

Catalogue no. 88-001-X

Science Statistics

Research and
Development Personnel in
Canada, 1998 to 2007



February 2010 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.gc.ca, e-mail us at infostats@statcan.gc.ca, or telephone us, Monday to Friday from 8:30 a.m. to 4:30 p.m., at the following numbers:

Statistics Canada's National Contact Centre

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

Local or international calls:

Inquiries line	1-613-951-8116
Fax line	1-613-951-0581

Depository Services Program

Inquiries line	1-800-635-7943
Fax line	1-800-565-7757

To access this product

This product, Catalogue no. 88-001-X, is available free in electronic format. To obtain a single issue, visit our website at www.statcan.gc.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, Statistics Canada has developed *standards of service* that its employees observe. 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.gc.ca under "About us" > "Providing services to Canadians."

Statistics Canada
Business Special Surveys and Technology Statistics Division
Research and Development Personnel in Canada, 1998 to 2007

Science Statistics

Research and Development Personnel in Canada, 1998 to 2007

February 2010 Edition

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2010

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.

February 2010

Catalogue no. 88-001-X, vol. 34, no. 1

ISSN 1209-1278

Frequency: Irregular

Ottawa

Cette publication est également disponible en français.

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	5
Analysis	6
Related products	8
Statistical tables	
1 Personnel engaged in research and development	11
1-1 Sector of performance	11
1-2 Federal government, occupational category	11
1-3 Provincial government sector, by occupational category	12
1-4 Business enterprise sector, by occupational category	12
1-5 Higher education sector, by occupational category	13
1-6 Private non-profit sector, by occupational category	13
2 Provincial distribution of personnel engaged in research and development (R & D)	14
2-1 Sector of performance, by occupational category	14
2-2 Occupational category	15
3 Personnel engaged in research and development (R & D)	16
3-1 Selected OECD countries and by major sector	16
3-2 All sectors, by occupational category	17
3-3 Major field of science and sector of performance	18
4 Researchers engaged in research and development (R & D)	19
4-1 Selected OECD countries	19
4-2 Higher education sector, by occupation	20
4-3 Sector of performance	20
5 Technicians engaged in research and development (R & D)	20
5-1 Natural sciences and engineering, by sector of performance	20
5-2 Social sciences and humanities, by sector of performance	21
6 Support staff in research and development, by major field of science and sector of performance	21
7 Natural sciences and engineering and social sciences and humanities, by occupational category and department or agency	22
8 Occupational coefficients, by category and field of science	22

Table of contents – continued

Data quality, concepts and methodology

Estimates of research and development personnel in Canada	23
---	----

Highlights

Research and Development Personnel, 1998 to 2007

- In 2007, a total of 228,680 full-time equivalent personnel were engaged in research and development (R&D) activities in Canada, up 2.0% over the previous year. Between 1998 and 2007, this number increased by 54.7% (Table 1-1).
- The business enterprise sector employs the majority of R&D personnel in Canada. In 2007, 65% of R&D personnel were employed by business enterprises, followed by 26% in the higher education sector, 8% in government (combined federal and provincial) and 1% in private non-profit organizations (Table 1-1).
- Approximately three-quarters of total R&D personnel worked in Ontario (45%) and Quebec (31%). Most of the remaining R&D personnel were engaged in British Columbia (10%) and Alberta (7%) (Table 2-1).
- Researchers accounted for 63% of total R&D personnel, while technicians comprised one-quarter and support staff 12% (Table 3-2).

Analysis

Research and development (R&D) personnel are instrumental in the advancement of R&D. This edition of the Science Statistics Bulletin reports on the number of full-time equivalent personnel performing R&D activities in Canada from 1998 to 2007. R&D personnel encompass a variety of occupations which are classified into three categories according to the International Standard Classification of Occupation (ISCO): researchers, technicians and support staff. Researchers generally include scientists and engineers who engage in the conception and creation of new knowledge, products, processes, methods and systems. Technicians are individuals whose main tasks require technical knowledge and experience in R&D related fields such as engineering or physical and life sciences. Support staff encompass skilled and unskilled craftsmen, secretarial and clerical staff that participate in R&D projects. Additional details on these occupational categories can be found in the Data quality, concepts and methodology section of this publication.

Researchers

In 2007 there were 142,950 researchers working in Canada, a 2.8% increase over the previous year and a 23% increase from five years earlier (2002) (Table 2-2).

Researchers are the predominant R&D personnel group. In 2007 doctoral students formed 72% of the 47,310 researchers in the higher education sector. Fifty-three percent of these doctoral students focused on natural science and engineering work, while the remaining 47% worked within the social sciences and humanities sector (Table 4-2).

Between 1998 and 2007 the count of researchers in the field of natural sciences and engineering increased 54%, while the number in social sciences and humanities increased 32% (Table 3-2).

Comparing all performing sectors in 2007, Prince Edward Island, Quebec, Ontario and British Columbia held the largest count of full-time equivalent researchers in the business enterprise sector. For the remaining provinces the higher education sector employed the most researchers. (Table 2-1)

In comparison with selected OECD countries, in 2006, the number of researchers per 1,000 labour force in Canada was 7.9 while the United States and Sweden posted higher ratios of 9.4 and 11.9 respectively. (Table 4-1).

The government sector employed 6.1% of total researchers in 2007. Eighty-two percent of government researchers work with the federal government. The National Research Council employed 1,540, the largest number of researchers among all federal departments. The majority of federal researchers, 94%, work in the natural sciences and engineering field. However, in the past decade the share of federal research personnel in the social sciences and humanities has grown from 4% to 6% (Tables 1-2, 4-3, 7).

Technicians

In 2007, a total of 57,390 technicians worked in Canada, up 4.1% from 2006. Over the five year period from 2002 to 2007 the number of technicians increased 34.4% (Table 2-2).

