

# 2004 Survey of Industrial Research and Development

## Form RD-1A

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# 2004 Survey of Industrial Research and Development Form RD-1A General Instructions

## Changes from 2003 to 2004 R&D survey year

- 1) The wording of most items has been changed for clarification.
- 2) Some item headings and numbers have changed. The four mandatory items are now as follows:
  - Question 2
  - Question 3
  - Question 5D, column 1
  - Question 5D, column 3
- 3) Some item response categories have been added; wording for some has been changed for clarification.
  - Question 6, column headings (1) Federal funds and (3) Total funds Columns 1+2, have been added.
  - Question 9, response categories have been reversed and explanatory wording added.

## How this information is used

Information about corporate research and development (R&D) activities is important in assessing our nation's scientific and technological resources. Your survey answers help us to provide national data on industrial R&D. This information is not available from any other source. Your participation is appreciated so that we can produce timely and comprehensive data.

## Who fills out this survey?

U.S. publicly traded and privately owned, nonfarm business firms

This survey does **not** include:

- Operations owned by Federal, state, or local governments
- Nonprofit organizations
- Trust or pension plans performing only investments

If you received this form in error, please explain in the Remarks section on page 6 of the survey form and return the form.

## Which company operations should you include in your survey answers?

Report all domestic operations of your **entire consolidated domestic enterprise**, including all U.S. subsidiaries.

Report all parts of the company located in the 50 United States and the District of Columbia (D.C.), except where indicated differently.

For holding companies, report for all U.S. subsidiaries under the ownership and control of the holding company.

EXCEPTION: If you report separately for a component of this company based upon an arrangement with the Census Bureau, please continue to do so.

## **Reporting period for your survey answers**

Please provide calendar year 2004 information, if possible. If not, please use your fiscal year ending between September 2004 and March 2005

## **How to report tax incentives for R&D**

The Federal government and many states offer incentives for research and development activity. For purposes of this survey, please report your total R&D expenditures regardless of any tax incentives.

For further information on the Federal research tax credit please go to:

<http://www.irs.gov/businesses/>

For further information on state tax incentives, please contact the Comptroller of the Treasury in your state.

## **To request more time to complete your form or additional copies of the form**

Please provide your 11-digit identification number (ID) as printed on the form above your address when you contact us.

For more time, call the Census Touchtone Data Entry System: 1-800-851-2014.

For official copies of the form, call (812) 218-3331.

OR

Write: U.S. Census Bureau  
1201 East 10th Street  
Jeffersonville, IN 47132-0001

To obtain a sample copy of the form, please visit the following web site. However, that sample copy **cannot** be used to submit your survey response because it lacks the appropriate labeling.

<http://help.econ.census.gov/econhelp/rd/>

## **For answers to your questions regarding this form**

Write:

U.S. Census Bureau, Manufacturing and Construction Division  
ATTN: Special Studies Branch  
Room 2135/4  
Washington, DC 20233-6900

Phone:

1 -800-851-2014 (option "0")

Use our web site at <http://help.econ.census.gov/econhelp/rd/>

- Submit e-mail via our secure server to encrypt your message and to keep your survey participation confidential
- See answers to frequently asked questions

## Electronic alternative for reporting

An electronic questionnaire may be used to report your responses. This electronic alternative potentially saves time for you and helps us to reduce processing costs. If you use the electronic alternative, please do **not** mail in the paper form. For questions about installing or using the electronic questionnaire, please call the Electronic Reporting Staff at 800–838–2640.

The system requirements for the electronic questionnaire are:

1. Microsoft Windows 98 or higher.
2. Microsoft Internet Explorer or Netscape Navigator 4.0 or above (128-bit encryption).
3. If you set your screen display for 16-bit color or higher, the forms will be easier to read. The forms are harder to read with 256-color display.

