



## **Pre-Interview Questionnaire**

### **Study Information Sheet**

#### **INDIANA UNIVERSITY STUDY INFORMATION SHEET FOR RESEARCH**

**Big Science Projects: Expert Interviews (IRB # 2012929244)**

##### **About this research**

You are being asked to participate in a research study. Scientists do research to answer important questions which might help change or improve the way we do things in the future. This form will give you information about the study to help you decide whether you want to participate. Please read this form, and ask any questions you have, before agreeing to be in the study.

##### **Taking part in this study is voluntary.**

You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with Indiana University.

This research is intended for individual 18 years of age or older. If you are under age 18, do not complete the survey.

**Why is this study being done?**

The purpose of this study is to advance our understanding of what makes Big Science projects successful and how success can be measured and communicated to improve project management and evaluation.

You were selected as a possible participant because you have relevant subject matter expertise.

The study is being conducted by Dr. Katy Börner from the Luddy School of Informatics, Computing, and Engineering at Indiana University.

**What will happen during the study?**

If you agree to be in the study, you will do the following—all completely online.

You will be presented with a “Pre-Interview Questionnaire” Qualtrics survey that aims to capture information on your background and experience. You will enter relevant information (e.g., about demographics, work practices, etc.) into Qualtrics.

Next, you are presented the “Big Science Project Questionnaire” Qualtrics survey with questions and visualizations that aim to increase our understanding of what makes Big Science projects successful and how success can be measured and communicated to improve project management and evaluation.

Lastly, you are presented with a “Post-Interview Questionnaire”, also in Qualtrics. We will ask you if you would like to review/comment on aggregated survey results before the paper is submitted.

The whole procedure will take ~60 mins.

**What are the risks and benefits of taking part in this study?**

The risks of participating in this research are discomfort answering questions and commenting on unfamiliar visualizations. Please be aware that you can terminate your participation in the study at any time.

You might benefit from taking part in this study by learning about Big Science metrics and data visualizations. Most importantly, we hope the study will increase our understanding about the structure and dynamics of Big Science projects.

**How will my information be protected?**

All efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in papers in which the study may be published.

**Will I be paid for participation?**

There is no payment for participation.

**Who should I call with questions or problems?**

For questions about the study, contact Dr. Katy Börner ([katy@indiana.edu](mailto:katy@indiana.edu)).

For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or offer input, please contact the IU Human Subjects Office at 800-696-2949 or at [irb@iu.edu](mailto:irb@iu.edu)

Accept this SIS by clicking 'Next Page' arrow.

**Pre-Interview Questionnaire**

Please answer the questions below to help us understand your background and experience.

**Block 5****Demographics**

Job Title

## Type of Institution

- ☐ Government
- ☐ Private Foundation
- ☐ Commercial
- ☐ University
- ☐ Other

## Academic Background

## Age

- ☐ 21-30
- ☐ 31-40
- ☐ 41-50
- ☐ 51-60
- ☐ 61-70
- ☐ >70

## Sex

- ☐ Male
- ☐ Female
- ☐ Non-binary / third gender
- ☐ Prefer not to say

## Native Language

- ☐ English
- ☐  Other

## Work Practices

In your daily work, what % of total work time do you spent on these activities:

% of total work time spent on activity

Meetings with 1 other person

Meetings with 2-5 persons

Meetings with 6-20 persons

Emails, IM, Slack

Reading documents, e.g., papers, books, news

Writing documents, e.g., papers, grant proposals

Running experiments

Analyzing and/or visualizing data

Other

Other

Other

What is your preferred problem-solving style?

- ☐ Clarifier: Analyzes current reality
- ☐ Ideator: Challenges current reality/envisions future reality
- ☐ Developer: Analyzes future reality
- ☐ Implementer: Executes future reality
- ☐ Integrator: Empowers the team, fills style gaps as needed

## Big Science Projects

Number

Number of big science projects you  
work(ed) on

0

Number of big science projects you  
led/lead

0

## Big Science Projects Questionnaire

### Big Science Projects Questionnaire

Please list major Big Science projects (completed or ongoing)

What is unique about Big Science projects when compared to other research projects?