Over the past decade, the number of technicians in the field of natural sciences and engineering increased three-quarters while technicians in the social sciences and humanities field increased 30% (Table 3-2).

The business enterprise sector employed the largest number of technicians among all provinces in 2007, with the exception of Prince Edward Island, where the business enterprise, higher education and federal government sectors employed the same amount of technicians (Table 2-1).

Other Support Staff

In 2007 a total of 28,340 R&D support staff worked in Canada, a decline of 5.4% from the previous year. However, from a five year perspective, 2002 to 2007, other R&D support staff increased 14.7% (Table 2-1).

During the ten year period between 1998 and 2007, the number of other R&D support staff in the field of natural sciences and engineering increased by almost half (48%), while the count in the social sciences and humanities increased 29% (Table 3-2).

In Quebec, Ontario, Manitoba, Alberta and British Columbia the business enterprise sector employed the greatest number of support staff. For the remaining provinces the higher education sector employed the most support staff (Table 2-1).

Related products

Selected publications from Statistics Canada

88-202-X	Industrial Research and Development: Intentions
88-204-X	Federal Scientific Activities
88-221-X	Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Business Special Surveys and Technology Statistics Division Working Papers
88F0017M	Science, Innovation and Electronic Information Division Research Papers

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
4210	Provincial Government Activities in the Social Sciences
4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences
5109	Higher Education Research and Development Estimates

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
Personnel engaged in research and development — Sector of performance

	1998 ^r	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^r	2006 ^r	2007
	number									
Total	147,860	153,340	168,120	179,380	183,420	196,510	210,550	218,610	224,110	228,680
Federal government	13,730	14,080	14,700	13,740	13,960	13,580	13,720	15,250	15,140	15,630
Provincial governments ¹	2,850	2,520	2,710	2,730	2,820	2,560	2,550	2,620	2,820	3,120
Business enterprise ²	85,930	91,300	104,710	115,720	118,460	127,210	138,170	142,030	146,670	147,600
Higher education	44,320	44,590	45,150	46,300	47,340	51,880	54,730	56,950	57,270	60,140
Private non-profit organizations ³	1,030	850	850	890	840	1,280	1,380	1,760	2,210	2,190
	percent change									
Total	1.5	3.7	9.6	6.7	2.2	7.1	7.1	3.8	2.5	2.0
Federal government	-1.6	2.5	4.4	-6.5	1.6	-2.7	1.0	11.2	-0.7	3.2
Provincial governments ¹	-4.0	-11.6	7.5	0.7	3.3	-9.2	-0.4	2.7	7.6	10.6
Business enterprise ²	4.0	6.2	14.7	10.5	2.4	7.4	8.6	2.8	3.3	0.6
Higher education	-1.3	0.6	1.3	2.5	2.2	9.6	5.5	4.1	0.6	5.0
Private non-profit organizations ³	-14.9	-17.5	0.0	4.7	-5.6	52.4	7.8	27.5	25.6	-0.9

1. Provincial government data includes provincial research organizations data.

2. Natural sciences and engineering only.

3. Private non-profit organization's personnel counts may fluctuate due to these organization's intramural research and development activities.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 1-2
Personnel engaged in research and development — Federal government, occupational category

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1998	5,620	230	5,850	3,760	60	3,820	3,840	220	4,060	13,730
1999	5,750	270	6,020	3,790	70	3,860	3,950	250	4,200	14,080
2000	5,840	280	6,120	3,750	70	3,820	4,530	230	4,760	14,700
2001	5,250	360	5,610	3,700	80	3,780	4,090	260	4,350	13,740
2002	5,800	390	6,190	3,700	70	3,770	3,720	280	4,000	13,960
2003	5,740	370	6,110	3,690	70	3,760	3,440	270	3,710	13,580
2004	5,620	360	5,980	3,640	90	3,730	3,740	270	4,010	13,720
2005	6,710	380	7,090	3,870	90	3,960	3,890	310	4,200	15,250
2006	6,320	430	6,750	4,060	130	4,190	3,780	420	4,200	15,140
2007	6,640	460	7,100	4,490	170	4,660	3,540	330	3,870	15,630

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 1-3
Personnel engaged in research and development — Provincial government sector¹, by occupational category

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1998	1,280	180	1,460	890	20	910	440	40	480	2,850
1999	1,140	130	1,270	820	20	840	390	20	410	2,520
2000	1,210	170	1,380	870	50	920	380	30	410	2,710
2001	1,160	170	1,330	830	30	860	510	30	540	2,730
2002	1,170	190	1,360	880	40	920	510	30	540	2,820
2003	1,030	230	1,260	730	50	780	480	40	520	2,560
2004	1,010	220	1,230	800	40	840	440	40	480	2,550
2005	1,060	270	1,330	790	40	830	410	50	460	2,620
2006	1,140	290	1,430	900	50	950	410	30	440	2,820
2007	1,300	310	1,610	980	60	1,040	430	40	470	3,120

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.
Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 1-4
Personnel engaged in research and development — Business enterprise sector, by occupational category

	Researchers	Technicians	Support staff	Total
	number			
1998	54,680	22,010	9,240	85,930
1999 r	58,000	22,810	10,490	91,300
2000 r	66,870	26,740	11,100	104,710
2001 r	73,140	29,660	12,920	115,720
2002 r	73,290	31,590	13,580	118,460
2003 r	76,600	34,570	16,040	127,210
2004 r	81,330	39,850	16,990	138,170
2005 r	84,390	40,430	17,210	142,030
2006 r	86,580	42,210	17,880	146,670
2007	86,370	44,060	17,170	147,600

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 1-5
Personnel engaged in research and development — Higher education sector, by occupational category

