

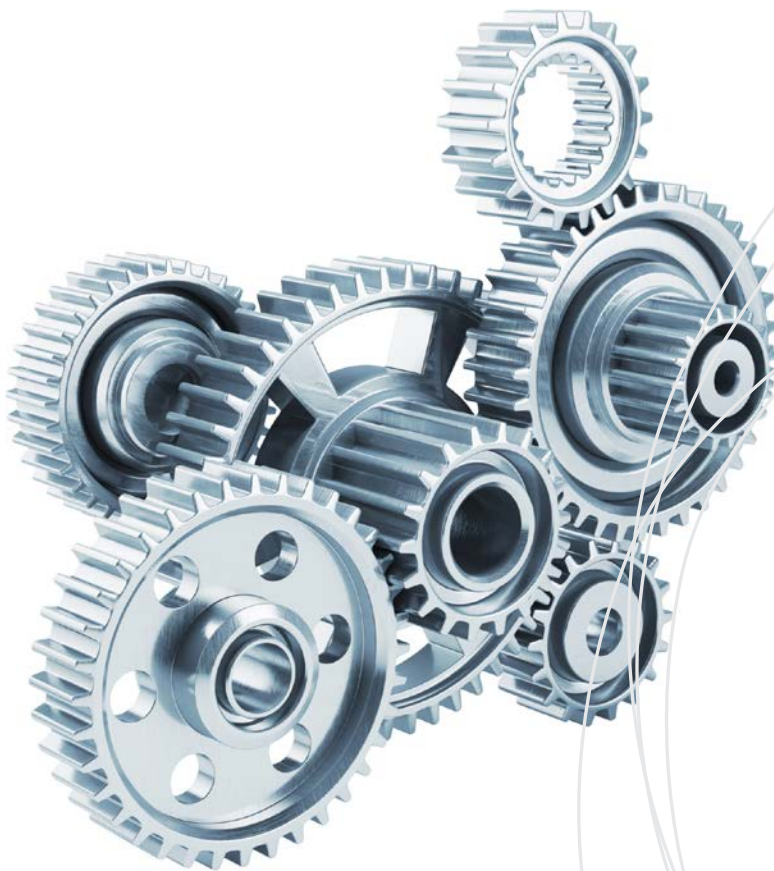


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du Canada

# Canada's Engineering and Applied Science Technicians and Technologists.

Assessing Their Economic Contribution



REPORT APRIL 2016

## **Canada's Engineering and Applied Science Technicians and Technologists: Assessing Their Economic Contribution**

Julie Adès

### **Preface**

This report provides an economic portrait of Canada's engineering and applied science technicians and technologists and quantifies their contribution to the Canadian economy. The engineering and applied science technicians and technologists' occupational group includes an array of different occupations found across many segments of the Canadian economy. We have developed a methodology using wage data at the occupational and industrial levels to obtain an approximation of the amount of GDP (or value-added) to which engineering and applied science technicians and technologists contribute in each industry. This research also provides an overview of the main factors influencing employment trends in this occupational group.

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Julie Adès, Senior Economist with the Board's Economic Forecasting and Analysis Division, was lead researcher and author on the project. The author would like to acknowledge suggestions and contributions from Pedro Antunes, Deputy Chief Economist at the Conference Board; Matthew Stewart, Associate Director of the Board's National Forecast group, and Greg Hermus, Associate Director of the Board's Canadian Tourism Research Institute. The author would also like to acknowledge suggestions and contributions from Andreas Trau, Unit Head Consulting and Marketing, Industry Accounts Division at Statistics Canada.

## EXECUTIVE SUMMARY

# Canada's Engineering and Applied Science Technicians and Technologists: Assessing Their Economic Contribution

### At a Glance

- Canada's engineering and applied science technicians and technologists are active across a broad range of industries and contributed \$54.7 billion to the economy in 2011—3.3 per cent of Canadian GDP.
- Thanks in part to Canada moving toward a knowledge economy, employment growth for this occupational group has strongly outpaced overall employment growth for Canada as a whole over the past 15 years.
- Engineering and applied science technicians and technologists are found across a number of industries including the professional, scientific, and technical services sector; manufacturing; construction; public administration; the information sector; and the natural resources sector. The trends, challenges, and opportunities facing these industries influence the demand for engineering and applied science technicians and technologists.

**This report provides an economic portrait of Canada's engineering and applied science technicians and technologists and quantifies their contribution to the Canadian economy.**

The engineering and applied science technicians and technologists' occupational group includes an array of different occupations requiring distinct sets of skills and involving diverse responsibilities. These occupations include, but are not limited to, user support technicians; computer network technicians; electrical and electronic engineering technologists' and technicians; civil engineering, mechanical engineering, and industrial engineering technologists and technicians; and geological, mineral, and drafting technologists and technicians. In many ways, technologists and technicians bridge the theoretical with the applied. They are involved in research and development and in bringing innovative processes to light.

Employment growth for the engineering and applied science technicians and technologists' occupational group has strongly outpaced overall employment growth for Canada as a whole over the past 15 years. Indeed, the number of engineering and applied science technicians and technologists recorded an average annual growth rate of 3.5 per cent between 1997–98 and 2013–14 while overall employment grew only 1.7 per cent on average annually over that period. Furthermore, their average wage rate has consistently remained above the national average—by more than 20 per cent—over the period analyzed (1997–98 to 2013–14).

## **Economic Contribution of Engineering and Applied Science Technicians and Technologists**

Assessing the economic contribution of a group of workers is a complex task from a theoretical perspective. Output is typically the result of the work of more than one occupation and, in fact, of more than one type of production factor (labour and capital). We have developed a

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The mining, quarrying, and oil and gas extraction industry has much higher productivity than the manufacturing sector.

methodology using wage data at the occupational and industrial levels to obtain an approximation of the amount of GDP (or value-added) to which the engineering and applied science technicians and technologists contribute in each industry across the Canadian economy.<sup>1</sup>

Using this approach, the direct economic contribution of engineering and applied science technicians and technologists represented \$54.7 billion in 2011—3.3 per cent of Canadian GDP. This is larger, proportionally speaking, than the share of technicians and technologists in the Canadian workforce—which was at 2.5 per cent in 2010–11.

Based on our methodology, a technician working in a highly productive capital-intensive industry would be estimated to have a larger economic contribution than a technician working in a labour-intensive industry with relatively low productivity (for a given wage). The mining, quarrying, and oil and gas extraction industry provides a clear example. There are fewer engineering and applied science technicians and technologists in the mining, quarrying, and oil and gas extraction industry than in the manufacturing sector. However, the estimated economic contribution of the technicians and technologists in the mining, quarrying, and oil and gas extraction industry is larger than the economic contribution of those working in the manufacturing sector. This is, in large part, because the mining, quarrying, and oil and gas extraction industry has much higher productivity (measured as production per hour worked) than the manufacturing sector.

## Main Industrial Trends Affecting Demand for Technical Professionals

Technical professionals are spread across every segment of the economy. As such, there is no one-size-fits-all trend analysis applicable to all categories of technicians and technologists. However, more than

1 GDP is a broad measurement of a country's overall economic activity. GDP by industry at basic prices is a measure of the economic production that takes place within the geographical boundaries of Canada. GDP by industry is also known as output-based GDP because it sums the value-added (output less intermediate consumption of goods and services) of all industries in Canada.

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Public investment in infrastructure is now set to enter a period of growth.

a quarter of such professionals work in the professional, scientific, and technical services sector, close to a fifth work in the manufacturing sector, and large numbers are also found in public administration, as well as in the construction, information, and mining and oil and gas extraction sectors. The trends, challenges, and opportunities facing these industries will have a strong influence on the demand for engineering and applied science technicians and technologists in coming years.

In particular, due to the collapse in oil prices, the mining, quarrying, and oil and gas extraction sector workforce contracted in 2015, mainly in the “support activities for mining and oil and gas extraction” segment. With commodity prices expected to remain relatively depressed for some time, employment growth in the resource sector will likely be modest in the near term.

Similarly, the construction sector will not be a major source of employment growth in the near term. The drop in investment in non-residential structures in 2015 (also largely due to the collapse in oil prices) has affected construction sector activity. Real investment in non-residential structures is expected to decline further in 2016, which will limit the demand for construction workers, including technical professionals, in the short term. Yet, there are some bright spots in the construction sector outlook. Indeed, business investment is expected to pick up in 2017, which should support demand for construction workers. Furthermore, public investment in infrastructure is now set to enter a period of growth. Some provincial governments have put forth large-scale investment plans (e.g., in Quebec, Ontario, Alberta, and British Columbia) and the federal government’s new 10-year infrastructure investment plan<sup>2</sup> should also generate new activity across the country. This would help support, to some extent, construction employment and the demand for technical workers in coming years.

2 In Budget 2016, the federal government announced immediate investments in public transit, green infrastructure, and social infrastructure, representing \$11.9 billion invested over five years (as part of the government’s 10-year plan).



The employment outlook for the manufacturing sector is unimpressive. Still, it is not all doom and gloom for the sector's workforce, and particularly for technical workers. The U.S. economy is expected to expand at a solid pace in coming years, which should boost export growth and improve job prospects in Canada's manufacturing sector. Employment is not expected to ever recover to its pre-recession levels, in large part because of growing global competition and the adoption of newer and less labour-intensive manufacturing technology. Yet, there is a silver lining for technical professionals. Despite limited employment growth, a focus on productivity gains and subsequent investment in state-of-the-art technologies would likely support the demand for high-skilled technical workers such as engineering and applied science technicians and technologists. This reflects historical trends in the data. For example, while Canada's manufacturing sector suffered significant job losses over the past decade, the number of industrial engineering and manufacturing technologists and technicians has remained relatively stable.

## Challenges and Opportunities

Overall, the Canadian economy will continue to face a number of challenges in coming years, including weak oil prices, growing global competition, the aging population, slower labour force growth, and growing public spending on health care. Many of these challenges point to the need for productivity gains. For example, as our aging population increases demand for services such as health care, faster productivity growth would improve our ability to fund health and social programs.<sup>3</sup>

Public investment in infrastructure and promoting business investment in machinery and equipment and innovative products are key factors that would help achieve productivity gains in Canada.<sup>4</sup> Putting these

3 Muzyka and Hodgson, "To Boost Productivity."

4 Ibid.

strategies into practice and maintaining a high productivity level in the economy would likely involve the participation of technical professionals such as engineering and applied science technicians and technologists.

However, these technical professionals will need to continuously improve and renew their skills in order to adapt to changing industrial conditions and contribute to productivity growth. An additional issue to consider is the impact of the baby boomers' retirement on the availability of technical professionals in the economy. As for many occupations, a large proportion of technical professionals are part of the baby boom generation (those born between 1947 and 1966). The oldest baby boomers have already started to retire. Yet, since they are much more numerous at the tail end of the generation, we can expect the retirement rate to accelerate over the next decade and a half. This growing wave of retirement will lead to the need to find and train individuals to fill positions that become vacant. Along these lines, it would be valuable to undertake further research to assess the number of new workers required in the coming years in order to replace those soon-to-be-retired technical professionals.

## CHAPTER 1

# Introduction

### Chapter Summary

- The main objective of this report is to quantify the economic contribution of engineering and applied science technicians and technologists.
- To achieve this task, we must first define this broad occupational group using the National Occupational Classification System and develop a methodology to assess its economic contribution to the economy.
- This report also analyzes past employment trends and discusses the main factors that will likely influence demand for such professionals in coming years.

