



Catalogue no. 88-001-X

Science Statistics

November 2007 edition



Statistics
Canada

Statistique
Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website at www.statcan.ca or contact us by e-mail at infostats@statcan.ca or by phone from 8:30am to 4:30pm Monday to Friday at:

Toll-free telephone (Canada and the United States):

Inquiries line **1-800-263-1136**

National telecommunications device for the hearing impaired **1-800-363-7629**

Fax line **1-877-287-4369**

Depository Services Program inquiries line **1-800-635-7943**

Depository Services Program fax line **1-800-565-7757**

Statistics Canada national contact centre: 1-613-951-8116

Fax line **1-613-951-0581**

Information to access the product

This product, catalogue no. 88-001-X, is available for free in electronic format. To obtain a single issue, visit our website at www.statcan.ca and select Publications.

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, the Agency has developed *standards of service* which its employees observe in serving its clients.

To obtain a copy of these service standards, please contact Statistics Canada toll free at 1-800-263-1136. The service standards are also published on www.statcan.ca under About us > Providing services to Canadians.



Statistics Canada
Science, Innovation and Electronic Information Division

Science Statistics

November 2007 edition

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2007

All rights reserved. The content of this electronic publication may be reproduced, in whole or in part, and by any means, without further permission from Statistics Canada, subject to the following conditions: that it be done solely for the purposes of private study, research, criticism, review or newspaper summary, and/or for non-commercial purposes; and that Statistics Canada be fully acknowledged as follows: Source (or "Adapted from", if appropriate): Statistics Canada, year of publication, name of product, catalogue number, volume and issue numbers, reference period and page(s). Otherwise, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, by any means—electronic, mechanical or photocopy—or for any purposes without prior written permission of Licensing Services, Client Services Division, Statistics Canada, Ottawa, Ontario, Canada K1A 0T6.

November 2007

Catalogue no. 88-001-X, vol. 31, no. 6

ISSN 1209-1278

Frequency: Irregular

Ottawa

La version française de cette publication est disponible sur demande (n° 88-001-X au catalogue).

Note of appreciation

Canada owes the success of its statistical system to a long standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

User information

Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

Table of contents

Highlights	4
Analysis	5
Related products	6
Statistical tables	
1 Total intramural research and development expenditures	9
1-1 By industry	9
1-2 In the pharmaceutical and medicine industries	10
1-3 By provinces	10
1-4 By major industrial sectors, Canada	10
1-5 By major industrial sectors, Atlantic Canada	11
1-6 By major industrial sectors, Quebec	11
1-7 By major industrial sectors, Ontario	11
1-8 By major industrial sectors, Manitoba	11
1-9 By major industrial sectors, Saskatchewan	12
1-10 By major industrial sectors, Alberta	12
1-11 By major industrial sectors, British Columbia	12
1-12 By performing company revenue size	12
1-13 By performing company employment size	13
2 Research and development expenditures and personnel in information and communications technology	13
3 Sources of funds for intramural research and development, by industrial sector 2005, with total values for 2004	14
4 Number of full time equivalent personnel engaged in research and development, by occupational category and by degree level	14
5 Distribution of current intramural research and development expenditures by type of activity	14
Data quality, concepts and methodology	
Methodology	15
Technical Notes	18