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1998	16,250	16,590	32,840	4,370	1,640	6,010	3,320	2,150	5,470	44,320
1999	17,400	15,620	33,020	4,400	1,660	6,060	3,330	2,180	5,510	44,590
2000	17,440	15,860	33,300	4,490	1,710	6,200	3,400	2,250	5,650	45,150
2001	18,110	16,090	34,200	4,440	1,540	5,980	3,640	2,480	6,120	46,300
2002	18,530	16,380	34,910	4,560	1,580	6,140	3,730	2,560	6,290	47,340
2003	21,160	17,740	38,900	4,750	1,660	6,410	3,900	2,670	6,570	51,880
2004	22,500	18,880	41,380	4,850	1,730	6,580	3,980	2,790	6,770	54,730
2005	23,720	19,700	43,420	4,920	1,750	6,670	4,030	2,830	6,860	56,950
2006	23,540	19,990	43,530	4,980	1,790	6,770	4,080	2,890	6,970	57,270
2007	25,700	21,610	47,310	4,670	2,010	6,680	3,420	2,730	6,150	60,140

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 1-6
Personnel engaged in research and development — Private non-profit sector¹, by occupational category

	Researchers	Technicians	Support staff	Total
	number			
1998	380	420	230	1,030
1999	330	340	180	850
2000	300	300	250	850
2001	310	300	280	890
2002	280	260	300	840
2003	430	540	310	1,280
2004	460	610	310	1,380
2005	520	890	350	1,760
2006	720	1,030	460	2,210
2007	550	940	700	2,190

1. Private non-profit organization's personnel counts may fluctuate due to these organization's intramural research and development activities.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 2-1
Provincial distribution of personnel engaged in research and development (R & D) — Sector of performance, by occupational category

	2007										
	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada ¹
	number										
Total²	1,880	390	3,730	2,630	69,830	102,260	4,120	3,490	15,090	22,740	228,680
Researchers	1,060	200	2,230	1,540	41,690	65,100	2,370	1,870	10,330	15,780	142,950
Technicians	520	120	910	700	19,120	25,060	1,160	1,070	3,040	4,690	57,390
Other	300	70	590	390	9,020	12,100	590	550	1,720	2,270	28,340
Federal government	230	100	620	270	2,370	2,740	550	500	860	770	9,030
Researchers	100	40	270	150	1,100	1,220	230	180	370	380	4,050
Technicians	80	40	200	80	620	1,140	220	190	290	250	3,120
Other	50	20	150	40	650	380	110	130	200	140	1,860
Federal government (National Capital Region)	...	...	...	...	630	5,970	...	...	...	...	6,600
Researchers	...	...	...	...	190	2,870	...	...	...	...	3,060
Technicians	...	...	...	...	60	1,490	...	...	...	...	1,550
Other	...	...	...	...	380	1,610	...	...	...	...	1,990
Provincial governments³	50	..	..	160	890	620	70	260	840	200	3,120
Researchers	40	..	..	50	490	380	40	70	390	140	1,610
Technicians	10	..	..	70	300	150	20	180	260	50	1,040
Other	0	..	..	40	100	90	10	10	190	10	470
Business enterprise	580	150	1,300	1,140	49,110	69,560	1,910	1,240	7,180	15,150	147,600
Researchers	220	90	770	620	26,130	41,920	950	640	4,690	10,130	86,370
Technicians	260	40	380	370	16,540	19,890	690	430	1,790	3,620	44,060
Other ⁴	100	20	150	150	6,440	7,750	270	170	700	1,400	17,170
Higher education	1,020	140	1,810	1,060	16,830	23,370	1,590	1,490	6,210	6,620	60,140
Researchers	700	70	1,190	720	13,780	18,710	1,150	980	4,880	5,130	47,310
Technicians	170	40	330	180	1,600	2,390	230	270	700	770	6,680
Other	150	30	290	160	1,450	2,270	210	240	630	720	6,150

1. Includes the Yukon, Northwest Territories and the Nunavut.
 2. The data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development, by performing sector include the private non-profit sector.
 3. Provincial government data includes provincial research organizations data.
 4. No provincial distribution between technicians and other, estimated proportionally according to national total.
Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 2-2
Provincial distribution of personnel engaged in research and development (R & D) — Occupational category

	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon, Northwest Territories and Nunavut	Canada
	number											
Researchers¹												
2002 r	770	130	1,840	970	34,630	55,920	2,020	1,580	7,730	10,140	20	116,030
2003 r	870	160	1,940	1,130	36,270	58,160	2,120	1,790	8,500	11,890	40	123,300
2004 r	920	170	2,110	1,180	37,790	60,440	2,210	1,870	9,520	13,660	50	130,380
2005 r	980	200	2,210	1,370	38,720	63,640	2,370	1,840	9,610	15,210	70	136,750
2006 r	1,040	220	2,230	1,530	40,390	64,310	2,360	1,850	9,880	14,210	270	139,010
2007	1,060	200	2,230	1,540	41,690	65,100	2,370	1,870	10,330	15,780	230	142,950
Technicians¹												
2002 r	310	80	800	510	14,660	18,060	970	810	2,620	3,590	20	42,690
2003 r	340	100	790	530	15,760	19,900	980	860	2,680	3,550	30	46,060
2004 r	370	90	980	610	17,290	22,250	1,130	960	3,140	4,130	50	51,610
2005 r	410	120	950	570	17,230	22,890	1,230	990	3,120	4,340	40	52,780
2006 r	530	140	890	700	17,980	24,130	1,170	1,060	2,940	4,540	40	55,150
2007	520	120	910	700	19,120	25,060	1,160	1,070	3,040	4,690	60	57,390
Other support staff¹												
2002 r	270	60	610	370	7,750	10,520	640	540	1,660	1,970	10	24,700
2003 r	260	80	600	390	8,680	11,810	630	580	1,760	2,040	10	27,150
2004 r	270	70	680	400	8,830	12,580	680	570	1,930	2,230	10	28,560
2005 r	280	80	650	380	8,890	12,810	720	610	1,920	2,390	10	29,080
2006 r	330	80	630	420	9,090	13,440	670	590	1,790	2,440	10	29,950
2007	300	70	590	390	9,020	12,100	590	550	1,720	2,270	40	28,340

