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A Case Study on the Use of Quantitative Measures Applied to Basic Research

Workshop on Performance Metrics for R&D Organizations

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Methodology

- Identify government-sponsored international cooperative activities (\$)
- Identify government-to-government agreements to support cooperation
- Identify national goals for the ICST in earthquakes
- Match goals to measures
- Choose measures and conduct assessment
- Assess 'lessons learned' about assessment

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A Framework for Applying Tools

- The framework focuses activities in the "second tier" of expected benefits construct
- -in a matrix consisting of:
 - A. reasons for cooperation
 - very large scale equipment
 - global nature of subject
 - unique foreign expertise or resource
 - government mission
 - B. type of cooperation
 - collaborative research
 - technical support
 - operational support
 - standards/database development

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Three Measures Chosen

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- **Citation counts survey, 1985 and 1995**
Used Science Citation Index

- **Standards-setting survey**
Surveyed foreign, US contacts

- **Survey of US participants for foreign contribution**
Surveyed 45 U.S. grantees, one-quarter of total

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Jointly Authored Papers Increased

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- **Joint citations for earth sciences research rose to 351 in 1985 from 259 in 1995**

- **More joint papers were multinational in authorship in 1995 than in 1985**

- **Japanese researchers were the most frequently cited co-authors, followed by Russia and China**

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The U.S. Is Leveraging Dollars

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- **Foreign contribution equals U.S. contribution**
Add in NASA and the U.S. is significantly leveraging foreign research dollars

- **Three-fourths of surveyed projects had some foreign financial or in-kind contribution**
In 47% of projects, foreign contribution exceeded U.S.
In 35% foreign contribution equaled U.S.
In 28% foreign contribution less than U.S.

- **Highest leverage was with Japan (NSF and NASA)**

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Project Management

Case Study Suggested Parity, Benefit

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- Case study on earthquake sciences and seismology suggested three things:
- Foreign partners contributed equally to joint projects
 - Not in every case, but on average
 - In-kind, financial, or through access
- Jointly authored articles are increasing
- US is setting the standard in 80 percent of cases

Quantitative finding: Cooperation may be raising the level of excellence of science in the U.S. and elsewhere

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Assessing Science: It Can Be Done!

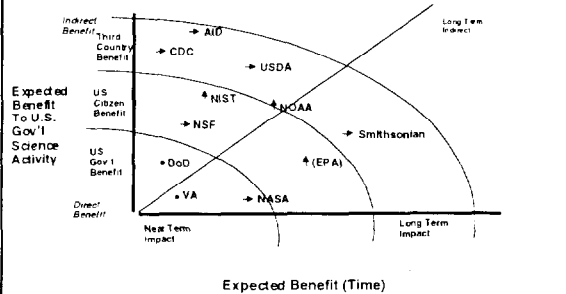
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- Tools need to be improved, true
- Use what we have and improve them
- Identify goals, benefits
- Ask researchers how they measure themselves
- Start with bibliometrics, expert judgment, survey research
- Place numbers in context
- Match a 'numbers' component with a 'quality' component

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Nature of Benefit Depends on Mission

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