



# National and International Context for Innovation-Related Statistics

John E. Jankowski  
Director, Research and Development Program

Advancing Measures of Innovation  
Arlington, Virginia  
June 6, 2006

National Science Foundation  
Division of Science Resources Statistics  
[www.nsf.gov/statistics/](http://www.nsf.gov/statistics/)



## SRS's Mission

- The Division of Science Resources Statistics (SRS) is one of thirteen federal statistical agencies... *whose principal function is the compilation and analysis of data and the dissemination of information for statistical purposes.*
- SRS fulfills the National Science Foundation's legislative mandate to ...*provide a **central clearinghouse** for the collection, interpretation, and analysis of data on scientific and engineering [S&E] resources, and to provide a **source of information for policy formulation** by other agencies of the Federal Government...*



# Fulfilling the SRS Mission

- **What SRS Does:**
  - Collect data and maintain widely accessible databases on R&D, S&E education, the S&E workforce, and related S&T areas (e.g, patents, bibliometrics, alliances, public attitudes)
  - Prepares and fosters analyses of S&E issues
  - Provide a global context for U.S. data and enables comparisons and benchmarking through collaboration with other international and national statistical agencies
- **How We Provide Information:**
  - Data tables
  - Public use databases and licensed data sets
  - Short reports – “InfoBriefs”
  - Longer special reports
  - Compendium publications – “S&E Indicators”



# Fulfilling the SRS Mission

- **Workforce Surveys:**
  - National Survey of College Graduates
  - National Survey of Recent College Graduates
  - Survey of Doctorate Recipients
  - Occupational Employment Statistics Survey
- **Education Surveys:**
  - Survey of Earned Doctorates
  - Survey of Graduate Students and Post-doctorates in S&E
- **R&D Surveys** (guided by the international Frascati Manual):
  - Survey of Federal Funds for Research and Development
  - Survey of Federal S&E Support to Universities, Colleges & Nonprofits
  - Survey of State Government R&D
  - Survey of R&D Expenditures at Universities and Colleges
  - Survey of Academic and Biomedical S&E Research Facilities (including cyberinfrastructure)
  - Survey of Industrial R&D Expenditures



## International Innovation Efforts

- European Community Innovation Survey, which has driven the development of international guidelines for collecting and interpreting innovation data, as defined in the Oslo Manual
  - CIS1 in 1993; CIS2 in 1994-96; CIS3 in 1998-2000
  - CIS “Light” carried out in 2004 with reference year of 2002 or 2003
  - Mandatory CIS4 launched in 2005, based on reference period 2004
    - Shorter and less difficult compared with CIS3
    - All EU Member States and Candidate Countries; Norway; Iceland
    - All manufacturing and many services industries
    - All enterprises with more than 10 employees
    - Eurostat data to be available late 2006 or early 2007
- Other countries have conducted similar Innovation surveys:
  - Australia, Canada, Japan, Russian Federation, etc
- EU also relies on European Innovation Scoreboard
  - Data from Eurostat



# What is Innovation according to Oslo?

- Not R&D; not invention (creation of new knowledge)
- Implied definition of Innovation (market concept):

During [the recent 3-year period], did your enterprise introduce...

- new or significantly improved goods or services? (Product innovation)
- a new or significantly improved production process, distribution method, or support activity for your goods or service? (Process innovation)
- new or significantly improved knowledge management systems; a major change to the organisation of work; new or significant changes in your relations with other firms or public institutions such as through alliances, partnerships, outsourcing or sub-contracting? (Organization innovation) [New in CIS4]
- significant changes to the design or packaging of a good or service; new or significant changes sales or distribution methods, such as internet sales, franchising, direct sales or distribution licenses? (Marketing innovation) [New in CIS4]



# Fourth Community Innovation Survey

- Data variables collected:
  - Geographic markets
  - Who developed the innovations
  - Novelty of innovation: Percent of sales from innovations
    - that were new to your market
    - that were only new to your firm
  - Ongoing or abandoned innovation activities (and reasons)
  - Expenditures on innovation
    - In-house R&D
    - Extramural R&D
    - Acquisition of machinery, equipment and software
    - Acquisition of other external knowledge
    - Training
    - Market introduction of innovations (yes/no)
    - Other preparations (yes/no)
  - Sources of innovations and cooperation (type of partner)
  - Effects of innovation



## SRS Innovation Efforts

- SRS/NSF has not conducted, nor currently intends to conduct, a nationally representative innovation survey similar to the CIS
- Supported development of experimental innovation concepts and data collection in early 1980s (e.g., Hill and Hanson) and again in the mid-1980s (Audits & Surveys)
- In 1994, NSF and Census conducted a pilot survey of 1,000 respondents in manufacturing and one service-sector industry (computer-related services)
  - Low 57% response rate
- In 2003, NSF sponsored a survey of ~3,500 information technology companies and intensive users of IT (PriceWaterhouseCoopers)
  - Low 57% response rate