**The Canadian economy is gradually moving toward a knowledge economy. Over the past decade, Canada's labour market has changed drastically. In particular, the manufacturing sector suffered significant restructuring, with the loss of about 600,000 jobs from 2004 to 2010 and virtually no gains since. Competition from low-cost jurisdictions, especially in Asia, means that Canada and other developed economies can no longer compete in the labour-intensive segments of the manufacturing sector. Nonetheless, steady and solid demand for skilled workers, particularly in professional, scientific, and technical services,<sup>1</sup> has helped to offset the losses from the restructuring in the manufacturing sector and the effects of the 2008–09 recession.**

This report provides an economic portrait of an important segment of Canada's skilled workforce: the engineering and applied science technicians and technologists. In this study, we quantify their contribution to the Canadian economy, analyze past employment trends, and discuss the main factors that will likely influence demand for such professionals in coming years.

The first step in our research involves defining what is being included in our measurement of the technicians and technologists' occupations, as well as describing the methodology and data sources used in the analysis. This is explained in Chapter 2. Chapter 3 provides an overview

1 Employment as defined under Statistics Canada's 2012 North American Industry Classification code 54. This is a broad employment sector that includes legal services; accounting, tax preparation, bookkeeping, and payroll services; architectural, engineering, and related services; specialized design services; computer systems design and related services; management, scientific, and technical consulting services; scientific research and development services; and advertising, public relations, and related services.

of this broad occupational group. Chapter 4 explains the methodology developed to assess the economic contribution of engineering and applied science technicians and technologists. Chapter 5 presents the employment trends in the main industries employing engineering and applied science technicians and technologists. Chapter 6 discusses the top 10 occupations included in the engineering and applied science technicians and technologists grouping. Chapter 7 offers concluding remarks.

## CHAPTER 2

# Defining the Engineering and Applied Science Technicians and Technologists Occupational Category

### Chapter Summary

- As a first step in our research, we define the types of workers to be included in our measurement of the engineering and applied science technicians and technologists group using Statistics Canada's occupational data based on the National Occupational Classification system.
- The analysis presented in this report also relies on labour market data by industry and economic data from the Canadian System of National Accounts.

**The first step in our research involved defining what types of workers are included in our measurement of the engineering and applied science technicians and technologists occupational group. Statistics Canada is the primary source of information on labour market statistics in Canada and reports the occupational data using the National Occupational Classification (NOC) system.<sup>1</sup>**

This system, which is specific to Canada and developed by Statistics Canada and Human Resources and Skills Development Canada (now Employment and Social Development Canada), provides a standardized system for describing the work performed by Canadians in the labour market. It provides a consistent way to collect data, describe, and understand the nature of work. This classification system is used in the Labour Force Survey<sup>2</sup> and the 2011 National Household Survey,<sup>3</sup> which were the sources of employment data for this report.

With this in mind and for the purpose of this report, technicians and technologists in engineering and applied science are defined as the following NOC codes:

- chemical technologists and technicians (2211)
- geological and mineral technologists and technicians (2212)
- biological technologists and technicians (2221)
- civil engineering technologists and technicians (2231)
- mechanical engineering technologists and technicians (2232)
- industrial engineering and manufacturing technologists and technicians (2233)
- construction estimators (2234)

1 Statistics Canada, *National Occupation Classification (NOC) 2011*.

2 Statistics Canada, *Labour Force Survey*.

3 Statistics Canada, *2011 National Household Survey*.

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The NAICS  
is built on a  
production-oriented  
framework.

- electrical and electronics engineering technologists and technicians (2241)
- industrial instrument technicians and mechanics (2243)
- aircraft instrument, electrical, and avionics mechanics, technicians, and inspectors (2244)
- architectural technologists and technicians (2251)
- drafting technologists and technicians (2253)
- land survey technologists and technicians (2254)
- technical occupations in geomatics and meteorology (2255)
- non-destructive testers and inspectors (2261)
- engineering inspectors and regulatory officers (2262)
- construction inspectors (2264)
- computer network technicians (2281)
- user support technicians (2282)
- systems testing technicians (2283)
- petroleum, gas, and chemical process operators (9232)

The list of occupational categories presented above is based on NOC 2011, which is the occupational classification system at the basis of the occupational data in the 2011 National Household Survey (NHS). However, the Labour Force Survey (LFS) time series we obtained from Statistics Canada (following a data request) were based on NOC-S 2006. The two classification systems—NOC 2011 and NOC-S 2006—comprise very similar occupational categories. In fact, the occupational categories analyzed in this report are almost identical in NOC 2011 and NOC-S 2006. An exception is the “chemical technologists and technicians” in NOC 2011, which were called “applied chemical technologists and technicians” in NOC-S 2006. Another exception is the “technical occupations in geomatics and meteorology” in NOC 2011 which encompass two different categories in NOC-S 2006: mapping and related technologists and technicians, and meteorological technicians. This report relies on occupational data from both the 2011 NHS and the LFS.



In addition to occupational data, we relied on labour market data broken down using the North American Industrial Classification System (NAICS).<sup>4</sup> This system is used by statistical agencies in Canada, the United States, and Mexico to describe economic and business activity at the industry level. It is built on a production-oriented framework, where establishments that produce similar goods or services are grouped together. Data are generally collected at the establishment level, with an establishment being assigned to a specific industry based on its primary activity.

The economic contribution analysis in this report also relies on the Canadian System of National Accounts (CSNA).<sup>5</sup> CSNA uses an industrial classification called the Input-Output Industry Classification (IOIC), which for the most part is based on NAICS. The IOIC industries for construction, however, are not based on NAICS. These industries are based on the activities related to the construction of various building and engineering structures, which are based on the assets collected by the Capital Expenditure Survey.<sup>6</sup>

An important undertaking for this study was to link these systems together.

In Chapter 6, we also relied on the Government of Canada's occupational profiles to describe the main duties of the top 10 occupations under study.<sup>7</sup> Service Canada was also an important source of insights on the main factors influencing trends in each of those occupations.

4 Statistics Canada, *North American Industry Classification System*.

5 Statistics Canada, *Canadian System of National Accounts*.

6 Andreas Trau (Unit Head Consulting and Marketing, Industry Accounts Division, Statistics Canada), e-mail communication to Julie Adès, March 10, 2016.

7 These occupational profiles are still found under Human Resources and Skills Development Canada's web addresses, even though the department name has been changed to Employment and Social Development Canada. Note that all NOC code numbers are now under "Government of Canada."

## CHAPTER 3

# General Trends in the Engineering and Applied Science Technicians and Technologists Grouping

### Chapter Summary

- Employment growth for this occupational group has strongly outpaced overall employment growth for Canada as a whole over the past 15 years.
- The engineering and applied science technicians and technologists' average weekly wage rate has consistently remained above the national average over the period analyzed (1997–98 to 2013–14).
- The average weekly wage rate varies from one occupation to another since each occupation under study is associated with a specific set of skills and responsibilities and some are concentrated in industries facing very different economic conditions.

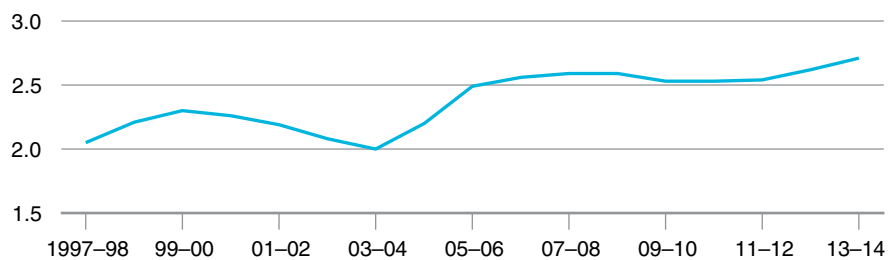
## Employment Growth

**In 2013–14, there were over 400,000 engineering and applied science technicians and technologists in Canada, under the 21 occupational categories described in Chapter 2.<sup>1</sup> Employment growth for this occupational group has strongly outpaced overall employment growth for Canada as a whole over the past 15 years.**

The number of engineering and applied science technicians and technologists recorded an average annual growth rate of 3.5 per cent between 1997–98 and 2013–14 while overall employment grew only 1.7 per cent on average annually over that period. As such, their share of total employment has been following an upward trend over the years, and in 2013–14, engineering and applied science technicians and technologists represented 2.7 per cent of total employment. (See Chart 1.)

Chart 1

### Technicians and Technologists as a Share of Overall Employment (all industries, per cent)

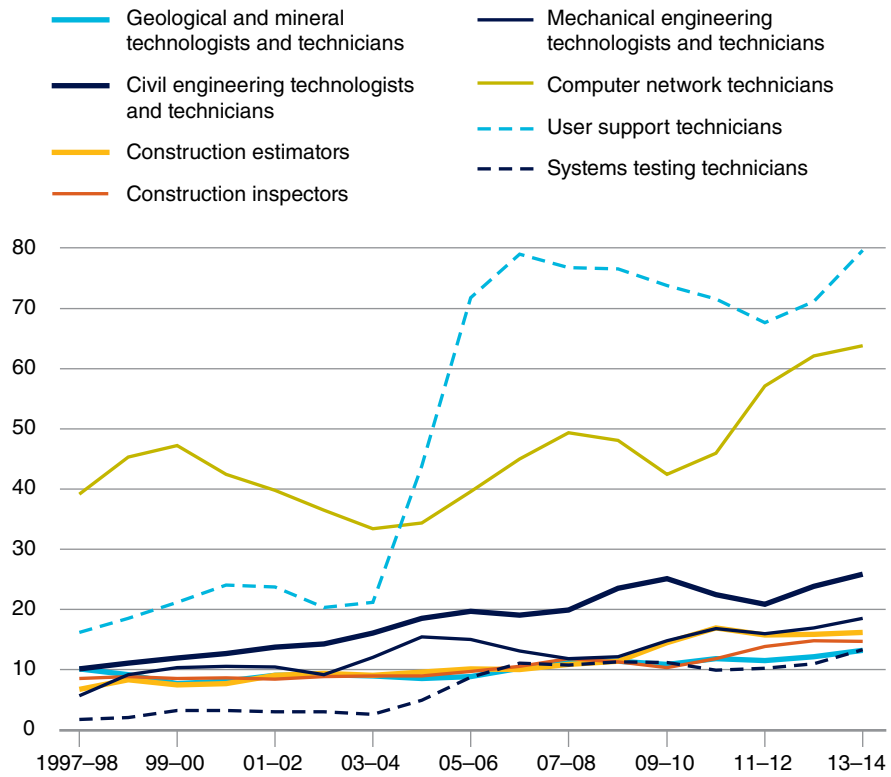


Sources: The Conference Board of Canada; Statistics Canada.

<sup>1</sup> Since disaggregated data by occupation can be volatile, the labour force survey data are reported as the average of two-year periods. We keep this two-year average framework for these comparisons.

This growing share is largely due to an increase in the number of technical occupations in computer and information systems—user support technicians posted rapid growth during the 2000s. In addition, average annual employment growth for a number of other occupations (such as non-destructive testers and inspectors, civil and mechanical engineering technicians and technologists, and construction estimators) also strongly outpaced overall employment growth over the 1997–2014 period. (See Chart 2.)