Have your username (UID) and password (PW) handy. ***The username and password are case sensitive.***

1. Go to the Business Help Site at: [www.census.gov/econhelp/rd](http://www.census.gov/econhelp/rd)
2. Click on Electronic Reporting
3. Follow the instructions for downloading software.

## Transmitting your data

You may transmit you completed data to the Census Bureau electronically via Internet, or by mail.

**WARNING CONCERNING ELECTRONIC MAIL:** The Internet is not a secure means of transmitting information unless it is encrypted. If you choose to communicate with the Census Bureau via electronic mail, the Census Bureau cannot guarantee the privacy of the information while transmitted, but will safeguard it in accordance with Title 13. Be advised that making inquiries regarding this survey via electronic mail may divulge your participation in this survey.

## Burden hour estimate

Public reporting burden for this collection of information is estimated to average 18 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspects of this collection of information, including suggestions for reducing this burden to:

Paperwork Project 0607-0912  
U.S. Census Bureau  
4700 Silver Hill Road, Stop 1500,  
Washington, DC 20233-1500

You may e-mail comments to [Paperwork@census.gov](mailto:Paperwork@census.gov); use "Paperwork Project 0607-0912" as the subject.

## Survey Definitions of R&D

R&D includes the following:

- the planned, systematic pursuit of new knowledge or understanding toward general application (basic research);
- the acquisition of knowledge or understanding to meet a specific, recognized need (applied research); and
- the application of knowledge or understanding toward the production or improvement of a product, service, process, or method (development).

This survey covers industrial R&D performed by people who are

- 1) trained—either formally or by experience—in engineering or in the physical, biological, mathematical, statistical, or computer sciences, and
- 2) employed by a publicly or privately owned firm engaged in for-profit activity in the 50 United States and D.C. (This also includes R&D they may perform **outside** of the 50 United States and D.C.)

This survey specifically **excludes** quality control, routine product testing, market research, sales promotion, sales service, and other nontechnological activities; routine technical services; and research in the social sciences or psychology.

This survey defines basic research, applied research, and development as follows:

**Basic research** is the pursuit of new scientific knowledge or understanding that does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interest.

**Applied research** applies the findings of basic research or other existing knowledge toward discovering new scientific knowledge that has specific commercial objectives with respect to new products, services, processes, or methods.

**Development** is the systematic use of the knowledge or understanding gained from research or practical experience directed toward the production or significant improvement of useful products, services, processes, or methods, including the design and development of prototypes, materials, devices, and systems.

## Survey Definitions of R&D *(continued)*

### Types of R&D activities to consider for this survey

INCLUDE:	EXCLUDE:
<ul style="list-style-type: none"> <li>• Activities that incorporate:               <ul style="list-style-type: none"> <li>– Basic and applied research in the sciences and engineering</li> <li>– Design and development of new products and processes</li> <li>– Enhancement of existing products and processes</li> </ul> </li> <li>• Activities carried on by persons trained, either formally or by experience, in:               <ul style="list-style-type: none"> <li>– Biological sciences (e.g., medicine)</li> <li>– Computer science</li> <li>– Engineering</li> <li>– Mathematical and statistical sciences</li> <li>– Physical sciences (e.g., chemistry and physics)</li> </ul> </li> <li>• Activities that take place in:               <ul style="list-style-type: none"> <li>– Separate R&amp;D organizational units of the company</li> <li>– Company laboratories</li> <li>– Technical groups not part of an R&amp;D organization</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D from acquired companies prior to acquisition (in-process R&amp;D)</li> <li>• Amortization above the actual cost of property and equipment related to your R&amp;D activities</li> <li>• Testing and evaluation once a prototype becomes a production model</li> <li>• Routine product testing</li> <li>• Geological and geophysical exploration activities</li> <li>• Technical services such as:               <ul style="list-style-type: none"> <li>– Quality and quantity control</li> <li>– Technical plant sanitation control</li> <li>– Troubleshooting in connection with breakdowns in full-scale production</li> </ul> </li> <li>• Advertising programs to promote or demonstrate new products or processes</li> <li>• Assistance in preparation of speeches and publications for persons not engaged in R&amp;D</li> <li>• Social science R&amp;D including:               <ul style="list-style-type: none"> <li>– Personnel R&amp;D</li> <li>– Economic R&amp;D</li> <li>– Artificial intelligence and expert systems R&amp;D</li> <li>– Consumer, market, and opinion R&amp;D</li> <li>– Engineering psychology R&amp;D</li> <li>– Management and organization R&amp;D</li> <li>– Actuarial and demographic R&amp;D</li> <li>– Educational processes and applications R&amp;D</li> <li>– R&amp;D in law</li> </ul> </li> </ul>