Highlights

- In 2007, firms performing research and development (R&D) dedicated \$15.8 billion to industrial R&D spending up from \$15.4 billion the previous year. Reported growth in R&D expenditures between 2005 and 2006 was flat while the estimated growth between 2006 and 2007 was 2.7% (Table 1-1 Total intramural research and development expenditures – By industry).
- The six leading industries performing R&D in 2007 continued to be information and cultural industries (\$1.7 billion), communications equipment (\$1.4 billion), scientific research and development (1.3 billion), computer system design and related services (1.3 billion), pharmaceutical and medicine (\$1.1 billion), and aerospace products and parts (\$1.0 billion). Together these industries represent half (49.5%) of industrial R&D expenditures (Table 1-1 Total intramural research and development expenditures – By industry).
- Industrial R&D expenditures related to health showed almost no growth, an estimated \$1.8 billion for 2007. R&D expenditures in the information communication technologies (ICT) industries showed modest growth attaining an estimated \$6 billion (Table 1-2 Total intramural research and development expenditures – In the pharmaceutical and medicine industries and Table 2 Research and development expenditures and personnel in information and communications technology).
- R&D expenditures by ICT industries from 2002 to 2007 represent four out of every 10 dollars spent on industrial R&D in Canada down from the high of five out of every 10 dollars in 2000 (Table 2 Research and development expenditures and personnel in information and communications technology).
- R&D activities provided employment to 137,686 full-time equivalents in 2005, up (8.9%) from 126,431 in 2003. Scientists and engineers accounted for 81,955 full-time jobs or 60% of the R&D personnel. Technicians, administrators and support staff comprised the remaining 55,731 full-time equivalents (Table 4 Number of full time equivalent personnel engaged in research and development, by occupational category and by degree level).
- The four most important provincial contributors to gross domestic product are the provinces in which the highest levels of industrial R&D spending occur. The largest amount spent on R&D by industry occurred in Ontario (\$8.0 billion or 52%) followed by Québec (\$4.2 billion or 27%), British Columbia (\$1.5 billion or 9%) and Alberta (\$1.1 billion or 7%) (Table 1-3 Total intramural research and development expenditures – By provinces).
- R&D performers in Canada continued to allocate the most important share of their research and development dollars to new (\$5.7 billion or 40%) and improved (\$3.2 billion or 22%) product development while basic research was allocated 4% of industrial R&D dollars attaining \$0.6 billion in 2005 (Table 5 Distribution of current intramural research and development expenditures by type of activity).

Analysis

The number of firms performing R&D in Canada is showing signs of rapid increase over the first four years of the new millennium with indications pointing to continued growth, up from 10,849 in 2000 to 17,222 in 2004 or 58.7%.

R&D firms can perform their R&D in multiple locations and therefore can be counted in more than one province. For 2004, the count of R&D performers including those making expenditures in more than one province was 17,557. Based on the location of the R&D performance the majority of R&D performers are located in the two central provinces Quebec (7,026 or 40%) and Ontario (6,623 or 38%).

For reference year 2005, data for employment size were taken where possible from Payroll Deduction tax files (PD7) for R&D performers spending less than \$1 million on R&D. These data were used to populate the base from reference year 2001 forward. They were also used to verify the 2005 records of the R&D performers spending more than \$1 million on R&D that did complete this information. Review of the employment data for 2001 to 2004 within the survey respondent universe will be completed for 2006 collection.

The employment size data of R&D performers continue to show a similar distribution of R&D expenditures. Modest shifting of the R&D expenditures distribution has occurred in the smallest and the largest employment size groups for years affected by this methodological change.

The smallest employment size group, R&D performers with between 1 and 49 employees, has the second highest R&D expenditures representing 18% of total R&D expenditures while the largest employment group, R&D performers with 2,000 or more employees, accounted for 35% of R&D expenditures in 2007 (employment size group as reported for 2005) (Table 1-13 Total intramural research and development expenditures – By performing company employment size).

When R&D performers are distributed by revenue size groups, the highest revenue size group \$400,000,000 or more, accounted for 43% of industrial R&D expenditures while commercial R&D performers with less than \$10,000,000 in revenues comprised 24% (Table 1-12 Total intramural research and development expenditures – By performing company revenue size).

The distribution of R&D spending continues to shift from manufacturing industries to services industries. In 2001, almost two-thirds (65%) of industrial R&D expenditures occurred in the manufacturing sector, for 2007 this is down to an estimated 53%. On the other hand the services sector accounted for an estimated 42% of R&D expenditures in 2007 up from one-third (32%) in 2001 (Table 1-4 Total intramural research and development expenditures – By major industrial sectors, Canada).

Related products

Selected publications from Statistics Canada

88-202-X	Industrial Research and Development...intentions
88-204-X	Federal Scientific Activities
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Science, Innovation and Electronic Information Division Working Papers
88F0006X2001005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1990-91 to 1998-99
88F0006X2002008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1991-92 to 1999-2000
88F0006X2003008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1994-95 to 2000-2001
88F0006X2004005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1995-1996 to 2001-2002
88F0006X2005002	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1996-1997 to 2002-2003
88F0006X2005019	Estimation of Research and Development Expenditures in the Higher Education Sector, 2003-2004
88F0017M	Science, Innovation and Electronic Information Division Research Papers

Selected technical and analytical products from Statistics Canada

88F0017M1999006	Diffusion of Biotechnologies in Canada: Results from the Survey of Biotechnology Use in Canadian Industries
88F0017M2000008	Explaining Rapid Growth in Canadian Biotechnology Firms
88F0017M2001009	Internationally Comparable Indicators on Biotechnology: A Stocktaking, a Proposal for Work and Supporting Material
88F0017M2001010	Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999