**Chart 2**  
**Drivers of Employment Growth in the Technicians and Technologists Broad Occupational Group**  
(employment level, 000s)

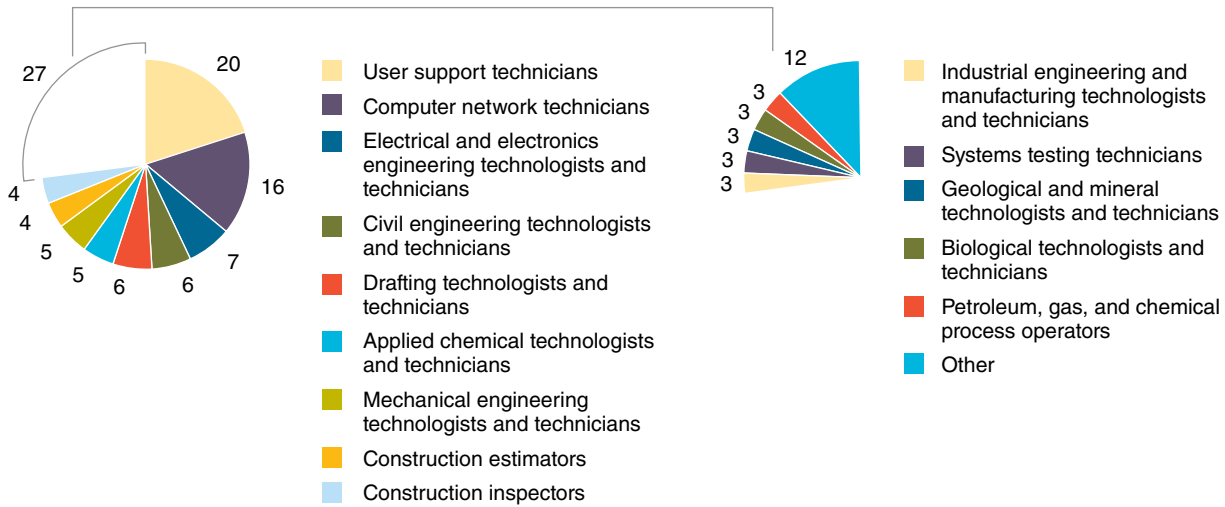


Sources: The Conference Board of Canada; Statistics Canada.

Today, technical occupations in computer and information systems account for the largest share of the technicians and technologists broad occupational group. More specifically, user support technicians and computer network technicians represent 20 per cent and 16 per cent, respectively, of all engineering and applied science technicians and technologists. Electrical and electronic engineering technologists and technicians, civil engineering technologists and technicians, drafting technologists and technicians, chemical technologists and technicians, and mechanical engineering technologists and technicians also account for large shares of this group of professionals. (See Chart 3.)

Chart 3

**Distribution of Engineering and Applied Science Technicians and Technologists by Type, 2013–14**  
(per cent)

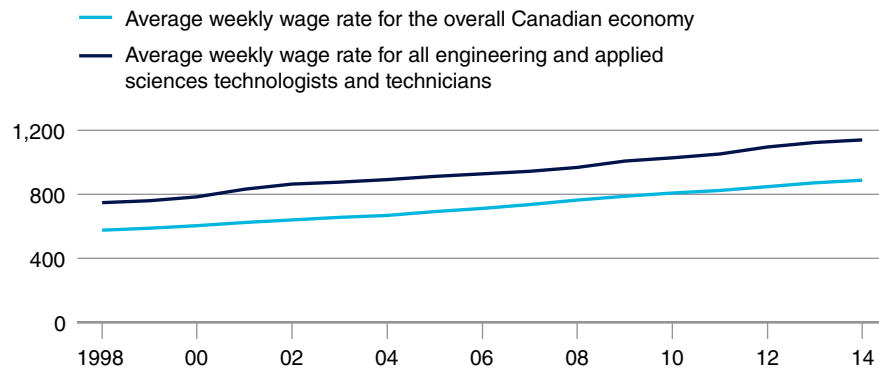


Sources: The Conference Board of Canada; Statistics Canada.

## High Wages Relative to the National Average

The average weekly wage rate of engineering and applied science technicians and technologists<sup>2</sup> has consistently remained above the national average over the period analyzed (1997–98 to 2013–14). (See Chart 4.) In fact, their average wage is more than 20 per cent higher than the national average.

**Chart 4**  
**Average Weekly Wage Rate, Technicians and Technologists' Average Versus the National Average**  
(\$)



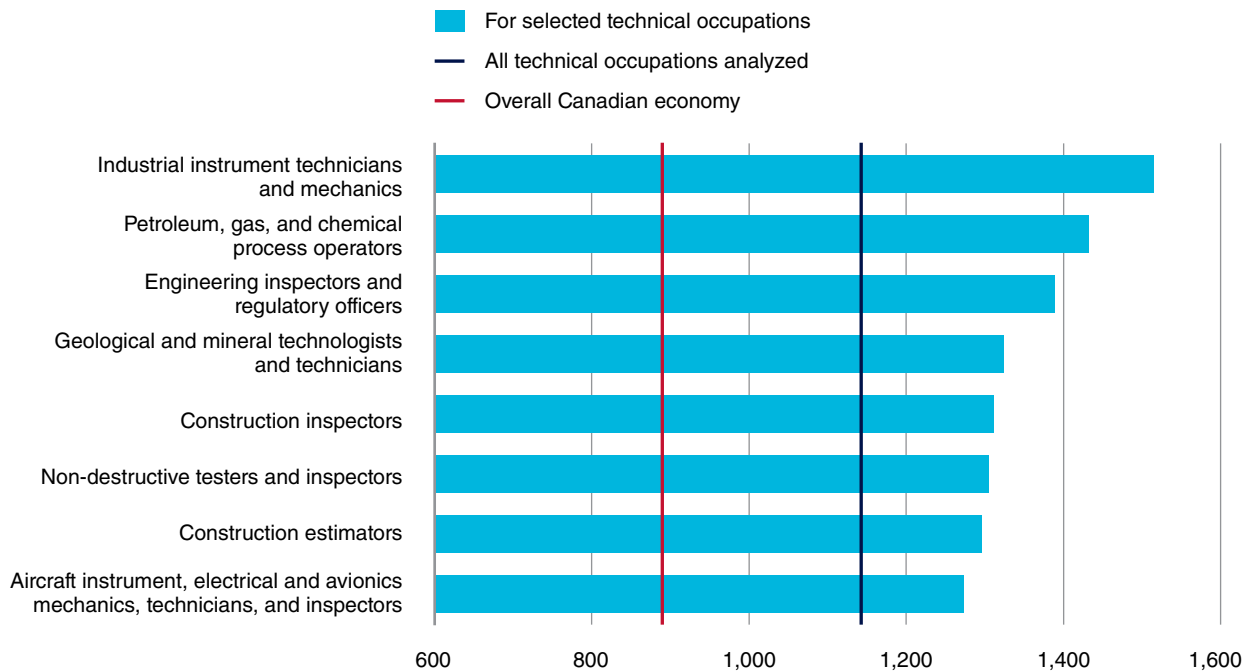
Sources: The Conference Board of Canada; Statistics Canada.

Still, the average weekly wage rate varies from one occupation to another. Each occupation under study is associated with a specific set of skills and responsibilities and some are concentrated in industries facing very different economic conditions. Occupations generally associated with the mining, quarrying, and oil and gas extraction sector—such as petroleum, gas and chemical process operators, and geological and mineral technologists and technicians—tend to have high wage

2 The average weekly wage rate for the engineering and applied science technologists and technicians is calculated as a weighted average of all technicians and technologists occupational categories.

rates relative to the other technical occupations. Industrial instruments technicians and mechanics; construction estimators and inspectors; aircraft instruments, electrical, and avionics technicians; engineering inspectors and regulatory officers; and non-destructive testers and inspectors are also among the occupations with the highest average weekly wage rates. (See Chart 5.)

**Chart 5**  
**Average Weekly Wage Rate, 2013–14**  
 (\$)



Sources: The Conference Board of Canada; Statistics Canada.

## CHAPTER 4

# Measuring the Economic Contribution of Engineering and Applied Science Technicians and Technologists

### Chapter Summary

- We have developed a methodology using wage data at the occupational and industrial levels to estimate the amount of GDP (or value-added) to which engineering and applied science technicians and technologists contribute in each industry.
- The direct economic contribution of engineering and applied science technicians and technologists was worth \$54.7 billion in 2011—3.3 per cent of Canadian GDP (or value-added).
- Based on our methodology, a technician working in a highly productive capital-intensive industry would have a larger economic contribution than a technician working in a labour-intensive industry with relatively low productivity.



## Methodology

**The complexity in measuring the output produced by a group of workers stems from the fact that an occupational category (e.g., engineering and applied science technicians and technologists) does not produce direct output. Statistics Canada does not provide output data by occupation since output is measured by industry. Indeed, output results from the combination of different factors of production such as labour and capital. As such, it is difficult to differentiate the output attributed to different occupational categories within an industry.**

Yet, it is possible to estimate the amount of output associated with the work of an occupation in a given industry by using wage data by occupation and by industry. Based on these data, we can calculate the ratio of wages paid to technicians and technologists over total wages paid to all workers in each industry. We use this ratio as a proxy for the ratio of output associated with the work of technicians and technologists (and the capital they use) in each industry.

### **Breaking Down Occupational Data by NAICS Industries**

Through a special request to Statistics Canada, we obtained the Labour Force Survey data on the total number of employees and the average weekly wage rate of the occupational categories listed earlier. For this level of occupational detail, only two-year averages of employment data were available from 1997–98 to 2013–14.

To measure the economic contribution of an occupational category, the number of workers within this occupational category must first be broken down by industry. To do so, we used detailed occupational and industrial data from the 2011 National Household Survey (NHS).<sup>1</sup>

For each of the occupational categories being analyzed, we calculated the number of technicians and technologists found in each industry based on industrial proportions reported in the NHS. We then applied those shares to the total number of technician and technologist employees in Canada as reported in 2010–11 by the Labour Force Survey. We were thus able to obtain an approximation of the number of technicians and technologists in each industry in the Canadian economy. We followed the same process for each of the categories of technicians and technologists analyzed in this report.

### **Linking NAICS and CSNA**

The next step involved further data manipulation. To measure the economic contribution of technicians and technologists, we had to match the industries for which the shares were calculated—which are classified using NAICS—to the industries included in the IOIC used in the CSNA. For some industries in the IOIC, notably for construction, conceptual differences between the two systems led to some challenges with respect to matching the wages paid in a given NAICS industry for construction. As such, we made a number of assumptions to link the two systems. More specifically, the construction industries in the IOIC are broken down into residential construction, non-residential construction, engineering construction, repair construction, and other activities in the construction industry. Meanwhile, the construction industries in the NAICS are broken down into residential construction, non-residential construction, heavy and civil engineering construction, and specialty trade contractors. It can easily be assumed that workers in the “heavy and civil engineering construction” NAICS industry would be found in the CSNA “engineering construction” industry. However, specialty trade

1 Statistics Canada, *2011 National Household Survey*.

contractors, which include foundation, structure, and building exterior contractors, building equipment contractors, and building finishing contractors, could be found across different IOIC construction industries. For the purpose of this study, technicians and technologists in the specialty trade contractors NAICS industry were spread out across three different IOIC construction industries: residential construction, non-residential building construction, and engineering construction. The breakdown is based on the relative weight of these three industries.

### **Calculating the Wage Ratios**

Once the linkage between the two systems was completed, we proceeded to the calculation of the shares of wages paid to technicians and technologists over total wages paid to all workers in each industry.