# Survey of Industrial R&D Expenditures (1)

- Annual survey conducted for NSF by the US Census Bureau
  - Survey of ~31,000 companies
  - Collects information on R&D performance
  - Response rates ~80% overall and 90% for top 300
    - NAICS industry
    - Size of company
    - Size of R&D program
- Represents all industry-performed R&D in the United States
  - Includes US companies and foreign-owned companies
  - Includes privately held and publicly-traded companies
  - Includes companies of 5 or more employees
- Survey has five mandatory questions:
  - Costs incurred for R&D (Total R&D performance)
  - R&D funding sources (Federal funds and nonfederal funds)
  - Total company net sales
  - Total company domestic employment
  - State location of R&D performance



## Survey of Industrial R&D Expenditures (2)

- Survey collects voluntary information on:
  - FTE R&D scientists and engineers
  - R&D work category (basic, applied, development)
  - R&D by type of cost (labor, fringes, materials, depreciation, other)
  - Energy R&D (nuclear, fossil fuels, solar, other)
  - Future company R&D budget
  - Federal R&D by Federal agency
  - External R&D company funds to different types of performers (other for-profit companies, government labs, universities, other nonprofits)
  - R&D for collaboration with different types of performers
  - R&D performed 'overseas'  
(includes country identification and percent ownership)
  - R&D by technology area  
(biotechnology, software, materials processing, nanotechnology)
  - Type of company  
(public, private, number of affiliates, percent foreign owned)



# Ongoing Improvements to the SIRD

- Recordkeeping Practices Study
  - What R&D related records do companies maintain?
- Industry Experts Panel (3 meetings)
  - Senior industry R&D executives provide advice on trends and issues of importance to maintaining the relevance of the R&D data.
- Data User Workshops
  - Government user needs
  - Non-federal policy-oriented user needs (e.g., press, trade associations, professional societies, state S&T agencies)
- Obtain additional assistance
  - Dedicated staff from the Center for Economic Studies
  - Establish redesign team within survey operations branch
- Other investigations
  - Respondent debriefings and reasons for non-response
  - Supplemental question evaluations

## Resultant possibilities

- Industry-specific modules to the Industry R&D Survey
- Innovation module to the Industry R&D Survey



## Extension of R&D Statistical Activities

- Inclusion of R&D and innovation questions to other Federal surveys
  - Economic Census R&D services and Headquarters surveys
  - Proposed for Information and Communications Technology Survey
- Interagency R&D-related activities that facilitate linking data collected across U.S. federal statistical agencies
  - Globalization of R&D
    - NSF funded Data-Linking Project to link NSF/Census Survey of Industrial R&D micro-data with BEA micro-data on Foreign Direct Investments in the US and US Direct Investments Abroad
  - Capitalization of R&D
    - NSF funded agreement for BEA development of an R&D Satellite Account to the US National Income and Product Accounts
- International R&D-related activities that facilitate data comparability across countries
  - OECD NESTI International R&D Task Force
  - Canberra II and NESTI Joint Task Force on the Capitalisation of R&D



## Other SRS Projects

- Updating the **taxonomy** on fields of science and engineering to understand emerging fields and interdisciplinary fields
- Tracking the development of research by country, as well as the growth of **international collaborations**, using citation data as indicators
- Building a **high-value patents database**, working with U.S. PTO, OECD, European and Japanese Patent Offices and the World International Patent Office.
- Working with OECD, UNESCO, Statistics Canada and others to improve the **international comparability of education, workforce and mobility data**
- Supporting an OECD/NESTI Blue Sky conference to develop the **next generation of S&T indicators** to better reflect how S&T is conducted in the 21<sup>st</sup> Century



# Science and Engineering Indicators

- A Congressionally-mandated biennial report designed to provide a broad base of quantitative information about U.S. science, engineering and technology in a global context.
- SEI is prepared by NSF's Division of Science Resources Statistics on behalf of the National Science Board
- Science and Engineering Indicators 2006 chapters
  - Elementary and Secondary Education
  - Higher Education in Science and Engineering
  - Science and Engineering Labor Force
  - R&D Funds and Linkages
  - Academic Research and Development (including bibliometrics)
  - Industry, Technology and the Global Marketplace (including patents)
  - Public Attitudes and Understanding of Science and Technology
  - State S&E Indicators



# SRS Data and Information Resources

Division Home Page:

<http://www.nsf.gov/statistics>

Publication Search Page:

<http://www.nsf.gov/statistics/publication.cfm>

Database Page:

<http://www.nsf.gov/statistics/database.cfm>

Science and Engineering Indicators 2006 Home Page:

<http://www.nsf.gov/statistics/seind06>