What is most challenging about Big Science projects when compared to other research projects?

For the Big Science project you are leading, what is the promised result?

In your project, what percentage of total project effort is devoted to advancing research, technology, other goals?

% of total effort devoted to this goal

Research progress

0

Technology development

0

Education & training

0

Other, e.g., improving health

0

Outreach

0

Other

0

Other

0

#Conjoint, Total#

0

How do you measure progress toward project success?

A large, empty rectangular box with a black border, intended for a text response to the question above.

Do the following metrics indicate that a Big Science project is successful?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Deliver on promised result	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Experts involved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Students trained	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Papers published	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Citations from same field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Citations from other fields	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Dollars spent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Instruments invented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Datasets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Dataset users	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#Data/code portal users	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
#People reached via press/outreach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## What is important for ensuring project success?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Som a
Engage the best experts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage team players	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hire professional project manager(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborate with industry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work closely with policy makers/funders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Project Phases: Which phases exist and what are typical durations?

Duration in months

Project initiation stage: understand the goals, priorities, deadlines, and risks of the project

0

Project planning stage: outline the tasks and timeline required to execute on the project

0

Project execution stage: turn plan into action and monitor project performance

0

Project closure stage: analyze results, summarize key learnings, and plan next steps

0

Other

0

Other

0

#Conjoint, Total#

0

## Please estimate total numbers over entire project effort for these measures:

(Powers of ten are best, e.g., 1, 10, 100, 1k, 10k, 100k, 1M, etc.)

Total (estimated) number over  
entire project as INTEGER

#Dollars spent

#Experts involved

#New datasets generated

#New instruments developed

#New software packages

#Papers

#Citations

#Users (of data, instruments, software)

#People reached via outreach

Other

Other

**Science communication.** Big Science teams need to generate support from the larger scientific community, university/research center administrators, funders and funding agencies, media, and the public at large to acquire/sustain necessary resources. Effective science communication is critical.