For all categories of technicians and technologists, we multiplied the average weekly wage rate for that specific occupation<sup>2</sup> by 52 to obtain the average annual wage rate, and then multiplied the resulting amount by the estimated number of technicians and technologists (for each of the categories) in each industry in 2010–11. In this way, we obtain total wages paid to each category of technicians and technologists in each industry in the Canadian economy. We then calculated total wages paid to all employees in each industry in the same fashion. This number would be used as the denominator of the ratio.

Next, for each industry, we calculated the ratio of wages paid to technicians and technologists (aggregating the 21 types of technicians and technologists) over the total wages paid in that industry. We used this ratio as a proxy for the ratio of industrial output associated with the work of technicians and technologists in each industry. Using the input-output tables, we then multiplied each ratio to GDP in the respective industry to obtain the value-added in that industry attributed to technicians and technologists.

2 We make the assumption that the average weekly wage rate for each category of technologists and technicians is constant across all industries.

The study assesses the economic contribution of technologists and technicians along with the technology used in their work. Based on our methodology, a technician working in a highly productive capital-intensive industry would have a larger economic contribution than a technician working in a labour-intensive industry with relatively low productivity (for a given wage).

## Direct Contributions

The direct economic contribution of engineering and applied science technicians and technologists was worth \$54.7 billion in 2011—3.3 per cent of Canadian GDP (or value-added). This is larger, proportionally speaking, than the share of technicians and technologists in the Canadian workforce—which was at 2.5 per cent in 2010–11.

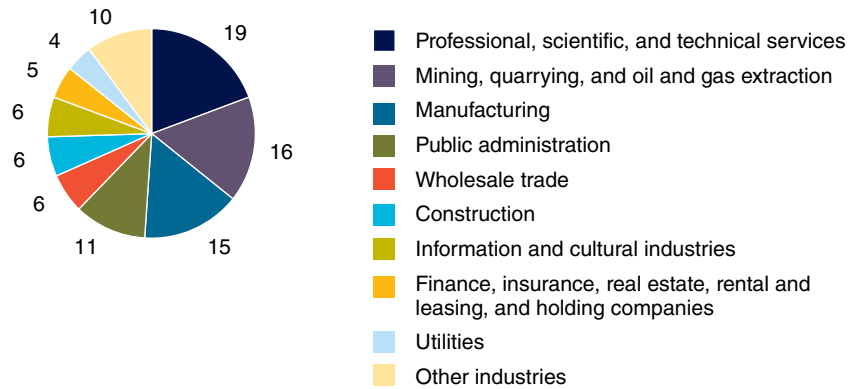
Based on our approach, a technician working in a highly productive capital-intensive industry would be estimated to have a larger economic contribution than a technician working in a low-productivity labour-intensive industry (for a given wage). Industry A may employ fewer technicians and technologists than industry B, but if industry A has a much higher productivity than industry B, the relatively smaller share of technicians and technologists working in industry A may be estimated to contribute more to the economy than the more numerous technicians and technologists in industry B.

For example, there are fewer engineering and applied science technicians and technologists in the mining, quarrying, and oil and gas extraction industry than in the manufacturing sector. Yet, the estimated economic contribution of the technicians and technologists (defined as the 21 occupations described previously) in the mining, quarrying, and oil and gas extraction industry is slightly larger than the economic contribution of the technicians and technologists working in the manufacturing sector. (See Chart 6.) This is in large part because the mining, quarrying, and oil and gas extraction industry is characterized by a much higher level of productivity than the manufacturing sector.

**Chart 6**

**GDP Contribution of Engineering and Sciences Technicians and Technologists by Industry**

(per cent)



Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey, Canadian System of National Accounts.

All in all, the economic contribution of engineering and applied science technicians and technologists depends, in part, on the ratio of wages paid to these professionals over the total wages paid to all workers in each industry in which they work. Their assessed economic contribution also depends on the level of productivity of the industries in which they work. Indeed, engineering and applied science technicians and technologists are found across a number of industries and their individual contribution is more significant in industries that have high productivities.

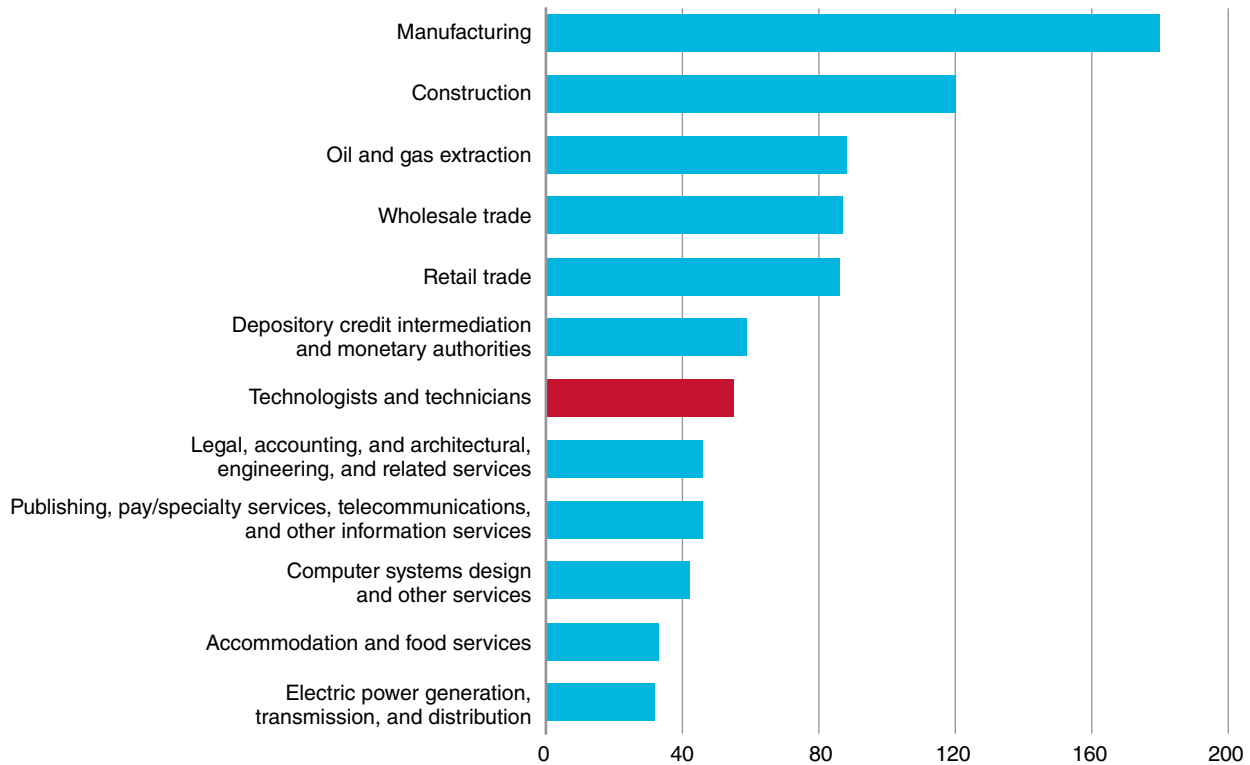
Along these lines, one cannot compare the GDP generated by an industry with the amount of GDP to which a group of professionals contribute. Chart 7 shows the amount of GDP to which technicians and technologists contributed in 2011, along with the GDP generated by a number of industries.<sup>3</sup> The chart should be interpreted solely as providing a sense of the importance of technicians and technologists' contributions to the economy.

3 The industries listed are at different levels of aggregations.

Chart 7

### GDP by Industry and GDP Contribution of the Engineering and Applied Sciences Technicians and Technologists, 2011

(\$ billions)



Note: This chart should be interpreted solely as providing a sense of the importance of technologists and technicians' contributions to the economy.

Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey, Canadian System of National Accounts.

## Indirect Contributions

The indirect impact measures the value-added that workers' activity (corresponding to a given occupation) generates economically through their demand for intermediate inputs or other support services.

However, one has to be careful when analyzing the indirect contribution of a given occupation found across a wide range of industries. In some cases, the direct contribution of an occupation in industry A would also reflect the indirect contribution of industry B.

Based on the 2011 NHS, technicians and technologists are found in every NAICS industry. As such, the indirect contributions of technicians and technologists on the overall economy (when summing up all industries) would count certain economic contributions more than once, and would thus overestimate the indirect contribution of these professions. Given this challenge, the indirect contribution of technicians and technologists on the overall economy cannot be isolated and accurately measured. Yet, it is clear that the work of engineering and applied science technicians and technologists is closely intertwined with the work of a number of professionals, including engineers, biologists, chemists, geoscientists, and architects. The economic contribution of such professionals often depends on the work of engineering and applied science technicians and technologists, and vice versa.

## CHAPTER 5

# Overview of Trends in the Main Industries Employing Engineering and Applied Science Technicians and Technologists

### Chapter Summary

- Engineering and applied science technicians and technologists are spread across a wide range of occupations and industries. As such, there is no one-size-fits-all trend analysis applicable to all categories of technicians and technologists.
- Most of these professionals work in the professional, scientific, and technical services sector, the manufacturing sector, and the public administration sector, as well as in the construction, information, mining, and oil and gas extraction sectors.
- An overview of these sectors can help us understand past trends and future demand for engineering and applied science technicians and technologists.

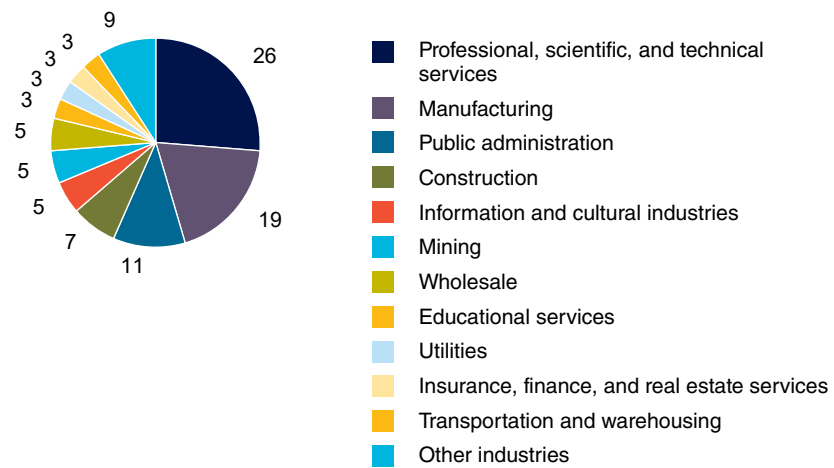


**Engineering and applied science technicians and technologists are spread across a wide range of occupations and industries. As such, there is no one-size-fits-all trend analysis applicable to all categories of technicians and technologists. However, more than a quarter of such professionals work in the professional, scientific, and technical services sector, close to a fifth work in the manufacturing sector, and large numbers are also found in the public administration sector, as well as in the construction, information, mining, and oil and gas extraction sectors. (See Chart 8.)**

**Chart 8**

**All Engineering and Applied Science Technicians and Technologists Broken Down by Main Sector**

(per cent)



Sources: The Conference Board of Canada; Statistics Canada.

An overview of these sectors<sup>1</sup> can help us understand past trends and future demand for engineering and applied science technicians and technologists.

