R&D and Innovation Surveys at NSF

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Agenda

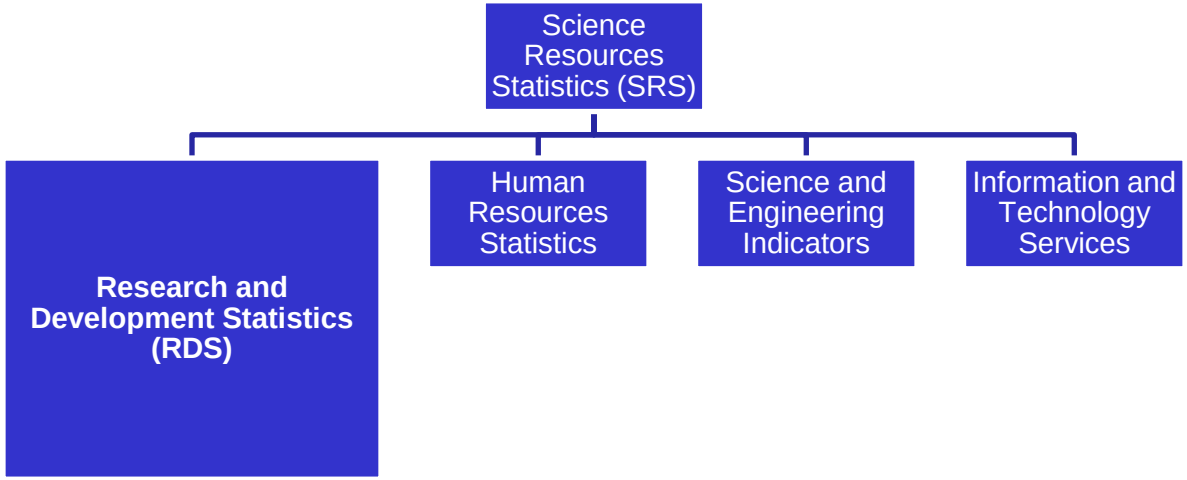
- Overview of SRS / RDS
- Business R&D and Innovation (BRDIS) Survey
- Current Academic R&D and Higher Education R&D (HERD) Surveys
- Microbusiness Innovation Science and Technology (MIST) Survey
- BRDIS Metrics on R&D Management and Strategy, IP, Technology Transfer, and Innovation
- University IP/Tech Transfer
- Preliminary BRDIS Findings
- BRDIS 2009 Changes
- Conclusion

Division of Science Resources Statistics

The Division of Science Resources Statistics (SRS) fulfills the legislative mandate of the National Science Foundation to…

> *"provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources, and to provide a source of information for policy formulation by other agencies of the Federal Government…"*

Division of Science Resources Statistics



RDS conducts surveys, studies, reports and analyses on the size and health of the U.S. R&D enterprise focusing on R&D funded and performed by industry, governments, and universities

Business R&D and Innovation Survey (BRDIS)

- Annual collection from manufacturers and service businesses of data on R&D spending, strategy, personnel, and outcomes
  - Data collection and tabulation by the US Census Bureau
  - Pilot survey launched January 2009 (collecting 2008 data)
- Includes all for-profit R&D-performing businesses
  - 5 or more employees
- Surveys at company (firm, enterprise) level
  - Not at establishment level, but with <u>business segment reporting</u>
- Sample = approx. 40,000
  - Overall unit response rate = 77%

    Top 500 R&D performers = 93%
- Uses two survey forms: BRDI-1 (sent to ~5,000) and BRDI-1A (short form); includes web-based reporting option
- All items mandatory and all responses confidential

BRDIS 2005-2008 Redesign Process

- In 2004 the Committee on National Statistics (CNSTAT) advised a complete review and redesign of the Industry R&D Survey to better reflect changes in the global R&D landscape

- Consultation with Federal and nonfederal data users (Two workshops)

- Consultation with Industry/Business Experts Panel
  (R&D VPs, R&D Managers, Chief Technology Officers)
  - Three meetings in 2006 (R&D definitions, collaboration, globalization)
  - Two meetings in 2008 (innovation, contact and launch strategies)

- Company contacts
  - Recordkeeping/environmental scanning interviews in 2005-06 (~25)
  - Cognitive interviews in 2007 and 2008 (~115)

BRDIS 2008 Survey Content

- Survey structured into six separate sections:
  - Company characteristics and classification of business activities
  - Financial measures of domestic and worldwide R&D activities (R&D expense in accounting terms)
  - Financial measures of domestic and worldwide R&D funded by others (not classified as R&D in accounting definitions; but is R&D performance)
  - Nature and technical aspects of R&D (management and strategy)
  - Domestic and worldwide employment and R&D employment data
  - Intellectual property (IP), technology transfer, and innovation

Current Academic R&D Survey (1)

- Currently a census of all universities and colleges with minimum of $150,000 of R&D spending (N = 725)
- Conducted annually since 1972
- Web-based survey
- Voluntary survey with response rates regularly over 95%
- Requests expenditures for all separately budgeted R&D performed at institutions during previous year
- Detailed statistical tables published at the institution level

Current Academic R&D Survey (2)

- Collects R&D expenditures by
  - Source of funds (federal, state/local, industry, institution, other)
  - Character of work (what percent is basic research?)
  - Field of science & engineering (S&E)
  - Federal agency sponsor and S&E field
  - Amount expended on research equipment, by S&E field
  - Amount passed through to subrecipients or received as a subrecipient
  - Non-S&E field

Higher Education R&D* (HERD) 2007-2009 Survey Redesign

- Workshop with over 30 data users to discuss top data needs
- Expert panel meetings to determine top priorities for redesign
- Methodological review of survey population issues and imputation procedures
- Special survey of respondents to solicit input for updating fields of R&D
- 32 institution visits to discuss recordkeeping, possible new content areas, and questionnaire testing
- FY2009 pilot test with 40 randomly selected institutions