## Question-by-Question Instructions

### Question 1 Did your company conduct R&D in 2004?

Question 1 asks if your company performed R&D in 2004.

*If "Yes," your company conducted R&D in 2004, continue to fill out the rest of the form.*

*If "No," your company did not conduct R&D in 2004, either call our touchtone service to report this (1-800-851-2014) or mark "No" and mail the form.*

If you have questions, please call the R&D Survey staff at 1-800-851-2014 (option "0") to determine whether you are required to complete the form.

### Question 2 What was the amount of your company's sales, shipments, operating receipts, or revenues, net of returns and allowances attributable to domestic operations in the 50 United States or D.C. during 2004?

Question 2 covers domestic company sales. Report only the parts of your company located **within** the 50 United States or D.C.

INCLUDE:	EXCLUDE:
<ul style="list-style-type: none"> <li>• Sales, operating receipts, and revenues from all domestic operations of the company, <b>net of returns and allowances</b></li> <li>• Receipts from sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries</li> <li>• Net selling value of shipments, f.o.b. (freight on board) plant, after discounts and allowances minus freight charges and excise taxes</li> <li>• Revenue from investments, rents, and royalties only if it is the principal business of the company</li> <li>• Interest, dividends, commissions, and rental income as part of revenues <b>only</b> if you are a finance, insurance, or real estate company</li> <li>• Value of assets sold under a capital lease agreement</li> <li>• Export transfers to your foreign subsidiaries and affiliates</li> </ul>	<ul style="list-style-type: none"> <li>• Sales and other taxes collected and paid directly to government taxing agencies</li> <li>• Domestic intracompany transfers</li> <li>• Receipts from sale of products and services provided by your foreign subsidiaries and affiliates</li> <li>• Receipts from sale of products and services provided by your subsidiaries and affiliates in Puerto Rico and other U.S. territories <b>outside</b> the 50 United States and D.C.</li> <li>• Income from interest, dividends, and commissions (Exception: Companies in the finance, insurance, and real estate industries)</li> <li>• Other nonoperating income (e.g., royalties)</li> </ul>

**Question 3** How many employees worked in the 50 United States or D.C. for your company on March 12, 2004?

Question 3 covers domestic company employment. Report only the parts of your company located **within** the 50 United States or D.C.

**INCLUDE:**

- Full- and part-time employees of the company as defined on Treasury Form 941, Employer's Quarterly Federal Tax Return, and Circular E, Employer's Tax Guide, if filed for the entire company
- Number of employees in all activities **within** the 50 United States or D.C. during the pay period that includes March 12, 2004
- Persons on paid sick leave, paid holidays, and paid vacations during the pay period that includes March 12, 2004

**Question 4** What was the number of full-time equivalent (FTE) scientists and engineers employed by your company as of January 1, 2005 who worked on the following types of R&D during 2004?

Question 4 covers the scientists and engineers who are employees of your company and perform R&D activities. It asks for the number of full-time equivalent (FTE) scientists and engineers who work on your company's R&D **within** the 50 United States or D.C.