## Professional, Scientific, and Technical Services

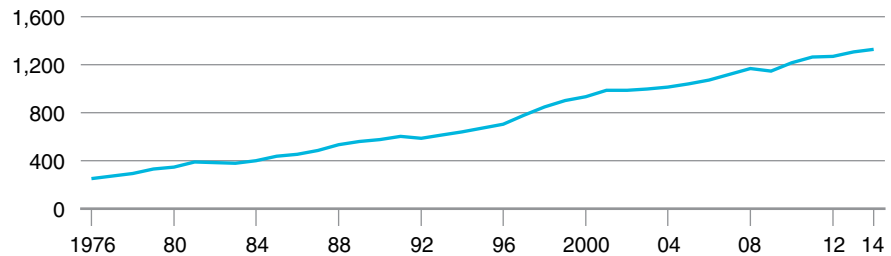
The professional, scientific, and technical services sector is a large sector in the Canadian economy and includes a variety of services. These services are:

- legal
- accounting, tax preparation, bookkeeping, and payroll
- architectural, engineering, and related
- specialized design
- computer systems design and related
- management, scientific, and technical consulting
- scientific research and development
- advertising, public relations, and related
- other professional, scientific, and technical

Chart 9

### Professional, Scientific, and Technical Services

(employment, 000s)



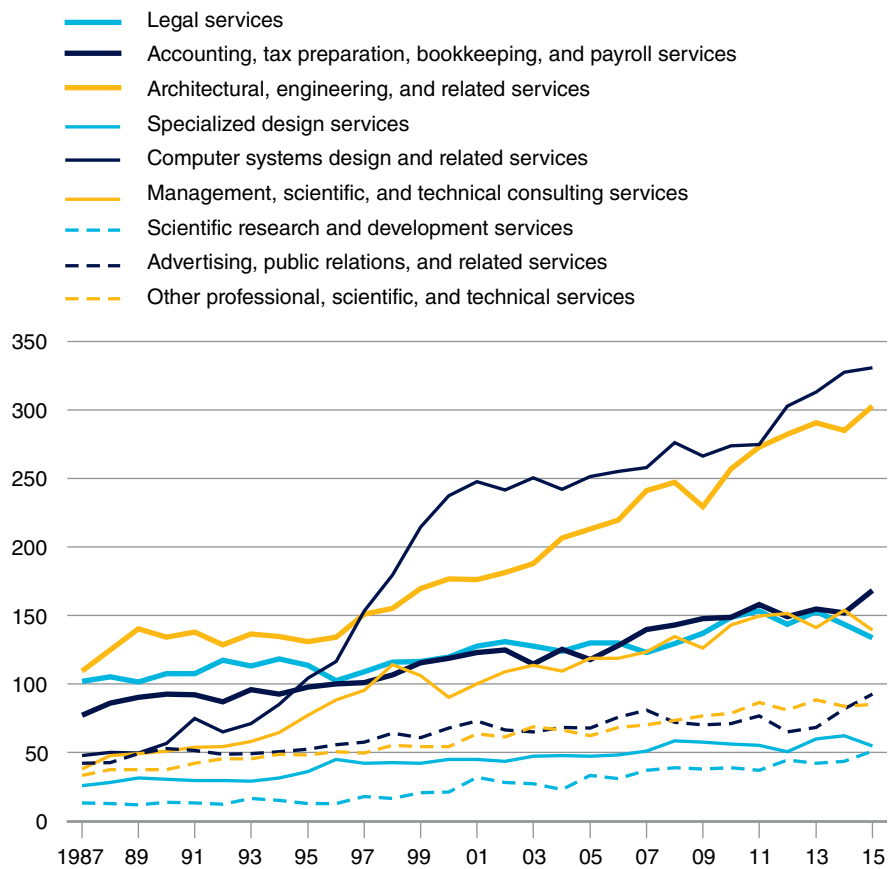
Sources: The Conference Board of Canada; Statistics Canada.

1 The Conference Board of Canada, *Canadian Outlook Economic Forecast: Winter 2016*.

This sector's workforce experienced significant growth over the past 25 years (see Chart 9) and accounts for a growing share of total employment.

Computer systems design; architectural, engineering, and related services; and management, scientific, and technical consulting services were responsible for most of the phenomenal growth in employment

**Chart 10**  
**Professional, Scientific, and Technical Services Industries**  
 (employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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A weaker Canadian dollar will help the competitiveness of many services sector exports.

in the professional, scientific, and technical services sector since the early 1990s. (See Chart 10.) Today, computer systems design and architectural and engineering services account for the largest shares of workers in the professional, scientific, and technical services workforce.

Opportunities for technicians and technologists working in the professional, scientific, and technical services sector will likely fare relatively well in coming years. Canada's continuing evolution to a knowledge and services sector economy is unlikely to slow. A weaker Canadian dollar will help the competitiveness of many services sector exports. Furthermore, over the medium term, the weaker loonie, coupled with a strengthening U.S. and global economy, will also help bolster Canadian goods exports. This bodes well for technical workers in the professional, scientific, and technical services sector. Indeed, services, including professional, scientific, and technical services, contribute to the production of exported manufactured goods, such as machinery and equipment and transport equipment.<sup>2</sup>

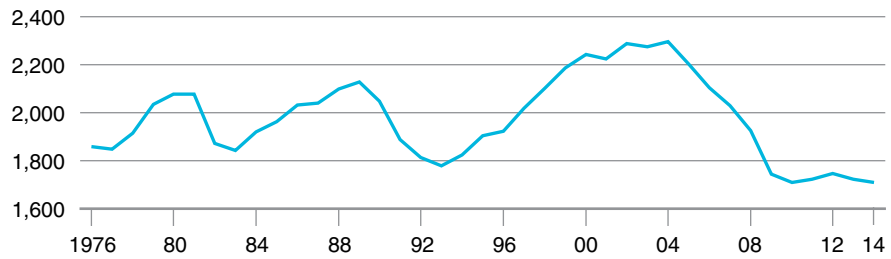
## Manufacturing Sector

From 2004 to 2010, the manufacturing sector went through major restructuring due to acute global competition. This restructuring and the effect of the 2008–09 recession led to a significant contraction in the manufacturing workforce over that period. (See Chart 11.) And from 2010 to 2014, the number of manufacturing workers has remained relatively stable, even as manufacturing GDP has increased by 7.7 per cent.

Steady economic growth in the U.S. and gains in U.S. business investment will support demand for Canadian manufactured products and likely lead to modest hiring in the manufacturing sector in coming years.

2 Palladini, *Good Service Is Good Business*.

**Chart 11**  
**Manufacturing Sector**  
 (employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

Increased investment in capacity will allow manufacturing production in some industries to continue to grow at a steady pace in coming years. Yet, employment is not expected to ever recover to its pre-recession levels, in large part because of growing global competition and the adoption of newer and less labour-intensive manufacturing technology.

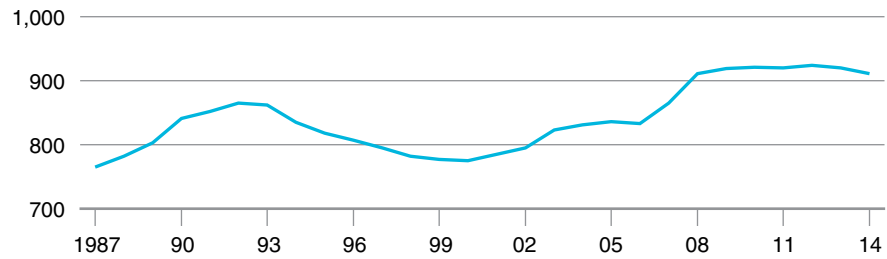
Canadian manufacturers can compete globally, but not in labour-intensive processes. Investment in state-of-the-art technologies—helping to boost output but not employment—will define the future of manufacturing in Canada. The move toward automation, robotics, and other innovative processes is expected to continue to support demand for high-skilled technical workers, including technicians and technologists.

## Public Administration

Roughly 11 per cent, or 45,000 of the technicians and technologists included in this study, work in public administration. Public administration employment posted strong growth from 2001 to 2008. However, since then, employment has remained relatively flat. (See Chart 12.)

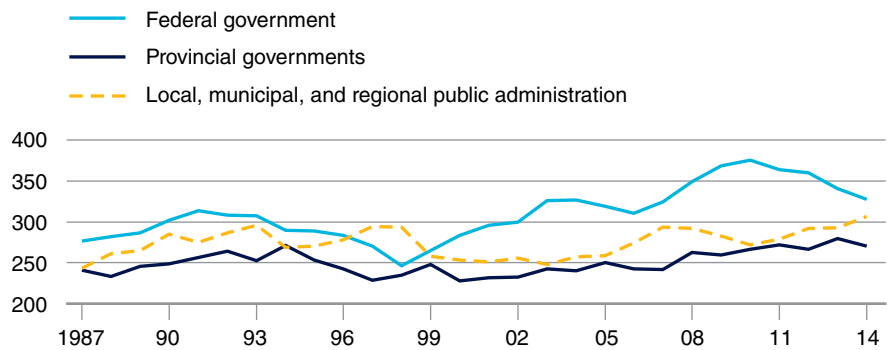
A detailed analysis of public sector employment reveals that provincial public administration employment followed an upward trend from 2001 to 2013 despite some ups and downs from year to year. Local, municipal,

**Chart 12**  
**Public Administration**  
(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

**Chart 13**  
**Public Administration Employment by Level of Government**  
(employment, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

and regional public sector employment also grew over that period, although the workforce contracted in 2009 and 2010 before expanding again in the following years. As for the federal public administration sector, its workforce expanded at a fast pace from 2007 to 2010, but most of these gains were slashed during the 2011–14 period. (See Chart 13.)

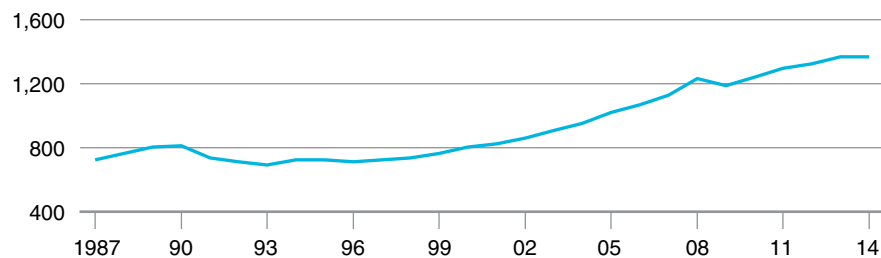
In fact, most of the job losses in the public sector in recent years have been at the federal level, as the federal government kept a tight rein on spending in an effort to eliminate its deficit. But provincial governments followed the lead and have been shedding jobs as well in 2014 and 2015. As the provinces continue to keep tight control on their spending, their hiring over the next few years will be limited.

Overall, the sustained efforts by governments to balance their books through fiscal restraints led to the contraction of the overall (all levels) public administration workforce in 2013, 2014, and 2015, and only modest employment gains are forecast for the next few years. Yet, the increase in public infrastructure investment expected in coming years may support the demand for some types of technicians and technologists (e.g., civil engineering technicians and technologists) within the public sector.

## Construction Sector

The construction sector employs about 7 per cent of the technicians and technologists included in this study. Construction employment grew at a strong pace in the 2000s thanks to strong increases in private and public investment. The sector did experience job losses in 2009 as a result of the 2008–09 recession. However, the construction workforce expanded again from 2010 to 2013. (See Chart 14.)

**Chart 14**  
**Construction Sector**  
 (employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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Investment in the  
oil and gas industry  
fell by 24 per cent  
in 2015.