What % of total project effort is devoted for outreach via

% of total project effort

Popular science magazines

0

Popular science books

0

Press releases

0

Social media

0

Free courses, e.g., MOOCs

0

Science fairs/exhibits

0

Talk shows/Documentaries

0

Other

0

Other

0

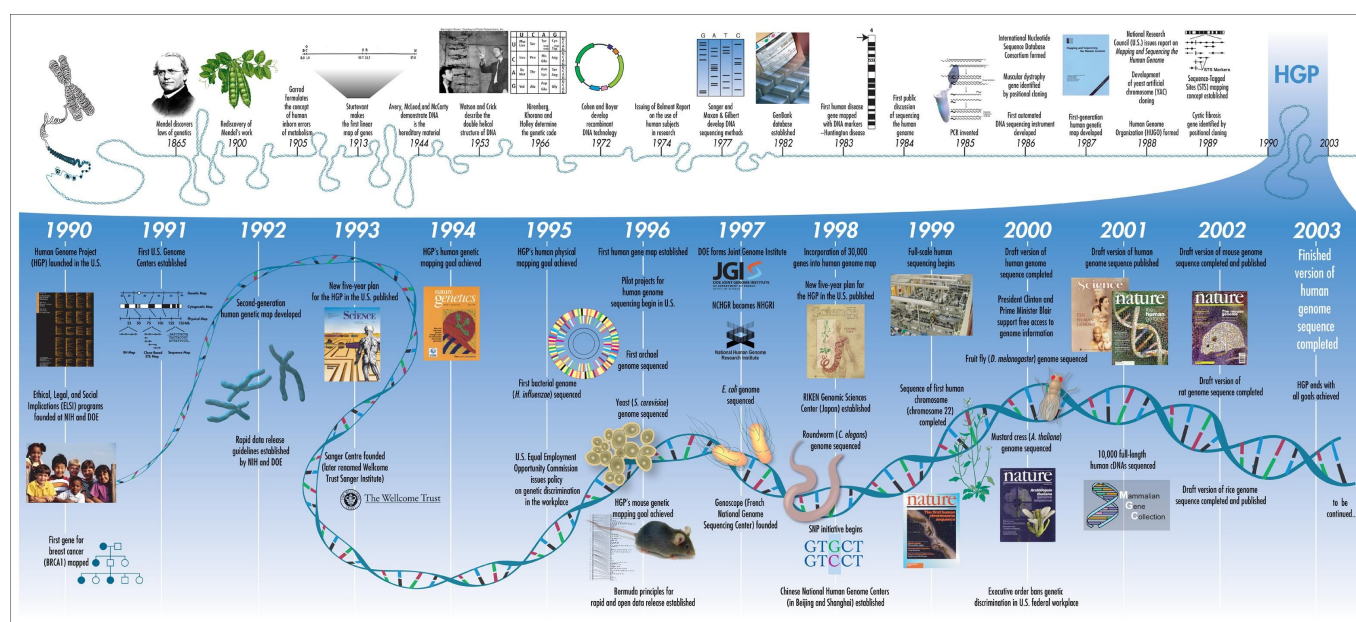
#Conjoint, Total#

0



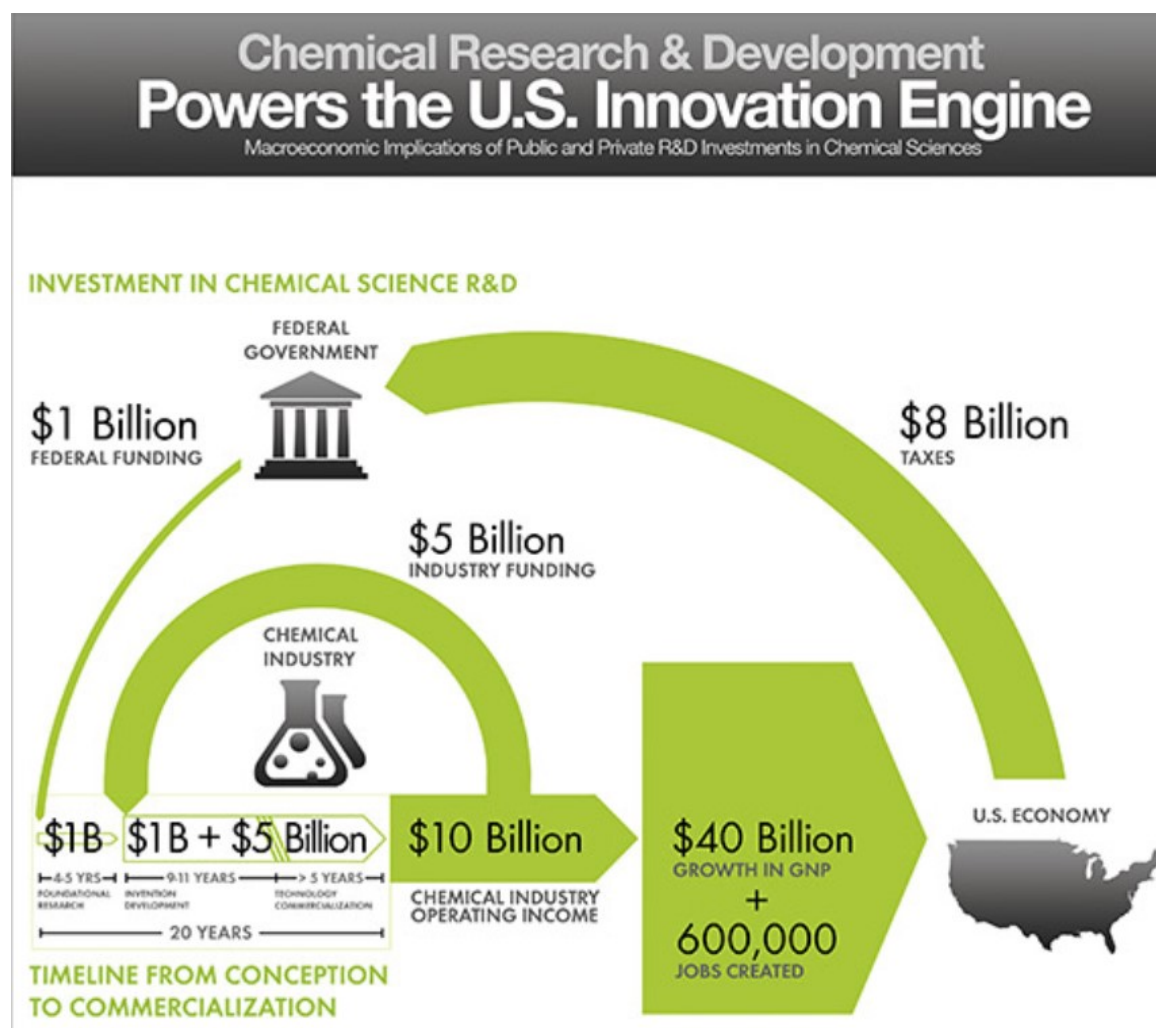
Publication, patent, funding, social media, and other datasets can be analyzed and visualized to understand, manage, communicate, evaluate big science projects.

