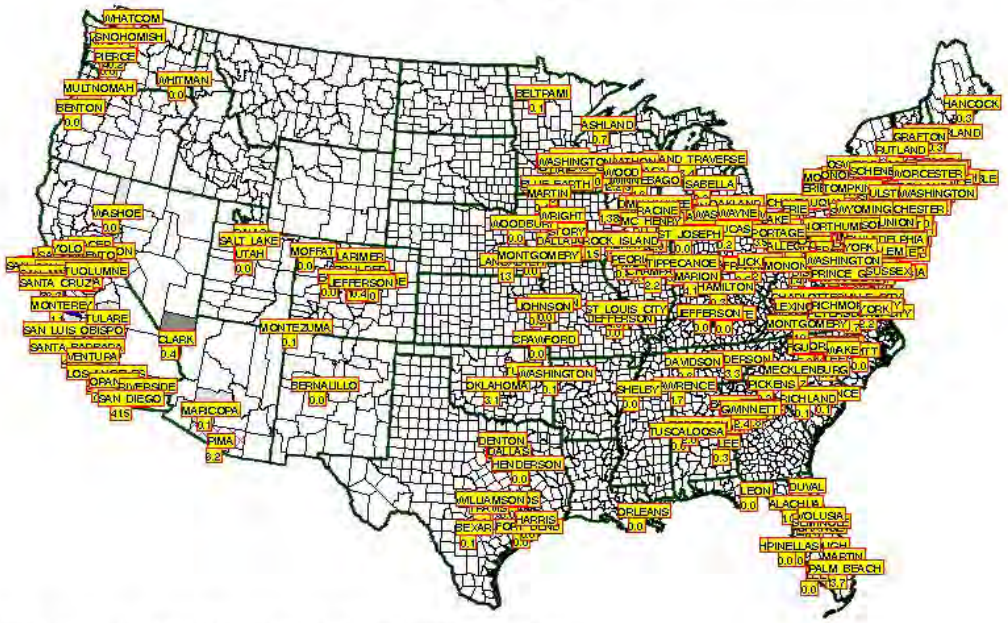


Local Economic Impact
for UNIVERSITY OF MASSACHUSETTS DARTMOUTH
Total Jobs (SIMULATED DATA)

County Name	County Code	Sub-Awards & Vendor Jobs	Award FTEs, Sub-Award & Vendor Jobs	Total Jobs
BARNSTABLE	1	76	76	76
BERKSHIRE	3	2.4	2.4	2.4
BRISTOL	5	100.7	861.4	931.1
DUKES	7	49.5	49.5	49.5
ESSEX	9	268.7	268.7	268.7
MIDDLESEX	17	123.8	123.8	123.8
NANTUCKET	19	5.8	5.8	5.8
NORFOLK	21	16.3	16.3	16.3
		643	1,404	1,474