1. The data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development, by performing sector include the private non-profit sector.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 3-1
Personnel engaged in research and development (R & D) — Selected OECD countries and by major sector

	1998	1999	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^r	2006 ^r	2007
	thousands									
Total research and development personnel										
Japan ¹	926	919	897	892	857	882	896	921	935	938
Germany	462	480	485	481	480	473	471	475	488	506
United Kingdom	284	290	289	299	309	316	319	325	335	349
France	309	314	327	334	340	342	352	350	366	372
Italy	146	143	150	154	164	162	164	175	192	208
Canada	148	153	168	179	183	197	211	219	224	..
Netherlands	85	87	88	89	87	86	91	88	93	89
Sweden	..	67	..	72	..	73	72	78	79	77
Governments										
Japan ¹	59	59	59	63	64	62	62	63	63	63
Germany	73	71	71	72	73	74	76	76	78	81
United Kingdom	29	30	30	23	21	21	21	20	21	18
France	52	53	53	49	48	48	48	50	51	51
Italy	32	31	31	30	31	31	32	33	36	35
Canada	17	17	17	16	17	16	16	18	18	..
Netherlands	16	17	13	13	13	14	14	13	13	12
Sweden	..	3	..	3	..	3	3	4	4	3
Business enterprise										
Japan ¹	613	605	582	562	556	581	587	610	619	620
Germany	288	307	312	307	303	298	299	305	312	322
United Kingdom	148	153	145	154	158	156	150	145	149	163
France	168	172	178	185	191	193	201	195	208	213
Italy	61	60	64	65	70	68	68	71	80	94
Canada	86	91	105	116	118	127	138	142	147	148
Netherlands	44	45	48	48	47	44	50	49	53	49
Sweden	..	44	..	49	..	48	47	56	58	56
Higher education										
Japan ¹	225	228	228	250	221	224	232	234	239	241
Germany	100	101	101	101	105	101	96	95	97	104
United Kingdom	..	..	..	..	..	..	..	153	158	161
France	82	83	90	92	94	95	97	99	101	103
Italy	53	52	55	59	60	59	61	67	68	71
Canada	44	45	45	46	47	52	55	57	57	..
Netherlands	24	24	27	27	27	27	27	27	27	27
Sweden	..	19	..	20	..	21	22	18	17	18

1. Overestimated (not in full-time equivalent).

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

Source(s): OECD, Main Science and Technology Indicators, Volume 2009/2.

Table 3-2
Personnel engaged in research and development (R & D) — All sectors, by occupational category

	Researchers			Technicians			Support staff			Total, all sectors
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1998 r	78,210	17,000	95,210	31,450	1,720	33,170	17,070	2,410	19,480	147,860
1999 r	82,620	16,020	98,640	32,160	1,750	33,910	18,340	2,450	20,790	153,340
2000 r	91,660	16,310	107,970	36,150	1,830	37,980	19,660	2,510	22,170	168,120
2001 r	97,970	16,620	114,590	38,930	1,650	40,580	21,440	2,770	24,210	179,380
2002 r	99,070	16,960	116,030	40,990	1,690	42,680	21,840	2,870	24,710	183,420
2003 r	104,960	18,340	123,300	44,280	1,780	46,060	24,170	2,980	27,150	196,510
2004 r	110,920	19,460	130,380	49,750	1,860	51,610	25,460	3,100	28,560	210,550
2005 r	116,400	20,350	136,750	50,900	1,880	52,780	25,890	3,190	29,080	218,610
2006 r	118,300	20,710	139,010	53,180	1,970	55,150	26,610	3,340	29,950	224,110
2007	120,560	22,380	142,950	55,150	2,240	57,390	25,260	3,100	28,340	228,680

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

**Table 3-3
Personnel engaged in research and development (R & D) — Major field of science and sector of performance**

	Business enterprise			Higher education			Federal government		
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total
	number								
1998	85,930	..	85,930	23,940	20,380	44,320	13,220	510	13,730
1999 r	91,300	..	91,300	25,130	19,460	44,590	13,490	590	14,080
2000 r	104,710	..	104,710	25,330	19,820	45,150	14,120	580	14,700
2001 r	115,720	..	115,720	26,190	20,110	46,300	13,040	700	13,740
2002 r	118,460	..	118,460	26,820	20,520	47,340	13,220	740	13,960
2003 r	127,210	..	127,210	29,810	22,070	51,880	12,870	710	13,580
2004 r	138,170	..	138,170	31,330	23,400	54,730	13,000	720	13,720
2005 r	142,030	..	142,030	32,670	24,280	56,950	14,470	780	15,250
2006 r	146,670	..	146,670	32,600	24,670	57,270	14,160	980	15,140
2007	147,600	..	147,600	33,790	26,350	60,140	14,670	960	15,630

	Provincial governments ¹			Private non-profit			Canada		
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total
	number								
1998 r	2,610	240	2,850	1,030	..	1,030	126,730	21,130	147,860
1999 r	2,350	170	2,520	850	..	850	133,120	20,220	153,340
2000 r	2,460	250	2,710	850	..	850	147,470	20,650	168,120
2001 r	2,500	230	2,730	890	..	890	158,340	21,040	179,380
2002 r	2,560	260	2,820	840	..	840	161,900	21,520	183,420
2003 r	2,240	320	2,560	1,280	..	1,280	173,410	23,100	196,510
2004 r	2,250	300	2,550	1,380	..	1,380	186,130	24,420	210,550
2005 r	2,260	360	2,620	1,760	..	1,760	193,190	25,420	218,610
2006 r	2,450	370	2,820	2,210	..	2,210	198,090	26,020	224,110
2007	2,710	410	3,120	2,190	..	2,190	200,960	27,720	228,680

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.
Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 4-1
Researchers engaged in research and development (R & D) — Selected OECD countries