88F0017M2001011	Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry
88F0017M2001012	Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results

Selected CANSIM tables from Statistics Canada

358-0001	Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual
358-0024	Business enterprise research and development (BERD) characteristics, by industry group based on the North American Industry Classification System (NAICS), annual
358-0026	Intellectual property management, by federal departments and agencies indicators, annual

Selected surveys from Statistics Canada

4201	Research and Development in Canadian Industry
4204	Research and Development of Canadian Private Non-Profit Organizations
4208	Provincial Research Organizations (PRO)
4209	Provincial Government Activities in the Natural Sciences
4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences

Selected summary tables from Statistics Canada

-
- *Research and development performed by the business enterprise sector*
 - *Domestic spending on research and development (GERD), funding sector, by province*
 - *Domestic spending on research and development (GERD), performing sector, by province*
 - *Domestic spending on research and development (GERD)*

Statistical tables

Table 1-1
Total intramural research and development expenditures — By industry

	2003 ^r	2004 ^r	2005 ^p	2006 ^p	2007 ^p
	millions of dollars				
Total all industries	14,039	14,947	15,356	15,360	15,773
Total agriculture, forestry, fishing and hunting	94	96	109	x	x
Agriculture	66	73	78	x	x
Forestry and logging	21	18	19	19	19
Fishing, hunting and trapping	6	5	12	13	12
Total mining and oil and gas extraction	283	333	409	398	368
Oil and gas extraction	224	279	360	354	321
Mining	59	54	49	44	46
Total utilities	x	242	261	x	x
Electric power	x	230	249	x	x
Other utilities	10	12	12	13	13
Construction	x	53	66	63	64
Total manufacturing	8,140	8,177	8,224	8,095	8,316
Food	119	129	128	117	120
Beverage and tobacco	43	27	31	30	29
Textile	52	56	58	54	53
Wood products	66	77	96	99	102
Paper	420	413	322	319	321
Printing	27	33	36	36	37
Petroleum and coal products	139	189	x	154	187
Pharmaceutical and medicine	1,110	1,189	1,221	1,129	1,145
Other chemicals	272	216	196	188	197
Plastic products	119	113	126	132	134
Rubber products	26	26	28	29	x
Non-metallic mineral products	49	41	57	61	66
Primary metal (ferrous)	36	46	36	x	41
Primary metal (non-ferrous)	x	218	243	193	170
Fabricated metal products	188	190	206	201	213
Machinery	473	484	526	552	560
Computer and peripheral equipment	192	165	159	151	159
Communications equipment	1,698	1,509	1,386	1,392	1,433
Semiconductor and other electronic components	743	808	832	857	917
Navigational, measuring, medical and control instruments	351	366	469	416	385
Other computer and electronic products	x	x	29	29	31
Electrical equipment, appliance and components	175	146	140	137	144
Motor vehicle and parts	454	575	555	534	524
Aerospace products and parts	891	x	x	963	1,021
All other transportation equipment	47	45	x	x	x
Furniture and related products	28	28	29	28	28
Other manufacturing industries	170	179	x	193	202
Total services	5,343	6,045	6,287	6,445	6,667
Wholesale trade	650	774	790	756	780
Retail trade	37	27	35	34	34
Transportation and warehousing	49	50	56	58	58
Information and cultural industries	1,124	1,346	1,545	1,654	1,671
Finance, insurance and real estate	235	318	354	342	356
Architectural, engineering and related services	501	507	449	420	432
Computer system design and related services	1,119	1,152	1,134	1,212	1,265
Management, scientific and technical consulting	79	66	70	69	76
Scientific research and development services	937	1,209	1,183	1,214	1,267
Health care and social assistance	381	363	404	408	444
All other services	230	232	267	278	283

Table 1-2
Total intramural research and development expenditures — In the pharmaceutical and medicine industries

	2003 ^r	2004 ^r	2005 ^p	2006 ^p	2007 ^p
	millions of dollars				
Total pharmaceutical and medicine research and development	1,637	1,929	1,904	1,729	1,768
Pharmaceutical and medicine (manufacturing)	1,110	1,189	1,221	1,129	1,145
Wholesale trade (pharmaceutical)	240	301	317	287	301
Scientific research and development services (pharmaceutical)	287	439	366	313	322