Source: STAR Metrics - Jobs

Initial Jobs Impact of Science Expenditures
for 5 universities
Total Jobs

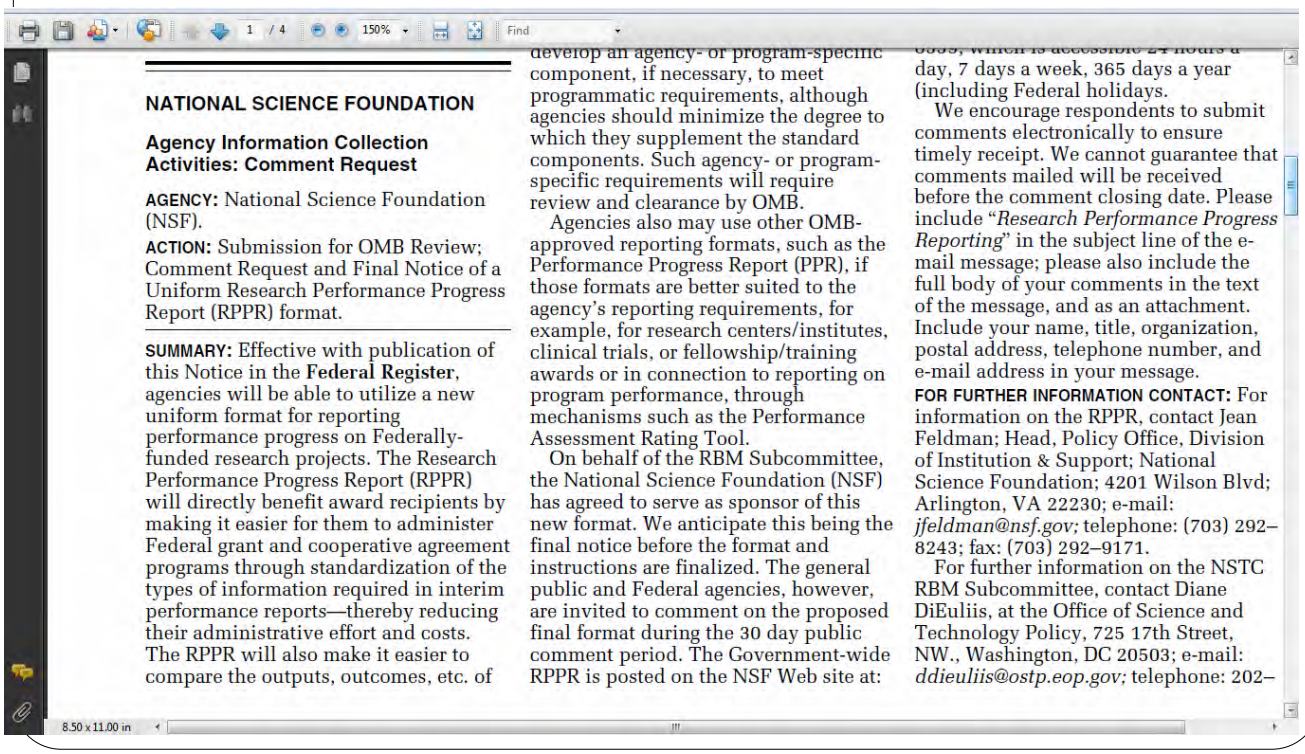


Source: STAR Metrics - Jobs Q3 2009 - Q2 2010 (fuzz factor applied)
Note: Map excludes Alaska, Hawaii, and Puerto Rico.

Measuring Outcomes: The Role of Incentives

1. Reduce Burden
2. Leverage Existing Data
3. Describe Impact

Reducing Burden:
Use Existing Reports



NATIONAL SCIENCE FOUNDATION

Agency Information Collection Activities: Comment Request

AGENCY: National Science Foundation (NSF).

ACTION: Submission for OMB Review; Comment Request and Final Notice of a Uniform Research Performance Progress Report (RPPR) format.

SUMMARY: Effective with publication of this Notice in the **Federal Register**, agencies will be able to utilize a new uniform format for reporting performance progress on Federally-funded research projects. The Research Performance Progress Report (RPPR) will directly benefit award recipients by making it easier for them to administer Federal grant and cooperative agreement programs through standardization of the types of information required in interim performance reports—thereby reducing their administrative effort and costs. The RPPR will also make it easier to compare the outputs, outcomes, etc. of

develop an agency- or program-specific component, if necessary, to meet programmatic requirements, although agencies should minimize the degree to which they supplement the standard components. Such agency- or program-specific requirements will require review and clearance by OMB.

Agencies also may use other OMB-approved reporting formats, such as the Performance Progress Report (PPR), if those formats are better suited to the agency's reporting requirements, for example, for research centers/institutes, clinical trials, or fellowship/training awards or in connection to reporting on program performance, through mechanisms such as the Performance Assessment Rating Tool.

On behalf of the RBM Subcommittee, the National Science Foundation (NSF) has agreed to serve as sponsor of this new format. We anticipate this being the final notice before the format and instructions are finalized. The general public and Federal agencies, however, are invited to comment on the proposed final format during the 30 day public comment period. The Government-wide RPPR is posted on the NSF Web site at:

day, 7 days a week, 365 days a year (including Federal holidays.

We encourage respondents to submit comments electronically to ensure timely receipt. We cannot guarantee that comments mailed will be received before the comment closing date. Please include "*Research Performance Progress Reporting*" in the subject line of the e-mail message; please also include the full body of your comments in the text of the message, and as an attachment. Include your name, title, organization, postal address, telephone number, and e-mail address in your message.