The employment outlook for the construction sector is the result of mixed factors. The collapse in oil prices and the resulting economic uncertainty was a drag on business investment in non-residential structures in 2015. Weak oil prices led to a significant drop in corporate profits, which forced energy companies to pull back on capital spending on engineering projects and mineral exploration. Overall, investment in engineering structures in the oil and gas industry fell by 24 per cent in 2015.

The construction sector on the non-energy side also faces uncertainty, but the picture here is somewhat brighter. A stronger U.S. economy and a weaker Canadian dollar will support demand for Canadian exports, which should in turn encourage exporters to expand their existing facilities or add new production space.

Still, export growth will likely not have an immediate effect on construction activity. Indeed, before a sector begins to add capacity and build new infrastructure, it usually first uses up all its existing capacity. The wood product manufacturing industry is near full capacity, with a capacity utilization rate of 95.3 per cent. Similarly, the chemical manufacturing industry capacity utilization rate is at 83.6, which is well above its 10-year average. On the other hand, machinery manufacturing is currently using 82.3 per cent of its capacity, a share similar to its 10-year average.<sup>3</sup> These industries are among the sectors expected to experience the strongest exports growth in coming years. As exports continue to grow and these industries approach full capacity, they will be prompted to increase investment. This would support to some extent construction employment.

In the office segment of the construction sector, fewer projects are expected to be started over the next few years while existing capacity is absorbed. Owners in the oversupplied regions will need to find takers for their vacant office space before any new projects are initiated.<sup>4</sup>

3 Armstrong, *Canada's Non-Residential Construction Industry*.

4 Ibid.



The commercial segment of the construction industry is also not expected to do very well. Several long-established retail chains have either gone out of business or are in the process of restructuring their operations, leading to the closure of hundreds of stores across the country.<sup>5</sup> This excess capacity will need to be absorbed only slowly, which will weigh on employment growth in the construction sector.

In terms of public investment in infrastructure, government spending ramped up during the 2008–09 recession to provide some much-needed economic stimulus. When private sector economic growth returned, governments' focus moved from stimulating economic activity to reducing the large deficits that emerged during the recession. The provinces and the federal government slowed growth in infrastructure spending, resulting in real declines in public investment from 2011 through 2014.

Public investment in infrastructure is now entering another period of growth. Many public infrastructure projects are initiated at the municipal level, but the funding for these projects is often divided equally between the municipal, provincial, and federal governments. As such, municipal infrastructure projects are largely constrained by provincial and federal government budgets. Yet, provincial governments have committed to large-scale investment plans. Quebec and Ontario alone plan to provide a combined \$215 billion in infrastructure funding over a 10-year period. Furthermore, in its 2016 budget, the federal government announced immediate investments in public transit, green infrastructure, and social infrastructure, representing \$11.9 billion invested over five years (as part of the government's 10-year plan).<sup>6</sup> These provincial and federal plans would help support, to some extent, construction employment and the demand for technical workers in the construction sector in coming years.

5 Ibid.

6 Government of Canada, *Budget 2016, Growing the Middle Class*.

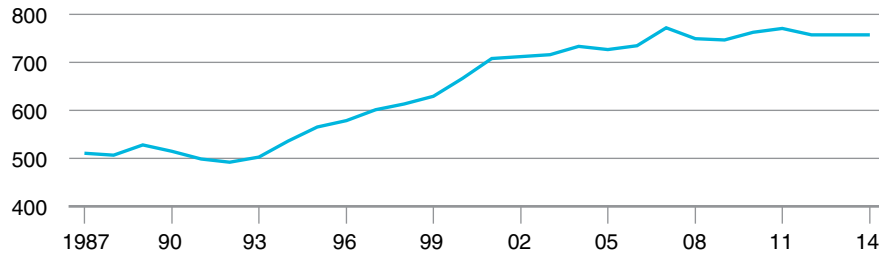
The information, cultural, and recreation sector experienced significant gains in the 1990s.

## Information, Cultural, and Recreation Industries

The information, cultural, and recreation sector includes publishing services (paper and software); motion picture and sound-recording industries; broadcasting; telecommunications; data processing, hosting, and related services; performing arts; spectator sports and related industries; heritage institutions; and amusement, gambling, and recreation Industries. About 5.4 per cent, or close to 22,000, of the technicians and technologists under study work in these industries.

The sector's workforce experienced significant gains in the 1990s thanks to the amusement and recreation industries (which include golf courses and skiing facilities, fitness and recreation sports centres, and bowling centres), and motion picture and video industries. However, since the early 2000s, employment has been growing at a slower pace, in part due to a slowdown in employment growth in these two industries. (See Chart 15.)

**Chart 15**  
**Information, Cultural, and Recreation Sector**  
(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

The telecommunications industry also has one of the largest workforces within this sector. Indeed, telecommunications employees account for close to one-fifth of the overall workforce in the information, cultural, and recreation sector. Yet, telecommunications employment has shown few gains over the past decade and a half.

Future employment growth in the telecommunications industry will be influenced by a number of factors, including households' and firms' pace of spending on telecommunications services. Indeed, slower growth in consumer spending has direct implications for the telecommunications industry, since consumers account for half of the industry's output. Although consumers' thirst for wireless data is set to grow at a rapid pace for the foreseeable future, their capacity and willingness to spend more on telecommunications services will not follow suit. The amounts households are dedicating to TV, Internet, and wireless services will continue to be constrained in the short term by slower-growth real disposable income per capita and high debt burdens.<sup>7</sup>

Given the deterioration in the Canadian business environment over the past year, firms will likely be more cautious when it comes to spending on telecommunications equipment and services. Moreover, according to Statistics Canada, the high cost of technology and implementation is the number-one barrier preventing firms from integrating more information and communications technology into their business.<sup>8</sup> Therefore, firms are likely to postpone upgrades to their telecommunications packages until the economic outlook brightens.<sup>9</sup> These may not be the most favourable conditions for the telecommunications industry to expand the size of its workforce in the near term.

7 Audet, *Canada's Telecommunications Industry*.

8 Statistics Canada, CANSIM table 358-0232.

9 Audet, *Canada's Telecommunications Industry*.

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The mining, quarrying, and oil and gas extraction sector benefits from a high level of productivity

## **Mining, Quarrying, and Oil and Gas Extraction Industries**

The mining, quarrying, and oil and gas extraction sector includes the following industries:

- oil and gas extraction
- coal mining
- metal ore mining
- non-metallic mineral mining and quarrying
- support activities for mining and oil and gas extraction

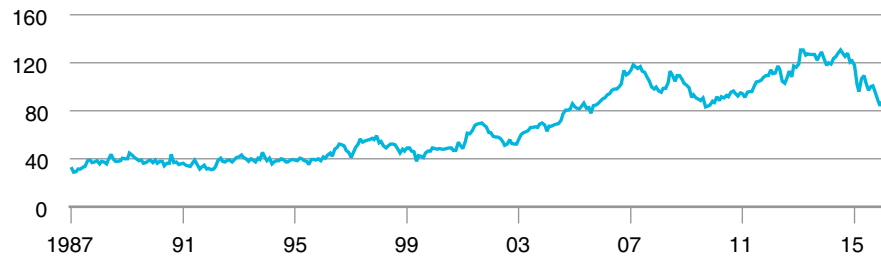
About 5 per cent, or 21,000 of the technicians and technologists under study work in the mining, quarrying, and oil and gas extraction sector. This sector does not have a large workforce as a share of total employment. However, it is very capital-intensive and benefits from a high level of productivity. As such, a technical professional working in this sector would tend to have a larger economic contribution than a technical professional working in a more labour-intensive sector.

The oil and gas extraction and “support activities for mining and oil and gas extraction” industries account for most of the sector’s workforce. The collapse in oil prices in the second half of 2014 prompted Canadian oil companies to quickly respond by paring billions of dollars from their investment plans, reducing their drilling activities, laying off workers, and instituting hiring freezes. In the “support activities for mining and oil and gas extraction” segment, which is made up, in large part, of oil and gas workers, there were close to 40,000 fewer workers in January 2016 than there were in October 2014. (See Chart 16.)

**Chart 16**

**Support Activities for the Mining and Oil and Gas Extraction Industry**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

Employment levels in the other segments of the sector have remained relatively elevated despite weak commodity prices. However, we expect crude oil prices to average only US\$38 a barrel in 2016 and increase only gradually over the forecast period, reaching around US\$55 a barrel in 2018 and US\$61 a barrel in 2019. As such, the oil patch will continue to struggle in the near term, and this will restrain overall employment and technologist and technician job opportunities in the mining, quarrying, and oil and gas extraction sector.

## CHAPTER 6

# Top 10 Engineering and Applied Science Technicians and Technologists Occupational Categories

### Chapter Summary

- This chapter provides an overview of the top 10 occupational categories (as measured by the number of workers in each occupation) in the engineering and applied science technicians and technologists broad occupational group.
- These top 10 occupations are computer network technicians, user support technicians, electrical and electronics engineering technologists and technicians, chemical technologists and technicians, civil engineering technologists and technicians, drafting technologists and technicians, construction estimators, construction inspectors, industrial engineering and manufacturing technicians and technologists, and mechanical engineering technologists and technicians.
- Employment trends in these occupational groups are influenced by a range of factors.

This chapter provides an overview of the top 10 occupational categories (as measured by the number of workers in each occupation) in the engineering and applied science technicians and technologists broad occupational group. These top 10 occupational categories are listed in Table 1 and discussed in the following subsections.

**Table 1**

**Top 10 Occupations Among the 21 Analyzed, 2013–14**

(employment level)

<b>Occupational category</b>	<b>Employment</b>
User support technicians	79,600
Computer network technicians	63,800
Electrical and electronics engineering technologists and technicians	29,600
Civil engineering technologists and technicians	25,900
Drafting technologists and technicians	25,800
Applied chemical technologists and technicians	21,300
Mechanical engineering technologists and technicians	18,500
Construction estimators	16,200
Construction inspectors	14,700
Industrial engineering and manufacturing technologists and technicians	14,200

Sources: The Conference Board of Canada; Statistics Canada.

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The number of computer network technicians has been following an upward trend.

## Computer Network Technicians

### Definition and Job Overview

Based on the Government of Canada's occupational profiles,<sup>1</sup> computer network technicians<sup>2</sup> “establish, operate, maintain and co-ordinate the use of local and wide area networks (LANs and WANs), mainframe networks, hardware, software and related computer equipment. They set up and maintain Internet and intranet websites and web-server hardware and software, and monitor and optimize network connectivity and performance.”<sup>3</sup>

### Main Employers of Computer Network Technicians

Computer network technicians are found in information technology departments throughout the private and public sectors.<sup>4</sup> They are employed in the professional, scientific, and technical services sector; the information and cultural industries; public sector; educational services; insurance, finance, and real estate services; and many more sectors. (See Chart 17.)

### Recent Employment Trends

The number of computer network technicians increased until 2000 (see Chart 18) thanks to increased investment in computer technology and Internet and intranet sites. Their number then declined between 2000–01 and 2003–04 as companies reduced business investment in the computer sector.<sup>5</sup> Since then, the number of computer network technicians has been following an upward trend thanks, once again, to

- 1 The Government of Canada's occupational profiles were the main source of information for occupational descriptions in Chapter 6.
- 2 Computer network technicians may have the following titles: Internet website technician; LAN (local area network) administrator; LAN (local area network) technician; web technician; computer network technician; data centre operator; network administrator; network support technician; supervisor, computer network technician; system administrator, supervisor—computer network technician.
- 3 Government of Canada, *2281 Computer Network Technicians*.
- 4 Ibid.
- 5 Service Canada, *Computer Network Technicians*.