**Project timelines** help communicate the chronological order of events.



[https://commons.wikimedia.org/wiki/File:Human\\_Genome\\_Project\\_Timeline\\_\(26964377742\).jpg](https://commons.wikimedia.org/wiki/File:Human_Genome_Project_Timeline_(26964377742).jpg)

**This graph shows the quantitative impact of research and development (R&D) in chemical sciences.**



*Chemical R&D Powers the U.S. Innovation Engine*

[http://scimaps.org/mapdetail/chemical\\_rd\\_powers\\_t\\_89](http://scimaps.org/mapdetail/chemical_rd_powers_t_89)

**Science Phylomemy**  
*THE RISE AND FALL OF SCIENTIFIC FIELDS*

David Chavalarias [dchav@nrc.ca](#) & Jean-Philippe Cochet [jcochet@nrc.ca](#)

Phylomes are based on the analysis of the textual content of publications. They describe how the scientific fields evolve and provide a convenient model to investigate science evolution.

The map approach has been generated by applying the methodology of phylomemy reconstruction to the domain of future and emerging technologies (FET), defined by the SET Open funding scheme (Dit-Framework Program of the European Union - EU FP7). We considered all the keyword terms given by authors of projects submitted to FET Open in 2002 in total to delineate the vocabulary associated with FET. These terms have been indexed in the titles and abstracts of a representative sample of worldwide literature, dating from 1990 to 2010 (Thomson Web of Science, ISI/JM publications). Using thematic proximity based on co-occurrence, terms were clustered to identify fields of scientific research.

Each scientific field was then represented by a set of terms. Inter-temporal matching between thematic fields results in evolving branches of science that might show several kinds of transformations. Fields can gain new terms or lose terms, merge with another field, split or even die if the underlying scientific community loses its thematic cohesion.

Exemplarily shown on the right are all branches in the domain of FET—nanoprosthesis, Prosthetic Socket or top to Active Circuits, Quantum Memory on bottom. The evolution of the branches, i.e., changes in the number and composition of their scientific fields—is plotted from left to right. A change of the Nanoprosthesis/Prosthetic Socket field is green on the right, from time runs top down and each scientific field has a title and associated keywords that are color and size coded by importance.

The main events in this branch are well recounted: the emergence of new terms as well as the branching and merging events correspond to important steps in the development of the science such as seminal papers, first clinical trials, etc. Nomenclature concepts that progress from one scientific field to another can be identified. Notice the increase of the branch width when the discipline starts to have commercial applications.

The study of science phylomemy might pave the way towards prediction of science evolution. Indeed, Chavalarias & Cochet [7] used two biomimetic datasets (ecology/science) and networks to demonstrate that fields do not emerge, decline, or hybridize at random: the likelihood of observing dynamic events strongly depends on the structural properties of the fields, such as the density index introduced by Galpin et al. in 1991 [8]. The probability that a scientific field will decline increases drastically as its density decreases – low density fields are more than twice as likely to decline than high-density ones.