There are two steps to calculate the number of FTEs for R&D scientists and engineers:

1. For company employees performing only research and development, count the number of scientists and engineers employed in January 2005.
2. For employees whose activities are not solely devoted to R&D, use the proportion of their time that is devoted to R&D to compute the number of full-time equivalent R&D scientists and engineers. For example, if a company had 60 scientists and engineers in January 2005 and one-fourth of their time was charged to R&D projects, then that company would have 15 full-time equivalent R&D scientists and engineers. Add these full-time equivalents to the count from the previous step.

**INCLUDE:**

- All persons engaged in scientific or engineering work at a level that requires knowledge of physical or life sciences or engineering or mathematics
- Persons with experience equivalent to completion of a 4-year college course with majors in these fields, regardless of whether they actually hold degrees in the fields

**Question 5** What was the cost of R&D performed within your company in the 50 United States and D.C. from each of the sources of funding below during 2004?

Question 5 covers the R&D that is performed both (1) *within* your company and (2) *within* the 50 United States and D.C.

**How to decide which expenditures to include as R&D costs**

<b>INCLUDE:</b>	<b>EXCLUDE:</b>
<ul style="list-style-type: none"> <li>• Wages, salaries, and related costs</li> <li>• Materials and supplies consumed</li> <li>• R&amp;D depreciation</li> <li>• Cost of computer software used in R&amp;D activities</li> <li>• Utilities, such as telephone, telex, electricity, water, and gas</li> <li>• Travel costs and professional dues</li> <li>• Property taxes and other taxes (except income taxes) incurred on account of the R&amp;D organization or the facilities they use</li> <li>• Insurance expenses</li> <li>• Maintenance and repair, including maintenance of buildings and grounds</li> <li>• Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&amp;D organization</li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D from acquired companies prior to acquisition (in-process R&amp;D)</li> <li>• Capital expenditures</li> <li>• Testing and evaluation once a prototype becomes a production model</li> <li>• Patent expenses</li> <li>• Income taxes and interest</li> </ul>

**Question 5 (continued)**

**How to decide which category of R&D**

<p><b>1. Basic research</b></p>	<p>Projects that pursue new scientific knowledge or understanding that does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interest</p>	
<p><b>2. Applied research</b></p>	<p>Projects that apply the findings of basic research or other existing knowledge toward discovering new scientific knowledge that has specific commercial objectives with respect to new products, services, processes, or methods</p>	
<p><b>3. Development</b></p>	<p>Projects that are directed toward the systematic use of the knowledge or understanding gained from research or practical experience directed toward the production or significant improvement of useful products, services, processes, or methods, including the design and development of prototypes, materials, devices, and systems</p>	
	<p><b>INCLUDE:</b></p>	<p><b>EXCLUDE:</b></p>
	<ul style="list-style-type: none"> <li>• Expenditures for designing and conducting clinical trials of drugs, pharmaceuticals, or other products that have not been marketed</li> <li>• Software development               <ul style="list-style-type: none"> <li>– Designing and/or adapting software if the application has commercial value (exclude software development for internal use)</li> <li>– Beta version of software being developed that has potential commercial application</li> <li>– Design and operation of pilot plants and semiwork plants</li> </ul> </li> <li>• Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements</li> <li>• Design, construction, and testing of prototypes and models including test models for defense contracts</li> <li>• Designs for special manufacturing equipment and tools</li> <li>• Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals</li> </ul>	<ul style="list-style-type: none"> <li>• Software development intended for <i>within</i> company use only</li> <li>• Routine technical services to customers</li> <li>• Tool making and tool tryout</li> <li>• Production of detailed construction drawings and manufacturing blueprints</li> </ul>