FOR FURTHER INFORMATION CONTACT: For information on the RPPR, contact Jean Feldman; Head, Policy Office, Division of Institution & Support; National Science Foundation; 4201 Wilson Blvd; Arlington, VA 22230; e-mail: *jfeldman@nsf.gov;* telephone: (703) 292–8243; fax: (703) 292–9171.

For further information on the NSTC RBM Subcommittee, contact Diane DiEuliis, at the Office of Science and Technology Policy, 725 17th Street, NW., Washington, DC 20503; e-mail: *ddieuliis@ostp.eop.gov;* telephone: 202–

Reducing Burden:
The Brazilian Experience

Principal Investigator/Program Director (Last, First, Middle)

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Michael Conlon	Interim Director of Biomedical Informatics, University of Florida
eRA COMMONS USER NAME MCONLON	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Bucknell University, Lewisburg, PA	B.A.	1975	Mathematics
Bucknell University, Lewisburg, PA	B.A.	1975	Economics
University of Florida, Gainesville, FL	M.Stat	1979	Statistics
University of Florida, Gainesville, FL	Ph.D.	1982	Statistics

A. Positions and Honors

Positions and Employment

2008- Interim Director, Biomedical Informatics, College of Medicine, University of Florida.
2008- Associate University CIO, IT Architecture
2008- Associate Director, Clinical and Translational Science Institute, University of Florida.
2008- Interim Director, Clinical and Translational Informatics Program, University of Florida
2008- Research Associate Professor, Department of Epidemiology and Health Policy Research, University of Florida
2005-08 PeopleSoft Implementation Officer, University of Florida
2002- Director of Data Infrastructure, University of Florida
2002-03 Co-founder and Chief Technology Officer, MarCon Global Data Solutions, Incorporated
1997-02 Assistant Vice President for Health Affairs, Academic Information Systems and Support and Chief Information Officer, University of Florida Health Science Center
1993-07 Director of Information Resources and Technology Programs, College of Liberal Arts and Sciences, University of Florida
1992-08 Research Associate Professor. Department of Statistics, University of Florida
1982-83 Asst. Dir. of Acad. Computing. Ctr for Instr. and Research Computing Activities, Univ. of Florida
1980-83 Director, Statistical Consulting Center, Center for Instructional and Research Computing Activities