Table 1-3
Total intramural research and development expenditures — By provinces

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Canada	14,266	13,541	14,039	14,947	15,356
Sub-total, Atlantic Provinces	159	181	181	204	271
Newfoundland and Labrador	21	22	31	29	86
Prince Edward Island	6	4	7	7	8
Nova Scotia	91	93	79	89	94
New Brunswick	41	62	64	79	83
Quebec	4,158	4,155	4,202	4,301	4,183
Ontario	7,899	7,064	7,384	7,717	8,030
Manitoba	173	155	150	178	196
Saskatchewan	87	112	88	112	150
Alberta	710	782	861	1,030	1,073
British Columbia	1,079	1,093	1,173	1,399	1,450
Yukon Territory, Northwest Territories and Nunavut	1	1	1	5	3

Table 1-4
Total intramural research and development expenditures — By major industrial sectors, Canada

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Canada¹	14,266	13,541	14,039	14,947	15,356
Agriculture, forestry, fishing and hunting	92	107	94	96	109
Mining and oil and gas extraction	216	x	283	333	409
Utilities	x	x	x	242	261
Construction	x	49	x	53	66
Manufacturing	9,236	8,241	8,140	8,177	8,224
Services	4,498	4,759	5,343	6,045	6,287

1. Includes the Yukon Territory, Northwest Territories and the Nunavut.

Table 1-5
Total intramural research and development expenditures — By major industrial sectors, Atlantic Canada

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Atlantic Canada	159	181	181	204	271
Agriculture, forestry, fishing and hunting	x	x	x	x	x
Mining and oil and gas extraction	x	x	x	x	x
Utilities	x	x	x	x	x
Construction	x	x	0	x	1
Manufacturing	84	85	98	118	164
Services	66	84	72	77	97

Table 1-6
Total intramural research and development expenditures — By major industrial sectors, Quebec

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Quebec	4,158	4,155	4,202	4,301	4,183
Agriculture, forestry, fishing and hunting	x	37	x	x	37
Mining and oil and gas extraction	x	x	x	x	x
Utilities	x	x	x	x	x
Construction	x	x	x	24	27
Manufacturing	2,457	2,427	2,389	2,335	2,262
Services	1,542	1,563	1,647	1,807	1,742

Table 1-7
Total intramural research and development expenditures — By major industrial sectors, Ontario

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Ontario	7,899	7,064	7,384	7,717	8,030
Agriculture, forestry, fishing and hunting	25	28	x	30	33
Mining and oil and gas extraction	20	x	30	23	19
Utilities	52	x	x	x	13
Construction	20	21	18	x	29
Manufacturing	5,658	4,871	4,783	4,798	4,873
Services	2,125	2,115	2,508	2,829	3,062

Table 1-8
Total intramural research and development expenditures — By major industrial sectors, Manitoba

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Manitoba	173	155	150	178	196
Agriculture, forestry, fishing and hunting	x	x	1	x	x
Mining and oil and gas extraction	x	x	x	x	x
Utilities	x	x	x	x	x
Construction	x	x	x	1	x
Manufacturing	124	87	89	100	114
Services	45	62	58	73	77

Table 1-9
Total intramural research and development expenditures — By major industrial sectors, Saskatchewan

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Saskatchewan	87	112	88	112	150
Agriculture, forestry, fishing and hunting	x	x	x	x	x
Mining and oil and gas extraction	x	x	16	x	x
Utilities	0	x	0	x	x
Construction	x	x	x	0 ^s	x
Manufacturing	37	32	34	40	51
Services	31	40	33	39	34

Table 1-10
Total intramural research and development expenditures — By major industrial sectors, Alberta

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
Alberta	710	782	861	1,030	1,073
Agriculture, forestry, fishing and hunting	x	7	3	x	x
Mining and oil and gas extraction	163	179	213	x	310
Utilities	x	1	1	x	x
Construction	2	2	2	x	x
Manufacturing	299	300	322	x	329
Services	240	292	320	323	309

Table 1-11
Total intramural research and development expenditures — By major industrial sectors, British Columbia

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^p
	millions of dollars				
British Columbia	1,079	1,093	1,173	1,399	1,450
Agriculture, forestry, fishing and hunting	x	23	20	18	22
Mining and oil and gas extraction	x	x	x	19	25
Utilities	x	x	x	4	x
Construction	x	x	5	4	x
Manufacturing	577	438	425	461	430
Services	450	603	704	895	966

Table 1-12
Total intramural research and development expenditures — By performing company revenue size