**Question 5 (continued)**

**How to decide which category to use for sources of R&D funding**

<b>Source of R&amp;D</b>	<b>INCLUDE:</b>	<b>EXCLUDE:</b>
Federal funds	<ul style="list-style-type: none"> <li>• Federally funded R&amp;D performed <b>within</b> the company. Include only the amount of work done on Federal R&amp;D contracts or subcontracts in the current year.</li> <li>• R&amp;D portion of procurement contracts or subcontracts</li> </ul>	<ul style="list-style-type: none"> <li>• Federally funded R&amp;D contracted or subcontracted to or otherwise performed by others <b>outside</b> of your company. (Report such funds in Question 7.)</li> <li>• Expenditures for independent research and development (IR&amp;D). (Report in column 2, Company and other nonfederal funds.)</li> </ul>
Company and other nonfederal funds	<ul style="list-style-type: none"> <li>• R&amp;D from company and other nonfederal sources that is performed <b>within</b> the company</li> </ul> <p>NOTE that “<b>company and other nonfederal funds</b>” and “<b>company funded</b>” are used interchangeably in the Form RD-1A.</p> <ul style="list-style-type: none"> <li>• R&amp;D your company performs under contracts you have with non-Federal sources</li> <li>• Costs for independent research and development (IR&amp;D). We define IR&amp;D funds as R&amp;D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services. Qualified projects usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&amp;D funds are excluded from federal funds received for federally sponsored research and development contracts.</li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D from nonfederal sources that is contracted to or otherwise performed by others <b>outside</b> of your company (Report such funds in Question 7.)</li> </ul>

**Question 6** If your company plans to perform R&D during 2005, what is the estimated projected cost?

Question 6 asks for an estimate or projection of the cost of R&D your company expects to perform in 2005 in the 50 United States and D.C.

**Question 7** If others outside your company performed R&D funded by you, what were the costs of the R&D performed in the 50 United States and D.C. during 2004?

Question 7 covers the R&D that was **both** performed for your company (1) by **others outside your company** such as contractors, and (2) **within** the 50 United States and D.C.

Include payments for R&D projects, contracts, or services performed for your company by contractors, suppliers, grantees, educational institutions, or other organizations.

**Question 8** What was the cost R&D reported in (7), column 2, performed by the following types of organizations?

Question 8 is not applicable to this form.

**Question 9** If your company funded R&D performed outside the 50 United States and D.C. during 2004, what were the costs? *(Please report costs of R&D performed by subsidiaries, affiliates, or others based on your company's percentage of ownership, if any, of the entity that conducted the R&D. Ownership can be based on voting stock or equivalent interest.)*

Question 9 covers R&D performed **outside** the 50 United States and D.C. including R&D performed in Puerto Rico.

For Question 9, line A, report payments for R&D projects, contracts, or services performed for your company by contractors, suppliers, educational institutions, or other organizations.

**Question 10** What was the cost of the R&D reported in (9), line A, in Puerto Rico and the following countries?

Question 10 is not applicable to this form.

**Question 11** If you reported Federally funded R&D in (5), line D, column 1, what were the costs funded by the following Federal agencies?

Question 11 is not applicable to this form.

**Question 12** For the total R&D you reported in (5), line D, column 3, what were the costs for the following types of expenses?

Question 12 is not applicable to this form.

**Question 13** For the total R&D you reported in (5), line D, column 3, what were the costs for the following areas?

Question 13 covers R&D by selected technology area.

**A. Biotechnology**

Definition of biotechnology for this survey:

Biotechnology is the application of science and technology to living organisms, as well as parts, products, and models thereof, to alter living or nonliving materials for the production of knowledge, goods, and services.