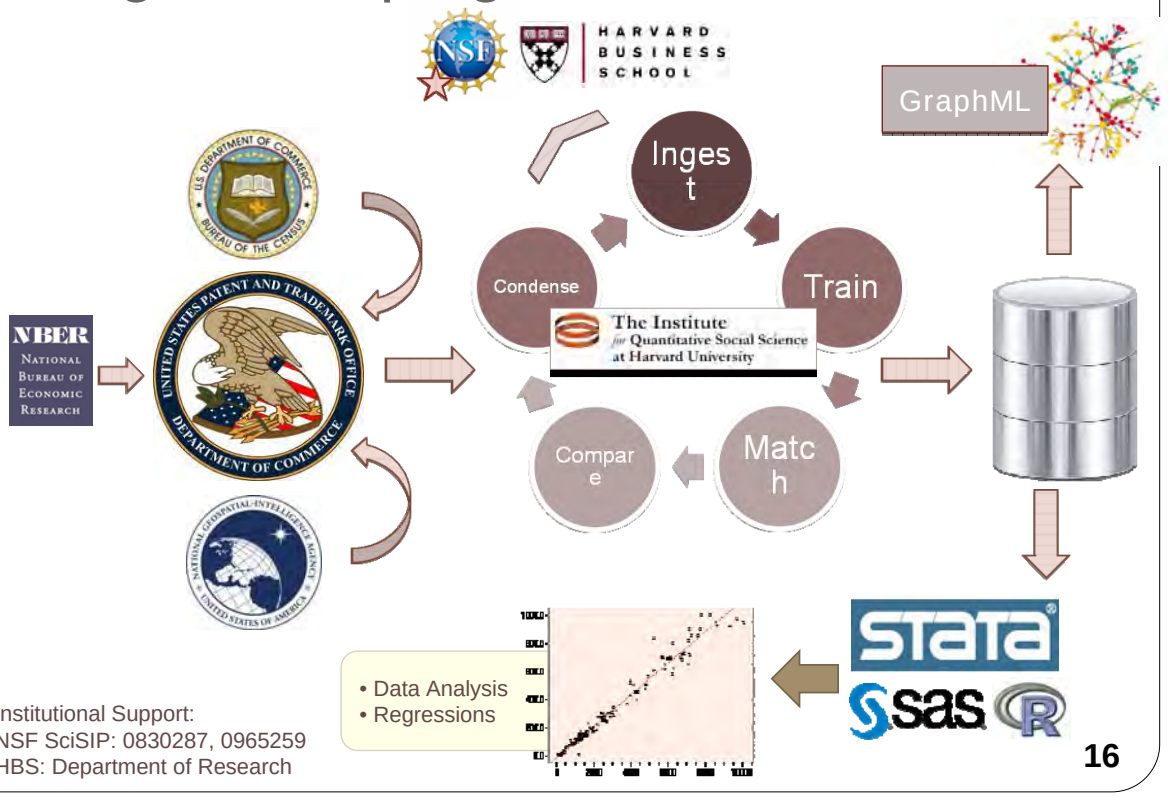
Other Experience

2009- Member, InCommon working group on Research Administration
2008- Chair, Health Science Center Information Architecture Committee
2008- Member, Health Science Center Information System Advisory Council
2008-09 Chair, University Planning Group on Computational Biology
2007-08 Member, Health Science Center Information Architecture Committee
2004- Member, Educause Working Group on Identity Management
2003- Chair, Information Technology Advisory Committee on UF Active Directory
2003-05 Editor, *AmStat OnLine*, American Statistical Association
2002- Member, Information Technology Advisory Committee, Data Infrastructure and Administrative Computing
2002-03 Chair, University Directory Services Committee
2001-03 Member, Microsoft national Higher Education Advisory Group

"Facebook for Scientists"

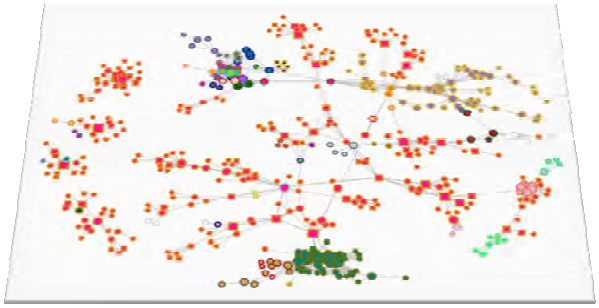
- Information in VIVO can be used to create
  - Biosketches
  - Vitas
  - Annual reports
  - Department and research group web sites
- Information can be used to populate profiles in collaborative tools – portals, wikis, …

Leverage Existing Data: e.g.Developing Patent Database



Institutional Support:
NSF SciSIP: 0830287, 0965259
HBS: Department of Research

Visual Exploration - Overview



Top Assignees - (501 inventors)

WISCONSIN ALUMNI RESEARCH FOUNDATION	(274)
PROMEGA CORPORATION	(58)
THIRD WAVE TECHNOLOGIES INC	(51)
TOMOTHERAPY INCORPORATED	(8)
ERAGEN BIOSCIENCES INC	(8)
STANDARD IMAGING INC	(7)
ACTUANT CORPORATION	(6)
FIRESITE LLC	(5)
JOHNSONDIVERSEY INC	(3)
RENGWAR INC	(4)

Primary Class - (471 patents)