	2003 ^r	2004 ^p	2005 ^p	2006 ¹	2007 ¹
	millions of dollars				
Total	14,039	14,947	15,356	15,360	15,773
Non-commercial firms	184	193	182	216 ^E	197 ^E
Less than \$ 1,000,000	992	1,187	1,079	1,126 ^E	1,191 ^E
\$ 1,000,000 to 9,999,999	2,220	2,093	2,407	2,418 ^E	2,521 ^E
\$ 10,000,000 to 49,999,999	1,655	1,825	1,735	1,732 ^E	1,812 ^E
\$ 50,000,000 to 99,999,999	808	820	894	901 ^E	928 ^E
\$ 100,000,000 to \$399,999,999	2,176	2,525	2,318	2,395 ^E	2,410 ^E
Greater than \$ 399,999,999	6,004	6,304	6,740	6,573 ^E	6,715 ^E

1. Values for 2006 and 2007 are estimated based on revenue size as reported for 2005 fiscal year.

Table 1-13
Total intramural research and development expenditures — By performing company employment size

	2003 ^r	2004 ^p	2005 ^p	2006 ¹	2007 ¹
	millions of dollars				
Total	14,039	14,947	15,356	15,360	15,773
Non-commercial enterprise	184	193	182	216 ^E	197 ^E
1 to 49	2,215	2,494	2,630	2,724 ^E	2,839 ^E
50 to 99	1,199	1,305	1,345	1,437 ^E	1,529 ^E
100 to 199	1,073	1,121	1,141	1,014 ^E	1,053 ^E
200 to 499	1,319	1,258	1,257	1,287 ^E	1,328 ^E
500 to 999	1,303	1,355	1,428	1,375 ^E	1,349 ^E
1,000 to 1,999	1,949	2,222	1,993	2,031 ^E	2,021 ^E
Greater than 1,999	4,796	4,998	5,379	5,276 ^E	5,457 ^E

1. Values for 2006 and 2007 are estimated based on employment size as reported for 2005 fiscal year.

Table 2
Research and development expenditures and personnel in information and communications technology

	2003 ^r	2004 ^r	2005 ^p	2006 ^p	2007 ^p
	million of dollars				
All industries					
Total research and development expenditures	14,039	14,947	15,356	15,360	15,773
Current	13,062	13,888	14,246	14,363	14,846
Capital	977	1,059	1,110	997	927
Information and communications technology industries					
Total research and development expenditures	5,427	5,555	5,738	5,896	6,041
Current	5,015	5,217	5,406	5,528	5,673
Capital	413	338	332	367	368
Industries other than information and communications technology					
Total research and development expenditures	8,611	9,392	9,618	9,464	9,732
Current	8,048	8,671	8,839	8,835	9,173
Capital	564	721	778	629	559
	number				
All industries					
Total research and development personnel	126,431	133,788	137,686	..	..
Professional	75,855	78,785	81,955	..	..
Technicians	34,570	38,482	39,491	..	..
Other	16,006	16,521	16,240	..	..
Information and communications technology industries					
Total research and development personnel	49,482	50,562	53,267	..	..
Professional	34,978	36,102	38,902	..	..
Technicians	9,580	10,258	10,269	..	..
Other	4,924	4,202	4,096	..	..
Industries other than information and communications technology					
Total research and development personnel	76,949	83,226	84,419	..	..
Professional	40,877	42,683	43,053	..	..
Technicians	24,990	28,224	29,222	..	..
Other	11,082	12,319	12,144	..	..

Note(s): Personnel counts are reported as full-time equivalents.

Table 3
Sources of funds for intramural research and development, by industrial sector 2005, with total values for 2004

	Canadian performing company	Federal government ¹	Other Canadian sources ²	Foreign sources	Total
	millions of dollars				
Total 2005^P	11,959	317	672	2,407	15,356
Agriculture, forestry, fishing and hunting	62	x	x	x	x
Mining and oil and gas extraction	356	x	x	x	409
Utilities	234	0 ^s	x	x	261
Construction	64	x	1	0	x
Manufacturing	6,799	216	262	947	8,224
Services	4,444	90	317	1,436	6,287
Total 2004^r	11,739	271	571	2,367	14,947

1. Taxes foregone as a result of income tax incentives for research and development are not considered direct government support and are not attributed to the Federal Government according to international standards.
2. Includes funds from related companies, from research and development contracts for other firms and grants and contracts from the provincial governments.