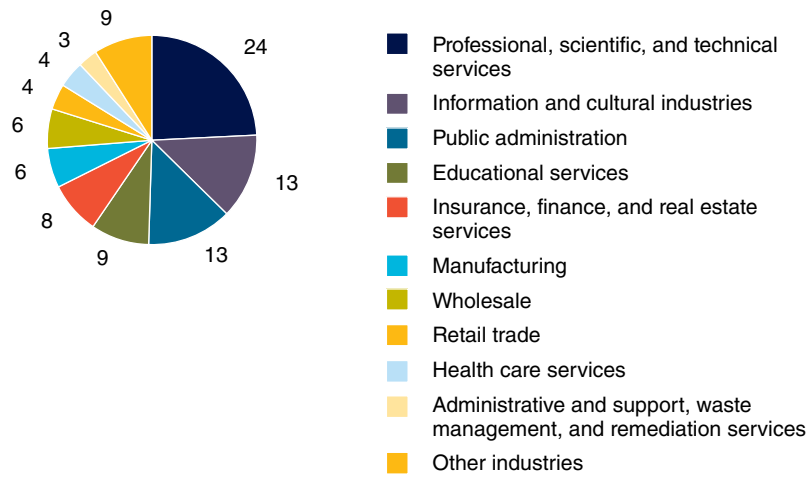


increased investment in computer technology. The demand for these professionals did feel the effect of the 2008–09 recession, but the upward trend quickly resumed in 2010–11.

**Chart 17**

**Computer Network Technicians Employment by Industry**

(per cent)

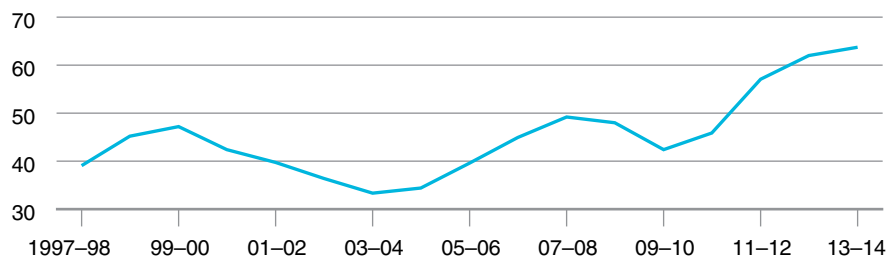


Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

**Chart 18**

**Computer Network Technicians**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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User support technicians are spread across the economy.

This upward trend will likely continue over the next few years thanks to continuous demand for computer services, the widespread use of the web, and the importance of continuously updating existing web sites.<sup>6</sup>

## User Support Technicians

### Definition and Job Overview

User support technicians<sup>7</sup> “provide first-line technical support to computer users experiencing difficulties with computer hardware and with computer applications and communications software.”<sup>8</sup>

More specifically, user support technicians “may communicate electronically and in person with computer users experiencing difficulties to determine and document problems; consult user guides, technical manuals and other documents to research and implement solutions, emulate or reproduce technical problems encountered by users, provide advice and training to users in response to identified difficulties, provide business systems, network and Internet support to users in response to identified difficulties, collect, organize and maintain a problems and solutions log for use by other technical support analysts, participate in the redesign of applications and other software” and “may supervise other technical support workers in this group.”<sup>9</sup>

### Main Employers of User Support Technicians

User support technicians are spread across the economy. They are employed by the professional, scientific and technical services sector, the information and cultural industries, and the public sector. (See Chart 19.) More specifically, they are employed by computer hardware

6 Ibid.

7 User support technicians may have the following titles: call centre agent—technical support; client support representative—systems; computer help desk representative—systems; computer help desk supervisor; hardware installation technician; hardware technical support analyst; help desk technician; software installation technician; software technical support analyst; systems support representative; technical support analyst—systems; technical support supervisor; user support technician.

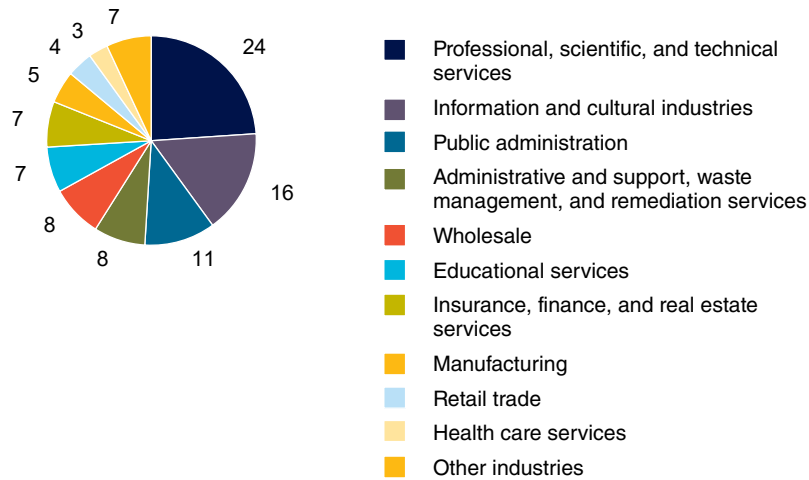
8 Government of Canada, *2282 User Support Technicians*.

9 Ibid.

**Chart 19**

**User Support Technicians Employment by Industry**

(per cent)



Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

manufacturers and retailers, software developers, and they work in call centres and in information technology units throughout the private and public sectors. They may also be employed by independent technical support companies or be self-employed.<sup>10</sup>

**Recent Employment Trends**

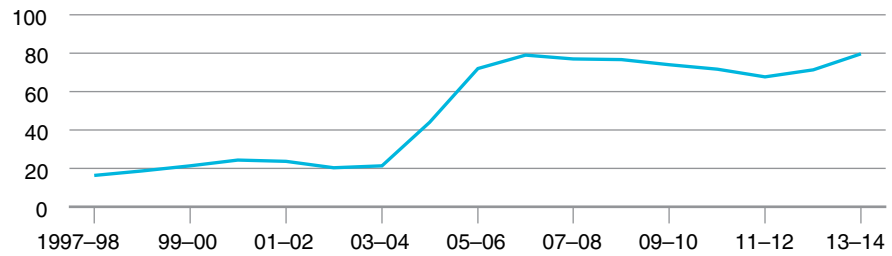
The number of user support technicians almost quadrupled in three years (between 2003–04 and 2006–07) from 21,000 workers in 2003–04 to 79,000 in 2006–07. Employment levels have remained relatively stable since; in 2013–14, there were around 80,000 workers. (See Chart 20.)

<sup>10</sup> Ibid.

Chart 20

**User Support Technicians**

(employment level, 000s)

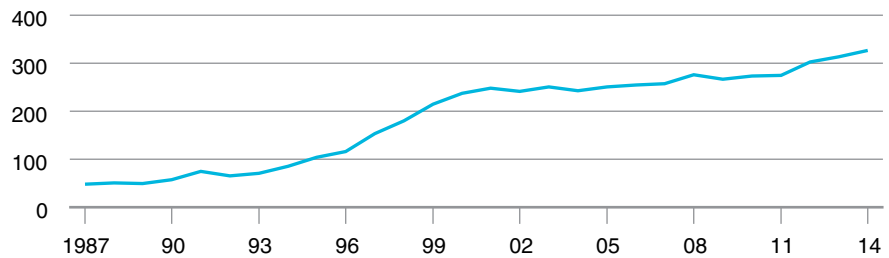


Sources: The Conference Board of Canada; Statistics Canada.

Chart 21

**Computer Systems Design Industry**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

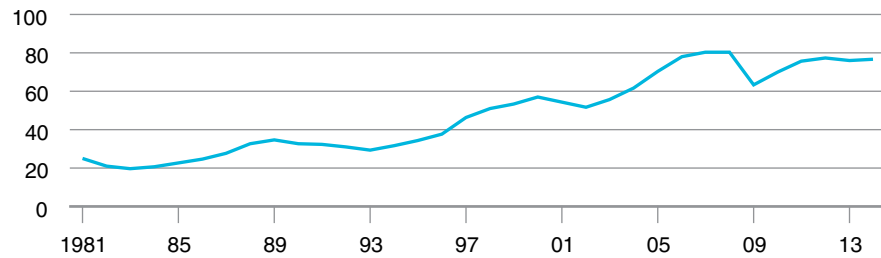
These past employment trends were the result of a number of factors. During the 1990s, demand for computer services from businesses boomed, leading to strong growth in employment in the computer systems design industry over that period. (See Chart 21.)

Employment growth in the computer systems design industry was also driven by work to eliminate the Y2K bug (also called the Millennium Bug) “that may have caused problems when dealing with dates beyond December 31, 1999.”<sup>11</sup> The end of the work on the Millennium Bug and the softening in business investment in computers in the early 2000s led to a small decline in the number of user support technicians between 2001–02 and 2002–03. (See Chart 20.) The number of user support technicians then increased at a fast pace from 2003–04 to 2006–07 thanks to a significant increase in business investment in machinery and equipment, including purchases of computers and other electronic products. (See Chart 22.)

Chart 22

**Business Investment in Machinery and Equipment**

(2007 \$ millions)



Sources: The Conference Board of Canada; Statistics Canada.

Business investment in machinery and equipment is expected to remain subdued in 2015 and in 2016, but growth is expected to pick up in 2017. This will likely stimulate demand for computer services and user support technicians during the following years.

11 National Geographic, *Encyclopedic Entry: Y2K Bug*.

Employment of electrical and electronic engineering technologists and technicians has remained relatively stable.

## Electrical and Electronics Engineering Technologists and Technicians

### Definition and Job Overview

Electrical and electronics engineering technologists and technicians<sup>12</sup> “may work independently or provide technical support and services in the design, development, testing, production and operation of electrical and electronic equipment and systems.”<sup>13</sup>

Specifically, electrical and electronics engineering technologists may design, develop, and test power equipment and systems, industrial process control systems; telecommunications, broadcast, recording, and audiovisual systems; micro-electronic systems and circuits; computers, computer systems, and networks; and computer software. They also supervise the building and testing of prototypes according to general instructions and established standards and conduct or supervise the installation, commissioning, and operation of electrical and electronic equipment and systems other than aircraft electronics or instruments. They carry out applied research in fields of electrical and electronic engineering and physics under the direction of scientists or engineers; set up and operate specialized and standard test equipment to diagnose, test, and analyze the performance of electrical and electronic components, assemblies, and systems; write specifications, schedules, and technical reports; and control schedules and budgets.<sup>14</sup>

Technicians in electrical and electronics engineering generally assist in similar tasks. They may assist in the design, development, and testing of electrical and electronic components, equipment, and systems; assist

12 Electrical and electronic engineering technologists and technicians may have the following titles: communications technologist; electrical engineering technician; electrical engineering technologist; electricity distribution network technologist; electronics design technologist; electronics engineering technician; electronics engineering technologist; electronics manufacturing technician; electronics manufacturing technologist; lighting technologist; metering technologist; microwave maintenance technician; production support technician—electronics manufacturing.