	1998	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^r	2006 ^r	2007
	thousands									
Researchers										
United States	..	1,261	1,290	1,320	1,342	1,431	1,394	1,388	1,426	..
Japan ¹	653	659	648	676	647	675	677	705	710	710
Germany	238	255	258	264	266	269	270	272	280	291
United Kingdom	158	168	171	182	198	217	229	249	254	255
France	156	160	172	177	186	193	202	203	211	216
Italy	65	65	66	67	71	70	72	82	88	93
Canada	95	99	108	115	116	123	130	137	139	..
Netherlands	39	40	42	46	38	37	47	47	52	50
Sweden	..	40	..	46	..	48	49	55	56	48
	millions									
Total labour force										
United States	139	141	144	145	146	148	149	150	152	154
Japan ¹	68	68	68	68	67	67	66	67	67	67
Germany	40	40	40	40	40	40	40	41	42	42
United Kingdom	28	29	29	29	29	29	29	30	31	31
France	26	27	27	27	27	28	28	28	28	28
Italy	23	24	24	24	24	24	24	24	25	25
Canada	15	16	16	16	17	17	17	17	18	18
Netherlands	8	8	8	8	8	8	9	9	9	9
Sweden	4	4	4	4	4	4	5	5	5	5
	ratio									
Total researchers per thousand labour force										
United States	..	9.0	9.0	9.1	9.2	9.7	9.4	9.3	9.4	..
Japan ¹	9.6	9.7	9.6	10.0	9.7	10.1	10.2	10.6	10.7	10.7
Germany	5.9	6.4	6.5	6.7	6.7	6.8	6.8	6.6	6.7	7.0
United Kingdom	5.6	5.9	5.9	6.3	6.8	7.4	7.8	8.3	8.3	8.3
France	5.9	6.0	6.4	6.5	6.8	7.0	7.3	7.2	7.5	7.6
Italy	2.8	2.8	2.8	2.8	3.0	2.9	3.0	3.4	3.6	3.8
Canada	6.2	6.3	6.8	7.1	7.0	7.3	7.6	7.9	7.9	..
Netherlands	5.0	5.1	5.2	5.5	4.5	4.4	5.5	5.5	6.0	5.7
Sweden	..	9.1	..	10.3	..	10.7	10.8	11.9	11.9	9.9

1. Overestimated (not in full-time equivalent).

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

Source(s): OECD, Main Science and Technology Indicators, Volume 2009/2, Table 08.

Table 4-2
Researchers engaged in research and development (R & D) — Higher education sector, by occupation

	Full-time teachers		Part-time teachers		Doctoral students		Postdoctoral fellowships		Total researchers	
	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities
	number									
1998	5,024	3,640	754	473	10,043	12,409	428	73	16,249	16,595
1999	5,051	3,692	758	480	11,156	11,363	434	89	17,399	15,624
2000	5,156	3,806	773	495	11,092	11,487	422	73	17,443	15,861
2001	5,349	3,942	749	473	11,625	11,614	391	65	18,114	16,094
2002	5,489	4,061	768	487	11,877	11,753	398	81	18,532	16,382
2003	5,731	4,247	802	510	14,148	12,899	478	86	21,159	17,741
2004	5,849	4,429	819	531	15,366	13,826	471	90	22,505	18,876
2005	5,932	4,491	831	539	16,422	14,583	532	83	23,717	19,696
2006	5,999	4,592	840	551	16,236	14,757	462	91	23,536	19,991
2007	6,220	4,791	1,120	575	17,919	16,147	444	94	25,703	21,607

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

Table 4-3
Researchers engaged in research and development (R & D) — Sector of performance

	1998	1999	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004 ^r	2005 ^r	2006 ^r	2007
	number									
Total	95,210	98,640	107,970	114,590	116,030	123,300	130,380	136,750	139,010	142,940
Federal government	5,850	6,020	6,120	5,610	6,190	6,110	5,980	7,090	6,750	7,100
Provincial governments	1,070	870	970	1,140	1,170	1,070	1,040	1,150	1,250	1,460
Provincial research organizations	390	400	410	190 ¹	190 ¹	190 ¹	190 ¹	180 ¹	180 ¹	150 ¹
Business enterprise	54,680	58,000	66,870	73,140	73,290	76,600	81,330	84,390	86,580	86,370
Higher education	32,840	33,020	33,300	34,200	34,910	38,900	41,380	43,420	43,530	47,310
Private non-profit organizations	380	330	300	310	280	430	460	520	720	550

1. In 2001, the Alberta Research Council Inc. became an agency of the provincial government, and is therefore included in that sector of performance.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 5-1
Technicians engaged in research and development (R & D) — Natural sciences and engineering, by sector of performance

	Federal government	Provincial ¹ governments	Business enterprise	Higher education	Private non-profit	Total
	number					
1998 ^r	3,760	890	22,010	4,370	420	31,450
1999 ^r	3,790	820	22,810	4,400	340	32,160
2000 ^r	3,750	870	26,740	4,490	300	36,150
2001 ^r	3,700	830	29,660	4,440	300	38,930
2002 ^r	3,700	880	31,590	4,560	260	40,990
2003 ^r	3,690	730	34,570	4,750	540	44,280
2004 ^r	3,640	800	39,850	4,850	610	49,750
2005 ^r	3,870	790	40,430	4,920	890	50,900
2006 ^r	4,060	900	42,210	4,980	1,030	53,180
2007	4,490	980	44,060	4,670	940	55,140

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 5-2
Technicians engaged in research and development (R & D) — Social sciences and humanities, by sector of performance