Table 4
Number of full time equivalent personnel engaged in research and development, by occupational category and by degree level

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^P
	number				
Total	115,696	118,397	126,431	133,788	137,686
Professionals	73,117	73,219	75,855	78,785	81,955
Bachelor's	60,276	58,898	57,857	59,262	61,623
Master's	8,618	9,698	12,415	13,852	14,515
Doctorate	4,223	4,623	5,583	5,671	5,817
Supporting staff	42,579	45,178	50,576	55,003	55,731
Technicians	29,661	31,591	34,570	38,482	39,491
Other	12,918	13,587	16,006	16,521	16,240

Note(s): Personnel counts are reported as full-time equivalents.

Table 5
Distribution of current intramural research and development expenditures by type of activity

	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^P
	millions of dollars				
Total	12,767	12,490	13,062	13,888	14,246
Basic research	530	438	496	583	582
Applied research	1,491	1,680	1,677	1,746	1,925
New product development	5,950	5,842	5,740	5,950	5,659
Existing product improvement	2,674	2,339	2,421	2,788	3,152
New process development	714	758	885	1,124	879
Existing process improvement	935	988	1,175	1,062	1,122
New technical services development	317	310	477	400	658
Existing technical services improvement	157	134	191	235	270

Note(s): Due to rounding, components may not add to the totals.

Methodology

The 2005 survey

The 2005 survey collected data on four years. The four years were: 2004 for which the data are expected to be final; 2005, for which the data are expected to be close to final, 2006 for which the data are planned expenditures, and 2007 for which the data are a forecast of spending intentions.

Data from the surveyed firms in 2005 represent approximately 81% of the total expenditures. Estimates are not available for administrative data for 2006 and 2007. Therefore, based on the percentage increase or decrease by industry reported by the surveyed firms, forecasts are made for planned expenditures and spending intentions based on the administrative data.

The 2005 survey was mailed out in September 2006. All companies believed to be performing or funding one million dollars or more in R&D were sent a questionnaire. The mailing list of companies was made up of firms which had reported R&D in the previous survey, of firms claiming an R&D income tax incentive for 2005, of firms reported by government respondents as R&D contractors or grantees for 2005 to 2006, of firms reported by other companies as funders or performers of R&D, and of firms indicated in some other way, such as newspaper or journal articles or provincial directories. These larger performers and funders received “long forms”, covering four years, 2004, 2005, 2006 and 2007.

Recent changes to survey methodology

To improve data quality for two of the survey’s classification variables - Revenues in Canada and Number of Employees in Canada - administrative sources were used to replace missing or inconsistent data.

Revenue figures for the SR&ED tax filers were adjusted to reflect corporate income tax data for the corresponding filer. These tax data are from T2 corporate income tax data mapped to the Statistics Canada Chart of Accounts (COA) classification, by firm, from Tax Data Division. The variable COA4 comprises (Total) Revenue for firms. COA4 values were used to improve data quality for missing total revenues data from reference year 1997 through the current year. Inconsistent reported total revenue data were also examined by subject matter experts with reference to COA4 data. Within the publication, the revisions have impacted the revenue size groups. It is believed the revisions have substantially improved the quality of the revenue variable.

Canada Revenue Agency (CRA) Payroll Deductions total employment data (PD7) was used to improve the quality of missing or inconsistent total employment data for survey years 2001 through the current survey year. Payroll Deduction data are monthly data, therefore an annual average is calculated from CRA monthly Payroll Deduction data for all business enterprises that reported having one or more employees in at least one of the twelve months of the tax year.

The survey’s history

Data on R&D in the business enterprise sector, covering commercially oriented enterprises (privately or publicly owned), industrial non-profit organizations and trade associations, have been collected since 1955. Until 1969, the survey was biennial. From 1970 to 1981, all known performers or funders of industrial R&D were surveyed for odd-numbered years and a sample, including the leading performers, were surveyed for even-numbered years. From 1982 to 1991, a full survey was conducted annually.

Because of reductions in the science and technology program, only the top 100 R&D performers (accounting for 64% of all industrial R&D) were surveyed for the 1992 and 1994 reference years. However, as a result of a cost-sharing agreement with the province of Quebec, the 1992 and 1994 industrial R&D survey results also included small firms having R&D activities in the province of Quebec.