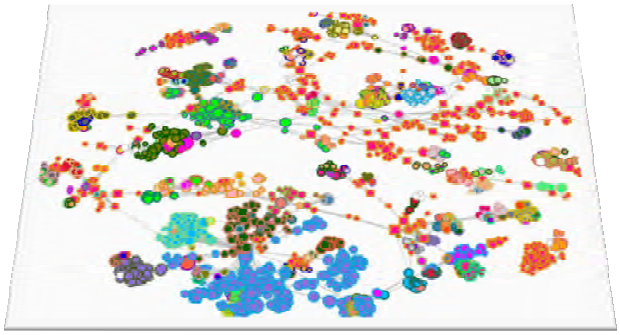
435 (147)	CHEMISTRY MOLECULAR BIOLOGY AND MICROBIOLOGY
514 (51)	DRUG BIO AFFECTING AND BODY TREATING COMPOSITIONS
07 (20)	EQUIPMENT FOR PREPARING OR SERVING FOOD OR DRINK NOT ELSEWHERE SPECIFIED
324 (17)	ELECTRICITY MEASURING AND TESTING
250 (13)	RADIANT ENERGY
378 (13)	X RAY OR GAMMA RAY SYSTEMS OR DEVICES
600 (11)	SURGERY
382 (8)	IMAGE ANALYSIS
372 (8)	COHERENT LIGHT GENERATORS
536 (8)	ORGANIC COMPOUNDS PART OF THE CLASS 532 570 SERIES

Top Assignees - (1822 inventors)

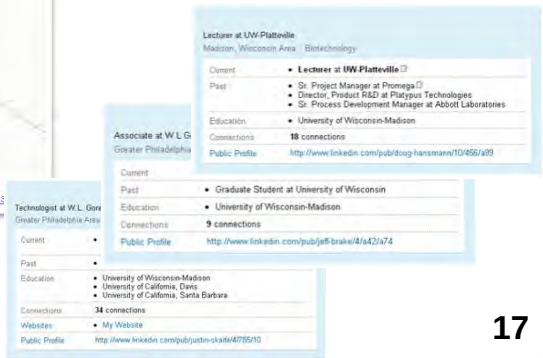
WISCONSIN ALUMNI RESEARCH FOUNDATION	(391)
INTERNATIONAL BUSINESS MACHINES CORPORATION	(123)
GENERAL ELECTRIC COMPANY	(72)
EMC CORPORATION	(59)
SUN MICROSYSTEMS INC	(54)
THIRD WAVE TECHNOLOGIES INC	(53)
PIONEER HIBRED INTERNATIONAL INC	(40)
PFIZER INC	(30)
EASTMAN KODAK COMPANY	(30)
PHARMACIA CORPORATION	(28)
ELAN PHARMACEUTICALS INC	(24)

Primary Class - (2847 patents)

514 (286)	DRUG BIO AFFECTING AND BODY TREATING COMPOSITIONS
435 (258)	CHEMISTRY MOLECULAR BIOLOGY AND MICROBIOLO
378 (208)	X RAY OR GAMMA RAY SYSTEMS OR DEVICES
800 (184)	MULTICELLULAR LIVING ORGANISMS AND UNMODIFI PARTS THEREOF AND RELATED PROCESSES
347 (109)	INCREMENTAL PRINTING OF SYMBOLIC INFORMATIO
530 (93)	CHEMISTRY NATURAL RESINS OR DERIVATIVES PEPTIDES OR PROTEINS LIGNINS OR REACTION PRODUCTS THEREOF
711 (87)	ELECTRICAL COMPUTERS AND DIGITAL PROCESSIN SYSTEMS MEMORY
709 (77)	ELECTRICAL COMPUTERS AND DIGITAL PROCESSIN SYSTEMS MULTICOMPUTER DATA TRANSFERRING
375 (74)	PULSE OR DIGITAL COMMUNICATIONS
424 (70)	DRUG BIO AFFECTING AND BODY TREATING COMPOSITIONS