**Legend for fields**

- Emerging: New term appears for the first time in a field.
- Branching: Two or more terms appear for the first time in a field.
- Merging: Two or more terms disappear from a field.
- Declining: A term disappears from a field.

**TIME**

**References**

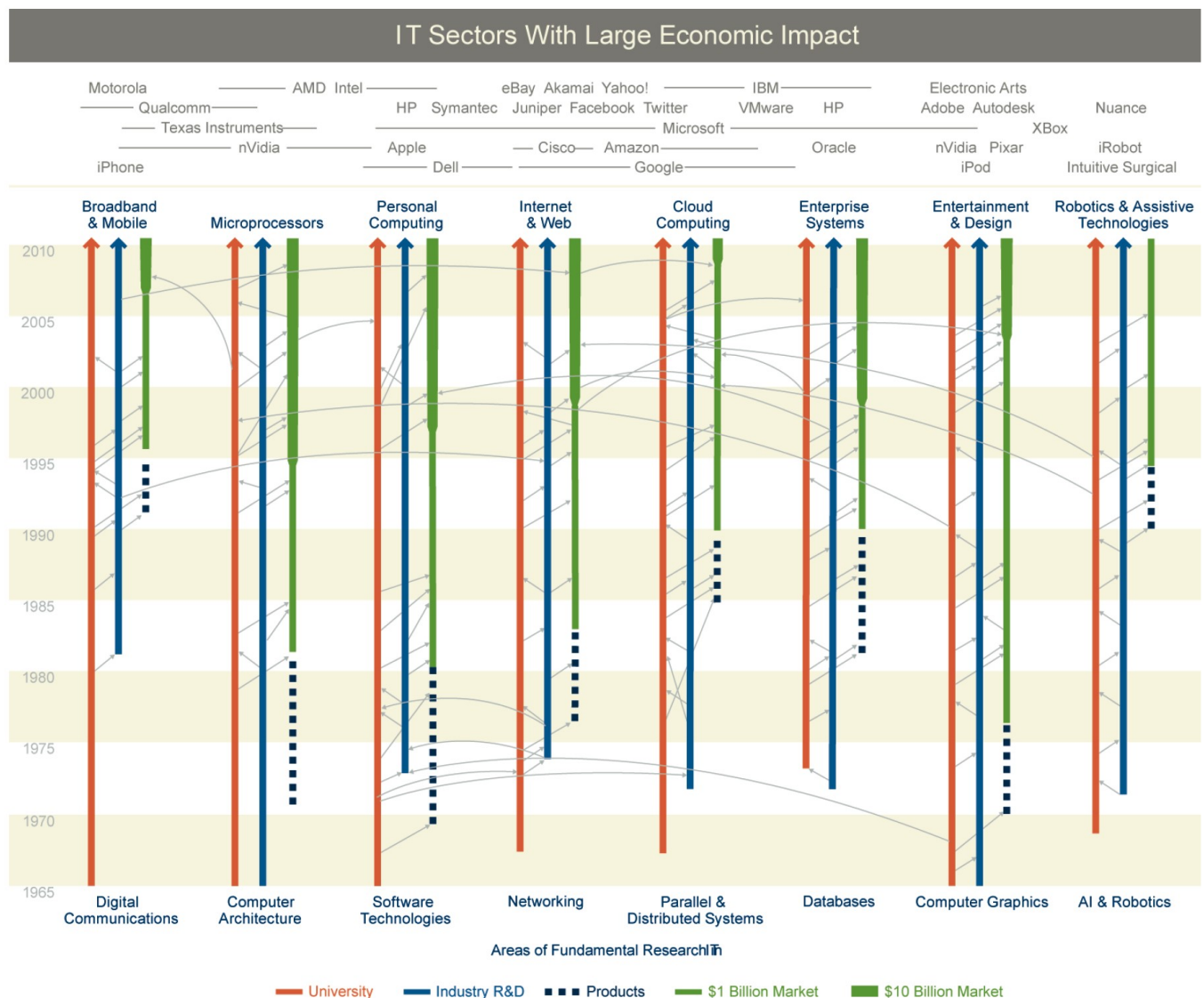
- [1] Chavalarias, David, and Jean-Philippe Cochet. 2012. "Phylomemy Patterns in Science Evolution: The Rise and Fall of Scientific Fields." *PLoS ONE* 7:3.
- [2] Galpin, Michel, Jean-Pierre Guillet, and Françoise Laville. 1991. "Do word Analysis as a Tool for Describing the Network of Interaction between Basic and Technological Research: The Case of Polymer Chemistry?" *Scientometrics* 22:153–205.