Prior to 1997, Statistics Canada surveyed all firms that performed or funded R&D in Canada. Virtually all of these firms also provided information to CRA in order to claim tax benefits under the Scientific Research and Experimental Development (SR&ED) program. In an effort to reduce respondent burden, Statistics Canada stopped surveying the small performers and funders (those with less than \$1 million of R&D in Canada) and instead, imputes their R&D data using CRA administrative data from the SR&ED program.

When first implemented, this initiative resulted in an understatement of the total value of intramural expenditure and of the total number of R&D personnel. Under the current tax regulations, firms must file their application to the SR&ED program within 18 months of expenditure. Once claims are submitted, they are processed and forwarded to Statistics Canada. As a result, data may not arrive for up to two years after the incurrence of expenditures. To remedy the situation, an estimation system was subsequently put into place to impute values for outstanding administrative data. This estimation system confirms the company is active using Statistics Canada's extensive Business Register, and then applies an estimate based on industry trends.

Recent developments in R&D spending are important economic signals, desired promptly by a variety of users. Because the small estimation of outstanding CRA data does not seriously influence overall trends, the R&D data are published as soon as possible after the survey is conducted, and revised in subsequent publications.

Data quality

One of the problems in a survey of this type is to ensure that the quality of the data is satisfactory. It cannot be expected that all firms funding R&D will be surveyed, will respond and will report correctly. There are sources of information such as federal government grant and contract lists to aid in identifying firms and editing returns. In addition, complete coverage cannot be assured. This is especially true for the smaller companies in the service industries. The term, R&D, in spite of survey guidelines, can be misinterpreted.

Different interpretations of the definition of R&D also result in discrepancies between federal government reporting of funds to industry (the business enterprise sector) for R&D and industry's reporting of such funds. For example, a federal government department may regard a contract to industry for the building of a prototype (e.g., communications satellite) as R&D. The contractors and subcontractors, however, may only use a portion of the R&D contract and even that portion may not be reported because the contract is considered as part of the firm's "routine" contract work. Differences may also arise for contracts awarded to industry for services or equipment required for a government in-house project which are reported by the federal sponsor as industrial R&D contracts. Therefore, the totals for R&D grants and contracts from the federal government to industry shown in this publication do not agree with those reported in *Federal Science Activities, 2006/2007*, (Catalogue no. 88-204-X).

Other notes

The business enterprise sector is the only sector in which data are not collected on R&D in the social sciences and humanities.

In this survey, the reporting unit is generally the company or enterprise. This unit has been used because a company, which may have several establishments or subsidiaries, will often have a centralized research unit. In the case of a company with decentralized research units, the reporting unit may be the division, if the accounting system enables divisions to supply the required data. This procedure creates a problem when classifying data by industry. A company can only be assigned to one industry although that company may have establishments in several industries. The assignment is based on the activity from which the firm derived the greatest portion of its income. Thus, comparisons between R&D data collected at the company level and other data collected at the establishment level, such as "census value added", may be misleading. Since industrial R&D is highly

concentrated, the use of the company/enterprise as the main reporting unit also means that classification cannot be very detailed, to avoid disclosing individual company data.

The survey response

The response for the 2005 “base year” survey is shown below:

For 2005 the response rate was 67 %. Survey questionnaires were mailed to 1,297 respondents: 832 were completed; 25 indicated no research and development activity; 28 were out of business; 6 were included with another respondent; and 406 were estimated.

An additional 245 firms were added to the survey universe from the 2005 Scientific Research & Experimental Development tax file.

Technical Notes

Data for the reference year 2005 are available for all tables with the exception of counts of companies. However, in the even years prior to 1982 and for 1992 and 1994, the estimation procedures did not permit the preparation of tables based on revenue size, employment size, sources of funds and country of control of companies.

Regional data on research and development (R&D) expenditures and personnel are only available for 1977, 1979 and 1981 to 2005.

Terminology

The following terminology is used within the publication:

Performing company: The organization which carried out the R&D and submitted the return. In the case of a consolidated return, performing company could include several companies. It also includes divisions of an enterprise which send separate returns or organizations such as industrial non-profit organizations.

Related companies: Includes parent, subsidiary and other affiliated companies. In the case where a consolidated return is submitted, "related companies" would exclude companies included in the consolidation.

R&D contracts for other companies: R&D contract work performed by the reporting company for other companies.

Federal grants: Federal R&D grants and the R&D portion of any other federal grants; it excludes funds or tax credits for R&D tax incentives.

Federal contracts: Federal R&D contracts and the R&D portion of any other federal contracts.