	Federal government	Provincial governments	Business enterprise ¹	Higher education	Private non-profit ¹	Total
	number					
1998	60	20	...	1,640	...	1,720
1999	70	20	...	1,660	...	1,750
2000	70	50	...	1,710	...	1,830
2001	80	30	...	1,540	...	1,650
2002	70	40	...	1,580	...	1,690
2003	70	50	...	1,660	...	1,780
2004	90	40	...	1,730	...	1,860
2005	90	40	...	1,750	...	1,880
2006	130	50	...	1,790	...	1,970
2007	170	60	...	2,010	...	2,240

1. Research and development surveys of the business enterprise and private non-profit sectors collect only natural science and engineering data.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 6
Support staff in research and development, by major field of science and sector of performance

	Federal government	Provincial ¹ governments	Business enterprise	Higher education	Private non-profit organization	Total
	number					
All sciences						
1998	4,060	480	9,240	5,470	230	19,480
1999 r	4,200	410	10,490	5,510	180	20,790
2000 r	4,760	410	11,100	5,650	250	22,170
2001	4,350	540	12,920	6,120	280	24,210
2002	4,000	540	13,580	6,290	300	24,710
2003 r	3,710	520	16,040	6,570	310	27,150
2004	4,010	480	16,990	6,770	310	28,560
2005 r	4,200	460	17,210	6,860	350	29,080
2006	4,200	440	17,880	6,970	460	29,950
2007	3,870	470	17,170	6,150	700	28,360
Natural sciences and engineering						
1998	3,840	440	9,240	3,320	230	17,070
1999 r	3,950	390	10,490	3,330	180	18,340
2000 r	4,530	380	11,100	3,400	250	19,660
2001	4,090	510	12,920	3,640	280	21,440
2002	3,720	510	13,580	3,730	300	21,840
2003 r	3,440	480	16,040	3,900	310	24,170
2004	3,740	440	16,990	3,980	310	25,460
2005 r	3,890	410	17,210	4,030	350	25,890
2006	3,780	410	17,880	4,080	460	26,610
2007	3,540	430	17,170	3,420	700	25,260

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.

Note(s): Personnel counts are reported as full-time equivalents (rounded to the nearest 10). Due to rounding, components may not add to the totals.

Table 7
Natural sciences and engineering and social sciences and humanities, by occupational category and department or agency

	2007			
	Researchers	Technicians	Support staff	Total
	number			
Natural sciences and engineering	6,640	4,490	3,540	14,670
Agriculture and Agri-Food Canada	670	970	430	2,070
Atomic Energy of Canada Limited	590	700	120	1,410
Canadian Space Agency	320	40	210	570
Environment Canada	580	240	130	950
Fisheries and Oceans Canada	230	220	40	490
Health Canada	250	160	30	440
Industry Canada	260	50	50	360
National Defence	800	390	420	1,610
National Research Council	1,540	1,060	1,240	3,840
Natural Resources Canada	880	410	170	1,460
Other Departments or Agencies	520	250	700	1,470
Social sciences and humanities	460	170	330	960
Bank of Canada	30	30	20	80
Canadian Museum of Civilization	10	20	40	70
International Development Research Centre	90	0	50	140
National Defence	50	10	10	70
National Gallery of Canada	20	10	10	40
Social Sciences and Humanities Research Council	10	0	120	130
Statistics Canada	160	90	60	310
Other departments or agencies	90	10	20	120

Table 8
Occupational coefficients, by category and field of science

	Natural sciences and engineering				Social sciences and humanities			
	Full-time university teachers	Part-time university teachers	Technicians	Other support staff	Full-time university teachers	Part-time university teachers	Technicians	Other support staff
	number							
2003	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2004	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2005	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2006	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2007	1	0.18	0.75	0.55	1	0.12	0.42	0.57

Note(s): For example, in 2003, in the Natural sciences and engineering, for every 1.0 full-time teacher doing research and development, there was 0.14 part-time teacher, 0.83 technician and 0.68 other support staff.

Estimates of research and development personnel in Canada

Canada's economic growth and competitiveness, like that of every other industrialized country, is tied to the development of its scientific and technological base. Of all the factors needed for a country's scientific and industrial development, the supply of suitable human resources is unquestionably one of the most vital. Thus, the formulation of science and technology policy requires reliable information on these human resources, especially those engaged in research and development (R&D). "... unless people with certain training and qualifications are available, organized R&D is almost impossible. Education and training are lengthy processes; personnel data are, therefore, essential to realistic science policy planning".¹

The number of R&D personnel is also considered a supplementary measure to intramural expenditures on R&D. The Frascati Manual states that "... personnel provide concrete measurements for international comparisons of resources devoted to R&D".²

It is important to determine the status of these resources on a regular basis. In this report, we present some statistical estimates and definitions concerning R&D personnel. Data on R&D personnel are derived from surveys conducted by the Science and Technology Surveys Section, Business Special Surveys and Technology Statistics Division (BSSTSD) and from estimates based on various data sources.

Classification by occupation

R&D personnel are drawn from a wide variety of occupations "... from the Nobel prize-winner to the winner's secretary, from the designer of space experiments to the breeder of laboratory animals".³ In order to assist analysis on needs and supplies of highly qualified S&T personnel, R&D personnel are classified into three categories. The International Standard Classification of Occupation (ISCO) distinguishes three occupational levels: researchers, technicians and equivalent staff, and other support staff.

- Researchers (scientists and engineers) are engaged in the conception or creation of new knowledge, products, processes, methods and systems. This level also includes managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work. They are usually equal in rank to the researchers and are often former or part-time researchers themselves. Post-graduate students, in particular those performing significant amounts of R&D, are included in this category.
- Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Equivalent staff performs the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities.
- Support staff includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects. Also included are all managers and administrators dealing mainly with financial and personnel matters and general administration given that their activities are directly supporting R&D. Those providing an indirect service, such as canteen and cleaning staff, should be excluded.

1. OECD, Frascati Manual 1980, Proposed standard practice for surveys on research and experimental development, (Paris), page 19, paragraph 23.

2. OECD, Frascati Manual 2002, Proposed standard practice for surveys on research and experimental development, (Paris), page 20, paragraph 30.