BROWSE THE FULL PHYLOMEMY  
[setphyla.sciencemapping.com](#)

Science Phylomemy. [http://scimaps.org/mapdetail/science\\_phylomemy\\_159](http://scimaps.org/mapdetail/science_phylomemy_159)

**This graph shows the impact of federal funding for fundamental research on IT sectors with large**

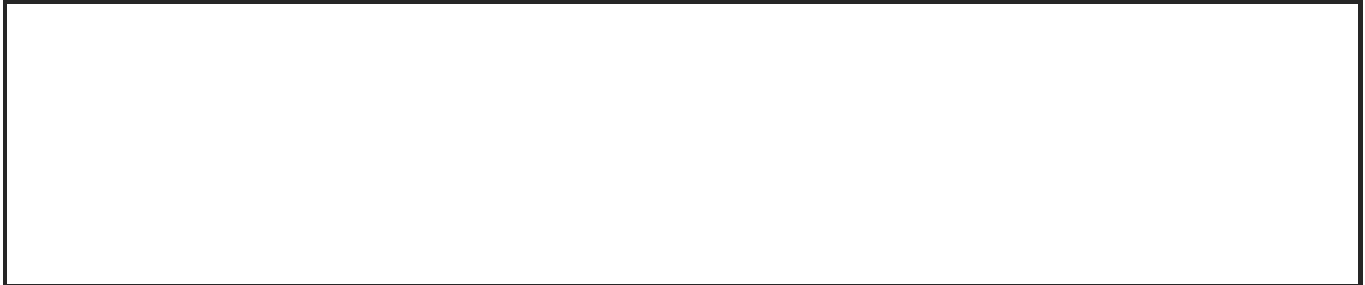
## economic impact.



<https://cccblog.org/wp-content/uploads/2016/07/Screenshot-2016-07-25-at-11.13.39-AM.png>

*National Academies of Sciences, Engineering, and Medicine. 2016. Continuing Innovation in Information Technology: Workshop Report. Washington, DC: The National Academies Press.*

What visualizations would be most valuable for the Big Science project you are leading/managing?

A large, empty rectangular box with a black border, intended for the respondent to list the most valuable visualizations for their Big Science project.

How would you use these visualizations in your work?

A large, empty rectangular box with a black border, intended for the respondent to describe how they would use the visualizations in their work.



Please rate visualization tool functionality listed below according to their utility for your daily work/decision making.

	Not useful	Neutral	Very useful
Identify all works on a topic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Within that topic, identify top-n researchers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
top-n institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
top-n countries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
show co-author network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
show paper-citation network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
show geospatial distributions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>			

## Compare:

	Not useful	Neutral	Very useful
Researchers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Countries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>			

## Identify correlations between:

	Not useful	Neutral	Very useful
Funded grants and papers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Papers and patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Academic/industry/govt activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What questions do you have about the structure and

dynamics of the project(s) you are leading?

What data, analyses, tools, or visualizations would be most valuable for planning, managing, evaluating, and communicating research collaborations within and across big science projects?

What data, analyses, tools, or visualizations do (or would best) support your daily decision making?



## Post-Interview Questionnaire

### Post-Interview Questionnaire

What survey question(s) did you find most interesting?

What survey question(s) did you find irrelevant?

What was missing in the survey?

If you can give one piece of advise to future leads/managers of Big Science projects, what would it be?

Would you like to review/comment on aggregated survey results before they are written up in a scholarly paper?

☐ Yes

☐ No

Thank you for your expert input.

Powered by Qualtrics