* Higher Education R&D is the new name for the Current Academic R&D Survey

Decisions Resulting from HERD Pilot

- All fields of R&D (both S&E and non-S&E) are included in all survey items
- Separate funding categories for nonprofit organizations and for institutional cost sharing
- Headcounts of personnel and postdocs paid from R&D accounts
- Specific cost elements of R&D expenditures (salaries, software, etc…)
- New questions to be included:
  - Foreign sources
  - R&D in medical schools
  - Clinical trials
  - Difference between contracts and grants
  - Interdisciplinary research centers

Microbusiness Survey (1)

- Currently BRDIS looks at businesses with five employees or more
- National Academy of Sciences' Committee on National Statistics (CNSTAT) recommended that SRS explore ways to measure firm innovation and investigate the incidence of R&D activities in growing sectors such as small businesses
- As a result, SRS is developing a survey of microbusinesses (fewer than five employees)
- SRS has conducted approximately 40 cognitive interviews and constructed a draft questionnaire
- SRS established an NSF working group to discuss issues related to the microbusiness survey mostly around the topics of entrepreneurship and innovation

Microbusiness Survey (2)

- SRS will conduct data user workshops and expert panels in 2010 and 2011:
  - To help gain a better perspective on data user needs and priorities of needs among users
  - To understand how microbusiness data will be used
  - To obtain advice on priorities and strategies for content to be included in the survey
- Members of the data user workshops will be individuals who are likely to use the microbusiness survey data in making policy decisions or are knowledgeable or influential in the S&T, innovation, or R&D communities
- NSF / Science Resources Statistics and IRS / Statistics of Income signed a Memorandum of Agreement in March 2009
- NSF / SRS and IRS / SOI are in the process of completing an Interagency Agreement to use IRS data to develop the sample frame and utilize during the analysis phase of the survey

Microbusiness Survey (3)

- We anticipate that the final survey will collect data on the following:
  - R&D and innovation funding
  - Employment and owner characteristics
  - Sales of significantly improved goods and services
  - Operating agreements and licensing activities
  - Technology transfer and knowledge diffusion
  - Patents and intellectual property
  - Sources of technical knowledge
  - Measures of firms' entrepreneurial effectiveness
- Data collection is expected to start in late 2012 or early 2013

BRDIS Metrics related to R&D Management and Strategy (1)

- Share of R&D
  - devoted to new business areas for the company
  - involving science or technology new to the company
  - on science or technology that is new to the market
  - spent on research (basic or applied) versus development
  - devoted to specific application areas (health, defense, energy, etc.)
  - devoted to specific technology areas (software, biotechnology, nanotechnology, clinical trials, etc.)

BRDIS Metrics related to R&D Management and Strategy (2)

- R&D partnerships
  - by sector (universities, companies, government)
  - by type of organization (customer, vendor, competitor)
  - by location (domestic vs. foreign)
- Interaction with academia
  - use of consultants, interns, postdocs, monetary gifts
- Company characteristics
  - year first started operations
  - receipt of venture capital
  - commercialize academic research

BRDIS Metrics on IP, Technology Transfer, and Innovation

- BRDIS to be a platform for innovative (including Community Innovation Survey-like) questions
- Intellectual property, technology transfer and innovative activities
  - Introduction of new or significantly improved products
    - goods
    - services
  - Introduction of new or significantly improved processes
    - methods of manufacturing or producing goods or services
    - logistics, delivery or distribution methods
    - support activities
  - Patent data (counts, external sources, foreign filings)
  - Patent licensing to others (counts and revenue)
  - Importance of types of intellectual property protection (utility or design patents, trademarks, copyrights, trade secrets)
  - Participation in specific technology transfer activities (acquisitions, technical assistance, “know-how” agreements, cross-licensing, open source IP)

Two Views on University IP/Tech Transfer Data

- High user demand:
  - Perceived importance of these data to provide a better understanding of the U.S. National Innovation system
  - NSF survey should become gold standard for technology transfer measures
- Academic R&D Expert Panel concerns:
  - Patents/licenses do not represent full range of indicators of productivity
  - Reinforce the idea that academic R&D is to generate money

Cognitive Interview Findings on University IP

- Found considerable overlap with existing (non-federal) data sources
- Totally new questions (e.g., by technology areas) difficult to answer, burdensome, and subject to varying interpretations
- Questions not meaningful: “99% of the value is in 1% of the stuff”
- Respondents suggested new question areas:
  - patents in specific foreign country
  - breakdown of licenses by lifetime revenue stream
  - information on unlicensed technologies

Some Preliminary BRDIS Findings

- More than 1,500 companies reported R&D agreements, and 2008 collaborative R&D likely to be 2 to 3 times greater than 2007 reports
- Whether businesses report R&D or not, there is a high likelihood that they respond to the IP/ Tech Transfer/ Innovation section
- 2006-2008 I National Science Foundation innovators: 73% of companies reporting any R&D activity; 12% of the companies without any reported R&D activity
- 2008 Patenting: 37% of companies reporting any R&D activity; 2% of the companies without any R&D activity
- Foreign patenting: 64% applying for US patent, have or will apply for similar foreign patent
- About 2,600 companies reported participation in technical assistance, know-how or cross-licensing agreements
- About 2,000 companies reported the use of open-source technologies

BRDIS 2009 Changes

- Additional innovation questions
  - If you introduced new or significantly improved products
    - were they new to one of your markets?
    - were they only new to your firm?
  - Percentage of total sales
    - that were new to one of your markets
    - that were only new to your firm
    - that were unchanged or only marginally modified

Conclusion

- Thank you

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