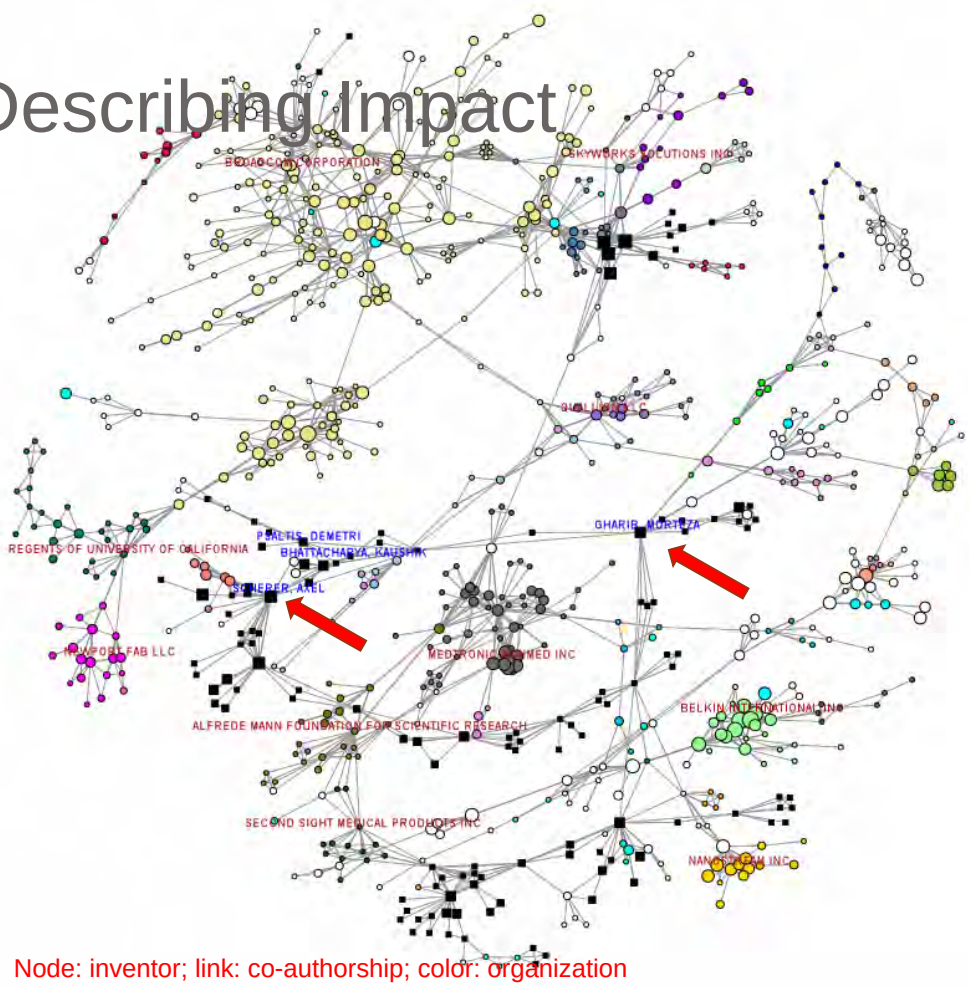


Visual Exploration - Drill Down



Describing Impact

- Broadcom: networking and communications ICs for data, voice, and video applications
- Medtronic
- Univ. of California
- Belkin Int'l: computer connectivity hardware
- Second Sight: retinal prosthesis (cybernetic eyeglasses)
- Alfred Mann Foundation: funds medical device research