3. OECD, Frascati Manual 2002, Proposed standard practice for surveys on research and experimental development, (Paris), page 20, paragraph 32.

Institutional classification

R&D data are classified into five sectors of performance. This method facilitates the collection of data and also provides information that can be cross referenced between sectors.

The sectors are:

- federal government
- provincial governments (includes provincial research organizations)
- business enterprise
- higher education
- private non-profit organizations

Measurement and data collection

Scientific research and experimental development (R&D): comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

Whenever possible, the data are also classified by major field of science; natural sciences and engineering (NSE) or social sciences and humanities (SSH).

Natural Sciences and Engineering (NSE): The NSE consists of disciplines concerned with understanding, exploring, developing or utilizing the natural world. Included are engineering, mathematical, life and physical sciences.

Social Sciences and Humanities: (SSH): The SSH embraces all disciplines involving the study of human actions and conditions and the social, economic and institutional mechanisms affecting humans. Included are such disciplines as anthropology, business administration and commerce, information and knowledge management, criminology, demography, economics, geography, history, languages, literature and linguistics, law, library science, philosophy, political science, psychology, religious studies, social work, sociology, and urban and regional studies.

Since most workers do not all spend the same amount of time on R&D, it is necessary to express the number of persons performing R&D in terms of full-time equivalents (FTE). If only those persons employed in pure R&D are counted, the number of R&D personnel will be understated, just as counting every person who spends part of his/her time on R&D will result in an overstatement. On a full-time equivalence basis then, a person devoting a third of his/her time to R&D will be counted as 0.3 of a full-time equivalent.

In Canada with the exception of the higher education sector, each of the sectors mentioned above are surveyed on an annual basis in order to collect R&D data (both expenditures and personnel). Questionnaires used to collect R&D data can be viewed on the *Statistics Canada website* (<http://www.statcan.ca/english/concepts/index.htm>).

The higher education sector R&D activities are estimated by Statistics Canada. Modifications were made to the estimation procedures in 2005. Data were revised back to 1991. A description of the estimation procedure is found in the section on the higher education sector.

Related information available from Statistics Canada

Information derived from surveys on scientific activities in Canada is available from the Science and Technology Surveys Section, Science Innovation and Electronic Information Division. Catalogue no. 88-001-X presents highlights of each survey once the survey has been completed. Three annual publications, catalogue no. 88-202-X, Industrial Research and Development, catalogue no. 88-204-X, Federal Scientific Activities and catalogue no. 88-221-X, Gross Domestic Expenditures on Research and Development in Canada and the Provinces are

also available. You may contact Michael Lynch at 613-951-2201; Michael.Lynch@statcan.gc.ca or Cindy Carter at 613-951-1856; Cindy.Carter@statcan.gc.ca to obtain more information or visit our website at www.statcan.gc.ca.

R&D personnel by sector

Federal government

This sector comprises all federal departments and organizations. All employees are included (indefinite, temporary and casual status). The data on persons engaged in R&D in the federal government are taken from the annual survey of the federal science expenditures and personnel. These data are classified into three occupational categories: researchers (scientists and engineers), technicians and support staff. The allocation of personnel to these classes is based on their public service classifications. Due to the nature of the work in the social sciences and humanities it is sometimes difficult to distinguish between technicians and other support staff; for convenience, these two categories have been combined and are shown as support staff up until 1990. From 1991 on, technicians involved in social science activities have been identified.

Provincial governments

The provincial government sector consists of all provincial government departments, ministries and agencies and provincial research organizations.

Government departments and agencies

Each year, Science and Technology Surveys Section, BSSTSD assists provincial governments to carry out surveys of resources devoted to their scientific and technological activities.

The statistics presented are aggregates of the provincial government science surveys conducted by Statistics Canada under contract with the provinces, and cover the period 1979-1980 to 2007-2008. The surveys currently cover six provinces: Newfoundland and Labrador, New Brunswick, Ontario, Manitoba, Alberta and British Columbia. Scientific expenditures for Newfoundland and Labrador are based on last year's survey and therefore their data for 2007/2008 are indicated as preliminary. Quebec conducts their own survey and shares the information with Statistics Canada.

Provincial research organizations

Statistics on the R&D personnel of provincial research organizations are estimated on the basis of an annual survey of the resources of the provincial research foundations and councils.

R&D is only one of the activities of these provincial research organizations. In the survey conducted by BSSTSD, the organizations are asked to allocate their expenditures by a number of activities, including R&D. The total number of personnel for all organizations is multiplied by the ratio of R&D to total expenditures in order to produce an estimate of R&D personnel. Since the three occupational categories are already specified in the survey, their relative proportions are applied to the R&D full-time equivalence total.

It should be noted that provincial research organizations data pertain to activities in the natural sciences and engineering only.

Business enterprise

The term "business enterprise" encompasses all commercially oriented enterprises (privately or publicly owned), industrial non-profit organizations and industrial research institutes.

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. Estimates for the 1980 R&D personnel were computed by averaging data for 1979 and 1981. From 1982 to 1991, a full survey was conducted annually.

Because of reductions in the science and technology program, in the even-years starting with the 1992 reference year, only the top 100 R&D performers (accounting for 64% of all industrial R&D), were surveyed. However, as a result of a cost-sharing agreement with the province of Quebec, the 1992 and 1994 surveys also include firms having R&D activities in the province of Quebec. In 1995 the industrial R&D survey was re-established annually under the new S&T project "An information system for science and technology".

The 1998 data reflects a new methodology for estimating R&D expenditure in the business sector in Canada. The essence of the new approach was the use of administrative data from the Canada Revenue Agency (CRA), in place of survey data, for any firm funding or performing less than \$1 million worth of R&D. To relieve respondent burden, the survey threshold was raised from one million dollars to one and one half million dollars in the survey year 2006, thereby reducing the number of surveyed firms. These firms continue to be included in our tabulations as their R&D data is imputed using CRA administrative data from the SR&ED program.