<b>INCLUDE:</b>	
<ul style="list-style-type: none"> <li>• DNA technologies such as:                             <ul style="list-style-type: none"> <li>– Genomics</li> <li>– Pharmacogenetics</li> <li>– Gene probes</li> <li>– DNA sequencing/synthesis/amplification</li> <li>– Genetic engineering</li> </ul> </li> <li>• Protein and molecular technologies such as:                             <ul style="list-style-type: none"> <li>– Protein/peptide sequencing/synthesis</li> <li>– Lipid/protein glycoengineering</li> <li>– Proteomics</li> <li>– Hormones</li> <li>– Growth factors</li> <li>– Cell receptors/signaling/pheromones</li> </ul> </li> <li>• Cell and tissue culture and engineering including:                             <ul style="list-style-type: none"> <li>– Cell/tissue culture</li> <li>– Tissue engineering</li> <li>– Hybridization</li> <li>– Cellular fusion</li> <li>– Vaccine/immune stimulants</li> <li>– Embryo manipulation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Process biotechnologies such as:                             <ul style="list-style-type: none"> <li>– Bioreactors</li> <li>– Fermentation</li> <li>– Bioprocessing</li> <li>– Bioleaching</li> <li>– Biopulping</li> <li>– Biobleaching</li> <li>– Biodesulphurization</li> <li>– Bioremediation</li> <li>– Biofiltration</li> </ul> </li> <li>• Subcellular organism research including:                             <ul style="list-style-type: none"> <li>– Gene therapy</li> <li>– Viral vectors</li> </ul> </li> <li>• Other biotechnology areas such as:                             <ul style="list-style-type: none"> <li>– Bioinformatics</li> <li>– Nanobiotechnologies</li> </ul> </li> </ul>

**B. Software development**

<b>INCLUDE:</b>	<b>EXCLUDE:</b>
<ul style="list-style-type: none"> <li>• Application development tools and environments</li> <li>• Applications software</li> <li>• Computer-aided design tools and methods</li> <li>• Computer systems software</li> </ul>	<ul style="list-style-type: none"> <li>• Software programming or engineering used exclusively for internal company operations such as financial management or human resources</li> </ul>

**Question 13 (continued)**

**C. Materials synthesis and processing**

Formulation and manipulation of new or improved materials using the data and techniques of science and engineering.

<b>INCLUDE:</b>
<ul style="list-style-type: none"><li>• Advanced structural materials in the industrial machinery, medical, building, and construction industries</li><li>• Higher performance semiconductors and photonic devices in the semiconductor industry</li><li>• Ceramics and alloys designed to withstand extreme temperatures and stresses for use in engine and structural parts in the aerospace and automotive industries</li><li>• Composite materials for use in sporting goods</li><li>• New and significantly improved synthesis and production techniques for existing materials</li></ul>

**D. All other R&D areas**

Report the remainder of R&D costs so that the total for this question matches Question 5, line D, column 3.

**Question 14** If your company used nanotechnology for R&D during 2004, what percentage of the R&D costs reported in (13) are attributable to nanotechnology for the following areas?

Question 14 asks for the nanotechnology proportion of the R&D expenditures provided in Question 13.

**For example, if about a fourth of your biotechnology R&D expenditures was devoted to nanotechnology projects, report 25% in Question 14.**

**Nanotechnology** is the creation and utilization of materials, devices, and systems sized at the level of atoms and molecules in the range of 1 to 100 nanometers.

<b>INCLUDE:</b>
<ul style="list-style-type: none"><li>• Materials and systems that exhibit novel and significantly improved physical, chemical, and biological properties; phenomena; and processes because of their size</li></ul>

**Question 15** For the Federal and total R&D you reported in (5), line D, columns 1 and 3, what were the costs for the R&D performed in each of the 50 United States and D.C.?

Question 15 is not applicable to this form.

**Question 16** If your company performed energy-related R&D during 2004, what were the costs of the R&D performed in the 50 United States and D.C. for the following sources of energy?

Question 16 is not applicable to this form.

**Question 17** If your company collaborated with others to perform R&D during 2004, what were your company's costs for the R&D performed in the United States and D.C. with the following types of partners?

Question 17 is not applicable to this form.

**Question 18 Company organization and ownership**

Question 18 asks for information on your company's ownership and your company's ownership of other entities.

**Question 19 Reporting period, location of records, contact information, and burden hours estimate**

Question 19 covers the reporting period, some reporting characteristics, and provides space for your contact information. Please give the name and telephone number of the person in your company to contact regarding this report.

**Question 20 Remarks**

The Remarks section provides space for your comments and explanations.