Node: inventor; link: co-authorship; color: organization

Describing Impact

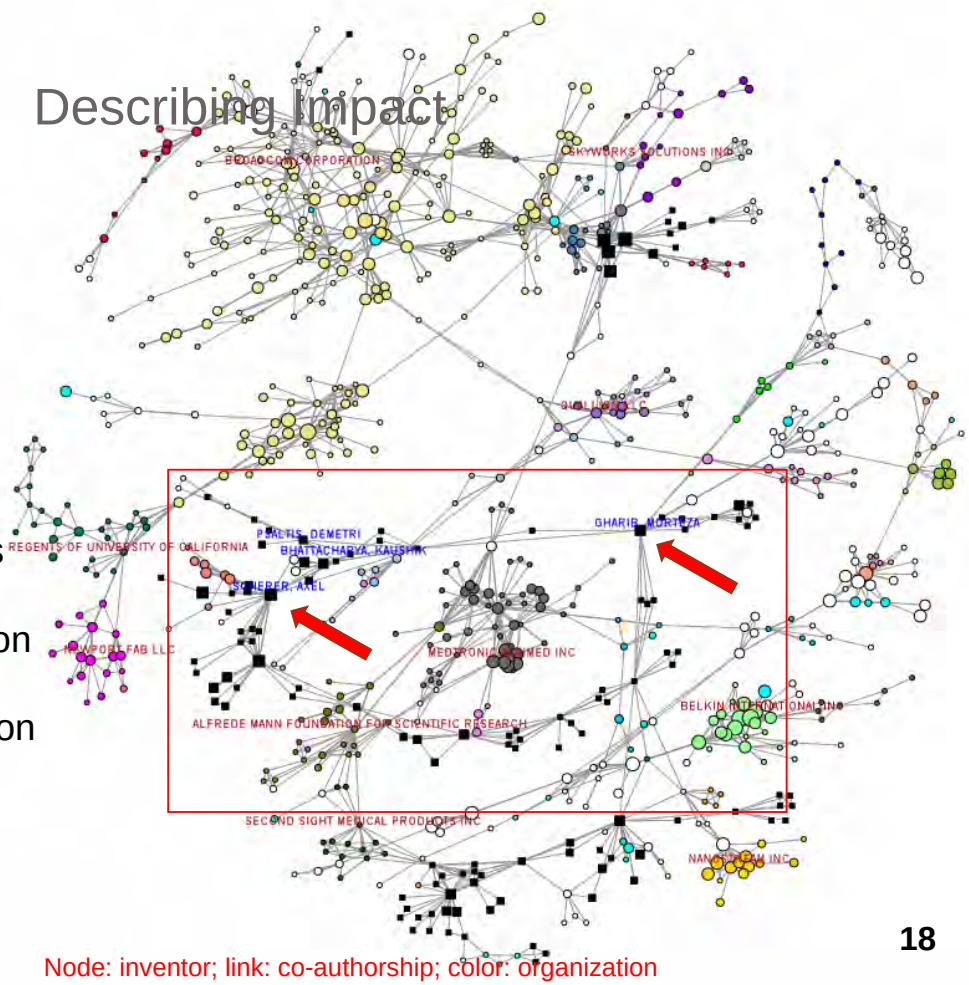
1. Knowledge Diffusion
Three links out

(Singh 2005)

2. Sources of Links

- ➢Student graduation
- ➢Inventor mobility
- ➢Direct collaboration

(Fleming 2007)



Node: inventor; link: co-authorship; color: organization

Capturing Outcomes

Scientists create tags on their websites, collaborate through VIVO, or register through a LATTES like process

New approaches discussed and validated with FDP

STAR METRICS

1. Inhales information from scientists
2. Creates Progress Report for scientists to validate
3. Exhales information to agency reports

Agencies identify fields that can be inhaled from STAR METRICS

Practical Application

Accelerating Innovation Research (AIR)

PROGRAM SOLICITATION
NSF 10-608

National Science Foundation
Directorate for Engineering
Industrial Innovation and Partnerships

Letter of Intent Due Date(s) ***(required)*** (due by 5 p.m. proposer's local time) *:*

December 01, 2010

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

February 01, 2011

D. *Project Description*:

Cannot exceed 15 pages, and must include the following:

- How the partnership will enable innovation that neither party could do as well or rapidly alone.
- How the partnership leverages the research and technology of the research alliance to accelerate innovation.
- How the partnership is expected to impact the development of an innovation ecosystem.
- A strategic plan and milestone chart with specific tasks and deliverables.
- Information on management and staffing.
- An assessment plan that will gauge the success of the partnership in creating an innovation ecosystem that includes the development of and justification for appropriate metrics. Proposers participating in the OSTP/NSF/NIH Federal Demonstration Partnership's STAR METRICS program, (http://sites.nationalacademics.org/PGA/fdp/PGA_057189) are encouraged to contact their institutional representatives to identify ways in which the program could support this requirement.
- An education plan that shows how participating students will learn about innovation, entrepreneurship, and technology translation process.

Option 1 and Option 2 Assessment

OMB/OSTP Memorandum M-09-27 directed science and technology agencies to describe the expected outcomes from their research in relation to these four practical challenges and cross-cutting areas, providing quantitative metrics where possible, and describe how they plan to evaluate the success of various techniques to increase support for high-risk research.

In compliance with this memorandum, each annual and final project report should provide an explanation of the quantitative and qualitative metrics that have been used in evaluating the impact of their activities.