Under the current regulations, firms have up to 18 months to submit a claim for R&D tax credits to CRA. This means that when survey data are ready for publication, not all of the CRA data for that year will have been received. At the time this bulletin is released, a portion of the R&D tax credit is still outstanding and their value is estimated. This bulletin provides preliminary estimates of R&D personnel in the business enterprise sector. In 2008, the Canada Revenue Agency (CRA) introduced new tax forms for applicants to the Scientific Research and Experimental Development (SR&ED) investment tax credit program. These new forms request R&D personnel data by head count, which may impact the R&D full-time equivalent personnel counts in this sector for the next edition of this publication.

It should be noted that business enterprise data pertain to activities in the natural sciences and engineering only. For further information, see Industrial Research and Development, catalogue no. 88-202-X.

Higher education

This sector includes universities, colleges of technology and other institutions of post-secondary education. Since existing surveys of this sector do not provide information on the R&D activities of staff, it is necessary to estimate R&D personnel.

As in other sectors of performance, we are interested in determining the full-time equivalence by three occupational categories (researchers, technicians and support staff) and by science type (NSE and SSH). The first step we take is to determine "researchers".

It is common knowledge that university professors are involved in other activities besides research (teaching and community service work). Doctoral students and postdoctoral research fellows also do research. The level of education held by these persons would qualify them as researchers. But, how much of their time is actually spent doing R&D?

When estimating R&D expenditures in the higher education sector, universities are classified into small, medium and large based on

- sponsored research expenditures;
- sponsored research as a percentage of general operating expenditures and
- the number of doctoral programs. This is based on the assumption that, depending on the size of the university, some universities spend more time on R&D than others. The same size classification is used to estimate R&D personnel.

Also, when estimating R&D expenditures, we use the full-time teachers field of study to determine science type. Science type of R&D personnel is based on the same field of study classification. Crossing the size classification of institutions with the science type and personnel category, we arrive at percentages used to determine how much time is spent on R&D (table 8).

Now, we apply this methodology to full-time teacher, doctoral student and Ph.D. fellows information. The Centre for Education Statistics provides us with full-time teacher and doctoral students data by institution and by field of study. Postdoctoral fellows information is received from the three granting councils, Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council and the Canadian Institutes for Health Research. These data are organized by university size and by field of study. To arrive at the amount of time these persons spend doing R&D in FTE's, we multiply the full-time teachers, doctoral students and Ph.D. fellows by the percentages in Table 8. As mentioned before, these persons are all considered to be researchers.

In addition to full-time university professors, doctorate students and Ph.D. fellows; there are part-time teachers, technicians and other support staff involved in R&D. Estimates for these classifications of R&D personnel are based on information provided by the Census.

The Census labour market statistics provide data on sector of employment, occupation (based on the National Occupational Classification for Statistics, 2001 (NOC-S), level of education and gender of the employed labour force. The division was able to purchase 1991, 1996 and 2001 Census data with funds made available through our memorandum of understanding (MOU) with Industry Canada. Census data prior to 1991 was not purchased and therefore no revisions to the higher education R&D personnel were made prior to 1991. Estimates previous to 1991 used coefficients based on the older Standard Occupational Classification, 1980 (SOC).

In order to use the Census data, the occupations had to be classified into our three categories – Researchers, Technicians and Other. In order to do this, we have attempted a concordance of NOCS 2001 to the Frascati Manual's (2002) categories of R&D personnel by occupation, which are based on the International Standard Classification of Occupations, 1988 (ISCO). Once this concordance was completed, detailed analysis was made on Canada's employed labour force who work in the university industry (SIC 8531) in order to arrive at the Occupational Coefficients listed in table 9. What the coefficients imply are that for every full-time teacher, there is 0.18 part-time teachers, 0.75 technicians and 0.55 other support staff doing R&D.

We have determined that "researchers" constitute the R&D full-time equivalent of full-time teachers, doctoral students and Ph.D. fellows. In addition to these we add part-time teachers using the appropriate occupational coefficient provided by the Census data (table 9). The total of these occupations equal "Researchers".

Technicians and Other Support staff are determined by applying the coefficient derived from the census data. That coefficient considers both the occupation specified, the highest level of education achieved as well as the field in which the person works (natural sciences and engineering or social sciences and humanities).

As a result of the analysis completed on the Census data, we have been able to identify technicians in the social sciences and humanities back as far as 1991. Previous to that year the distinction between technicians and other support staff is unclear in the social sciences and humanities, these two categories have been combined and are shown as support staff.

The use of large-scale estimates naturally causes data reliability problems. Nevertheless, in the absence of more reliable data, these estimates provide us with a general idea of the situation in this sector, given certain assumptions. Caution should be used when comparing them with other sectors or with expenditure estimates.

Private non-profit organizations

This sector is comprised of private and semipublic organizations and entities for which profit-making is not a primary goal. There are four main types of organizations included: private philanthropic foundations, scientific societies and associations, voluntary health organizations, and research institutes which do not belong to other sectors.

Since 1983, BSSTSD has been collecting personnel data through its survey of R&D performed by private non-profit organizations in Canada. In this survey, respondents are asked to estimate the number of employees engaged in R&D by occupational category.

Since no statistics on R&D personnel in these organizations for the years prior to 1983 are available, estimates were made on the 1983 relationships of personnel, R&D expenditures and occupational categories. Finally, since R&D in this sector is carried out basically in the health sciences, there are no estimates for personnel engaged in R&D in the social sciences and humanities.

The PNP sector appears in both the performing and funding sector for the GERD for Canada. Commencing with reference year 2000, the data for the PNP sector performing research and development are not distributed by provinces, territories or the national capital region. However, the national totals of research and development by performing sector include the PNP sector. The PNP sector continues to be distributed for the funding sector.