Provincial sources: Provincial R&D grants and contracts, and the R&D portion of any provincial grants and contracts; it excludes funds or tax credits for R&D tax incentives.

Other Canadian sources: Includes funds from universities and from levels of government other than federal and provincial.

Intramural expenditures: Expenditures for R&D work performed within the reporting company, including work financed by others.

Current intramural expenditures: Labour costs, fringe benefits and other current costs for R&D, including non-capital purchases of materials, supplies and equipment but excluding capital depreciation. Current intramural expenditures also include contracts for services required to carry out R&D (e.g. contracts awarded for drilling needed for heavy oil R&D).

Capital expenditures: Expenditures on fixed assets used in the R&D program, classified into land, buildings, and equipment.

Revenues: Revenues resulting from the sale of products and services (after deducting sales and excise taxes), and other revenues such as those generated from investment and rentals.

Non-commercial firms: R&D performers without a directly affiliated Canadian commercial base. Includes industrial non-profit organizations and trade associations, R&D establishments set up by consortia, and R&D establishments set up by non-residents without associated commercial establishments and funded principally from abroad.

R&D personnel: Calculated in full-time equivalent (FTE). R&D may be carried out by persons who work solely on R&D projects or by persons who devote only part of their time to R&D, and the balance to other activities such

as testing, quality control and production engineering. To arrive at the total effort devoted to R&D in terms of person-years, it is necessary to estimate the full-time equivalent of these persons working only part-time in R&D.

FTE = number of persons who work solely on R&D projects + estimate of time of persons working only part of their time on R&D.

Example calculation:

If out of five scientists engaged in R&D work, one works solely on R&D projects and the remaining four devote only one quarter of their working time to R&D, then: $FTE = 1 + 1/4 + 1/4 + 1/4 + 1/4 = 2$ scientists.

Federal government funds for industrial R&D: Federal support consists of grants and contracts for R&D to be performed by business enterprises. Taxes foregone as a result of income tax incentives for R&D are not considered direct government support and are not attributed to the federal government.

Industrial classification

The natural classification to use within the business enterprise sector is the North American Industry Classification System (NAICS). There are, however, problems with its use. A major problem is caused by companies with establishments in more than one industry (e.g., companies which both refine petroleum and extract oil). Another is caused by the concentration of the R&D activity among a few companies. In order to prevent disclosure of individual respondents many industries must be grouped together to provide sufficient observations for publication.

A third problem is that the classification, chosen to represent general industrial activity, may not be entirely suitable for identifying companies chosen only for their involvement in R&D.

There are some restrictions on the application of the NAICS, for example, industrial non-profit organizations will be assigned to the industry they support.

The R&D activities of other sectors such as the federal government, provincial governments, higher education, and private non-profit organizations are covered in other reports.

Definitions

Research and development

Research and development (R&D) is systematic investigation carried out in the natural and engineering sciences by means of experiment or analysis to achieve a scientific or commercial advance.

Research is original investigation undertaken on a systematic basis to gain new knowledge.

Development is the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes. If successful, development will usually result in devices or processes which represent an improvement in the “state of the art” and are likely to be patentable.

Example:

The investigation of electrical conduction in crystals was research. The application of this knowledge to the creation of a new amplifying device - the transistor - was development. The application of the device to the construction of new electrical circuits for television receivers was development. The formulation of new plastic cases for a television receiver is design, not development.

Research and development may be carried out either by a permanent R&D unit (e.g., R&D division) or by a unit generally engaged in any non-R&D activity such as engineering or production. In the first case, the R&D unit may spend part of its time on routine testing or trouble shooting or on some other activities which should not be included in R&D. In the second, only the R&D portion of such units' total activity should be considered.

Research and development should be considered to be “Scientific Research and Experimental Development” as defined in Section 37, Regulation 2900 of the Income Tax Act; this section specifically excludes the following:

- i. market research, sales promotion,
- ii. quality control or routine analysis and testing of materials, devices or products,
- iii. research in the social sciences or the humanities,
- iv. prospecting, exploring or drilling for or producing minerals, petroleum or natural gas,
- v. the commercial production of a new or improved material, device or product or the commercial use of a new or improved process,
- vi. style changes, or routine data collection.

Note:

Although the definition of “Scientific Research and Experimental Development” is considered to be the same as R&D, certain expenditures for scientific research cannot be claimed for income tax purposes (e.g., land, building). All expenditures attributable to R&D are included in this report.