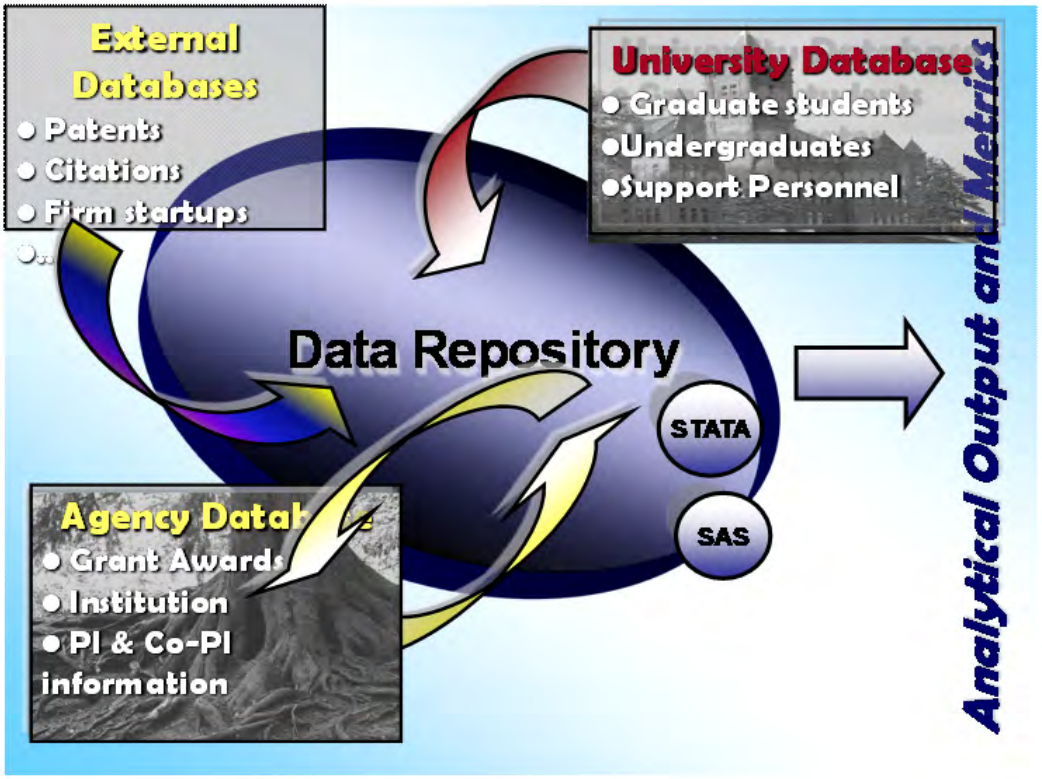
In order to reduce reporting and administrative burden, proposers are encouraged to use administrative records where possible. Universities participating in the OSTP/NIH/NSF/Federal Demonstration Partnership's (FDP) STAR METRICS program (http://sites.nationalacademies.org/PGA/fdp/PGA_057189) are encouraged to contact their institutional representatives to identify ways in which the program could support the evaluation of their activities.

The report should be filed in the activities and findings section of the annual and final reports.

Current Status

- NIH, NSF and OSTP MOU signed, DOE and EPA joining
- Partnership with Federal Demonstration Partnership, and engagement with AAU, APLU, COGR
- Over 100 academic institutions at various degrees of participation
- European Union engagement and emulation

Developing Metrics: Engage Domain and Social Scientists



What does this entail?

- Partner with Pis to
  - develop flow-based annual and final reports/biosketches
    - http://ideas.repec.org/e/pla36.html
    - http://citeseerx.ist.psu.edu/
  - Visualizations of networks and impact
  - Collaborative tagging of research outputs etc….
- Partner with university administrators to develop flow-based impact of science funding

Ultimate Goals for Development of Science Metrics

- Fully fledged academic field
- Fully fledged analytical tool set in government: Science policy in same analytical tier as tax policy
- Common, automated, empirical infrastructure available to all universities and science agencies to quickly respond to State, Congressional and OMB requests
- Incentive compatible structure
- Common scientific infrastructure for researchers to develop and study science metrics

Why metrics matter

- You can`t manage what you can`t measure
- And what you measure is what you get