13 Government of Canada, *2241 Electrical and Electronics Engineering Technologists and Technicians*.

14 Ibid.

in inspection, testing, adjusting, and evaluation of incoming electrical, electro-mechanical, and electronic components and assemblies to ensure conformance with product specifications and tolerances; conduct life tests (burn-ins) on assemblies and record and analyze results; and assist in building and testing prototypes to specifications. They may also carry out a limited range of technical functions in support of research in electrical and electronic engineering and physics; install, operate, and maintain electrical and electronic equipment and systems; calibrate electrical or electronic equipment and instruments according to technical manuals and written instructions; and collect and compile operational or experimental data and assist in the preparation of estimates, schedules, budgets, specifications, and reports.<sup>15</sup>

### **Main Employers of Electrical and Electronics Engineering Technologists and Technicians**

Electrical and electronic engineering technologists and technicians are distributed across a wide range of industries, with manufacturing employing the largest shares. Electrical and electronic engineering technologists and technicians are employed by manufacturers of electrical and electronic equipment, consulting firms, electrical utilities, the wholesale and retail trade sector, construction companies, the public sector, communications companies, and a wide range of other services industries. (See Chart 23.)

### **Recent Employment Trends**

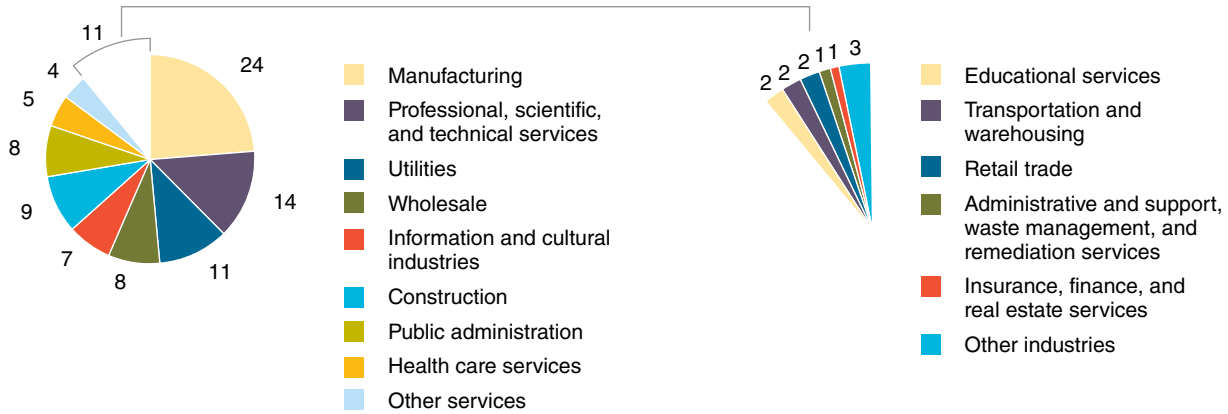
The electrical and electronic engineering technologists and technicians category is the third-largest occupational category among the 21 included in this study. As is the case for the user support technicians and computer network technicians, employment of electrical and electronic engineering technologists and technicians increased in the late 1990s. Their number then declined gradually up to 2005–06 and has remained relatively stable since. (See Chart 24.)

15 Ibid.

Chart 23

**Electrical and Electronic Engineering Technologists and Technicians by Main Industry**

(per cent)



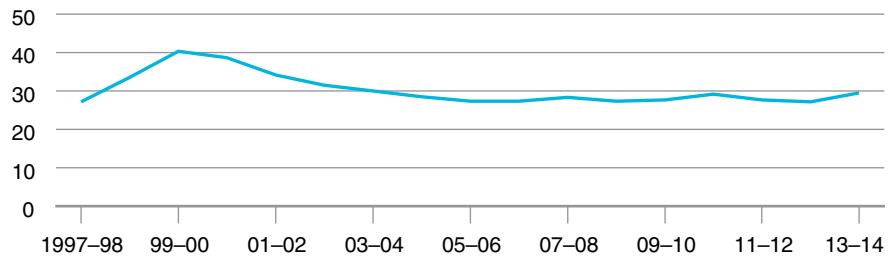
Note: Totals may not add to 100 due to rounding.

Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

Chart 24

**Electrical and Electronics Engineering Technologists and Technicians**

(employment level)



Sources: The Conference Board of Canada; Statistics Canada.

Employment trends in this occupation depend on factors influencing the computer and electronic product manufacturing industry and the demand for and widespread use of machines and equipment with computer and electronic components.

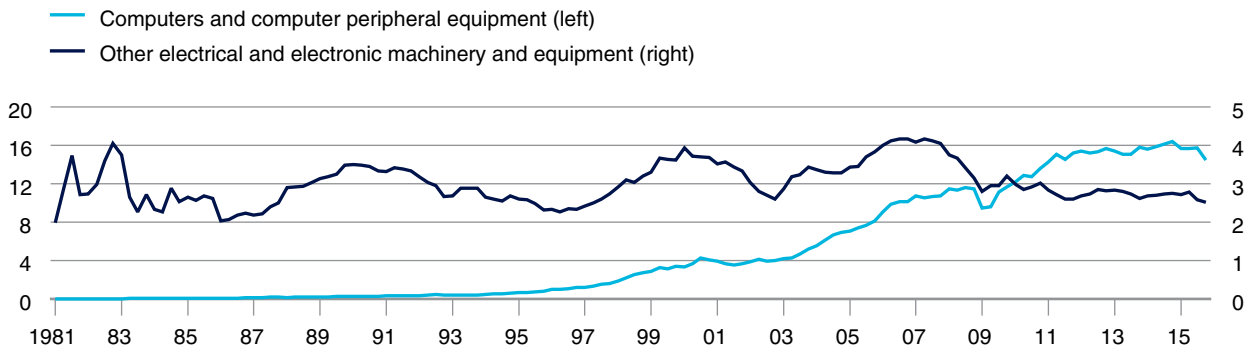


The employment gains in the late 1990s were the result of strong growth in investment in computer and computer peripheral products and in other electrical and electronic machinery and equipment. Investment in computer products then stalled in the early 2000s, while investment in other electrical and electronic machinery and equipment declined sharply between 2000 and 2002. Investment did pick up during the following few years but this was short-lived. In particular, investment in electrical and electronic equipment dropped by more than 32 per cent from mid-2007 to early 2009 and has remained depressed since. (See Chart 25.)

Chart 25

### Business Investment in Computers and Computer Peripheral Equipment and Other Electrical and Electronic Machinery and Equipment

(2007 \$ millions)



Sources: The Conference Board of Canada; Statistics Canada.

Trends in the number of electrical and electronics engineering technologists and technicians followed a similar pattern. Their number fell by more than 32 per cent between 1999–2000 and 2005–06 due to growing global competition for computer and electronic products and weaker investment. (See Chart 24.)

The demand for electrical and electronic engineering technologists and technicians will likely be maintained in coming years. The growing global competition from low-wage countries is more evident in the production

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Machines and systems with computer and electronic components will likely support demand for electrical and electronic engineering technologists and technicians.

phase than in the design phase of computer and electronic products.<sup>16</sup> As such, job creation for electronics assemblers, fabricators, inspectors, and testers would be more negatively affected by growing competition than engineers and technologists who are more involved in the design phase of the products.<sup>17</sup>

Furthermore, electrical and electronic engineering technologists and technicians are required in “the design and testing stages of computer and electronic machines and systems but also in their installation, development, maintenance and repair.”<sup>18</sup> As such, the use of machines and systems with computer and electronic components across different sectors of the economy will likely support demand for electrical and electronic engineering technologists and technicians.

## Chemical Technologists and Technicians

### Definition and Job Overview

Chemical technologists and technicians<sup>19</sup> “provide technical support and services or may work independently in chemical engineering, chemical and biochemical research and analysis, industrial chemistry, chemical quality control and environmental protection.”<sup>20</sup>

Chemical technologists may set up and conduct chemical experiments, tests, and analyses using techniques such as chromatography, spectroscopy, physical and chemical separation techniques, and microscopy; operate and maintain laboratory equipment and apparatus

16 Ibid.

17 Ibid.

18 Ibid.

19 Chemical technologists and technicians may have the following titles: analytical technician; chemical, biochemistry technologist; chemical analyst; chemical engineering technician; chemical engineering technologist; chemical laboratory analyst; chemical research technician; chemical technician; chemical technologist; food technologist; formulation technician; geochemical technician; industrial hygiene technologist; mass spectrometer technician; master dyer—textiles, paint technician; pilot plant technician; quality control technician—chemical processing; quality control technician—food processing.

20 Service Canada, *2211 Chemical Technologists and Technicians*.

and prepare solutions of gas or liquid, reagents, and sample formulations; compile records and interpret experimental or analytical results; develop and conduct programs of sampling and analysis to maintain quality standards of raw materials, chemical intermediates, and products; assist in the development of chemical engineering processes, studies of chemical engineering procurement, construction, inspection, and maintenance, and the development of standards, procedures, and health and safety measures; operate experimental chemical or petrochemical pilot plants; conduct or assist in air and water quality testing and assessments, environmental monitoring, and protection activities, and development of and compliance with standards; assist in synthesis of small molecules for the purpose of creating drug candidates; and assist in the design and fabrication of experimental apparatus.<sup>21</sup>

Chemical technicians may assist in setting up and conducting chemical experiments, tests, and analyses; operate and maintain laboratory equipment and apparatus and prepare solutions of gas and liquid, reagents, and sample formulations; compile records for analytical studies; assist in developing and conducting programs of sampling and analysis to maintain quality standards; carry out a limited range of other technical functions in support of chemical research, tests, and analyses, and environmental air and water quality monitoring and protection; and assist in the design and fabrication of experimental apparatus.<sup>22</sup>

### **Main Employers of Chemical Technologists and Technicians**

Chemical technologists and technicians are found in the manufacturing sector, the professional, scientific, and technical services sector, as well as the public sector, wholesale, mining, educational services, and utilities. (See Chart 26.) More specifically, “they are employed by

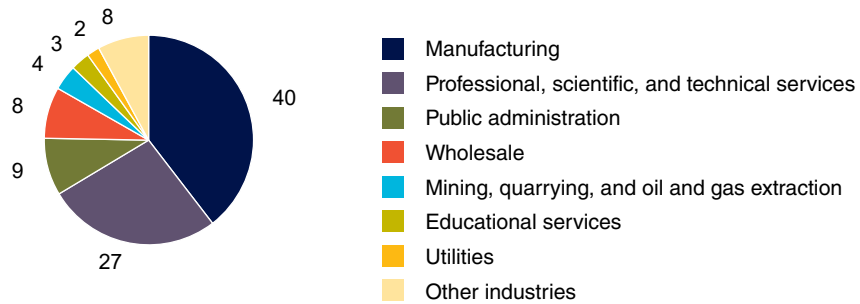
21 Ibid.

22 Ibid.

research and development and quality control laboratories, consulting engineering companies, in chemical, petrochemical, pharmaceutical and a variety of other manufacturing and processing industries.”<sup>23</sup>

Chart 26

**Chemical Technologists and Technicians Employment by Industry**  
(per cent)



Note: Totals may not add to 100 due to rounding.

Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

### Recent Employment Trends

Employment of chemical technologists and technicians has followed a downward trend from 2000–01 to 2010–11 but increased slightly afterwards. (See Chart 27.)

Changes in employment levels for chemical technologists and technicians can be explained by the impact of technological innovations, scientific discoveries as well as legislative changes, and the level of government spending. Trends in the chemical manufacturing industry also influence demand for such professionals.<sup>24</sup>

Pharmaceutical production was a key driver of employment growth in the chemical manufacturing industry in the 1990s. (See Chart 28.) However, pharmaceutical firms have been facing an increasingly competitive

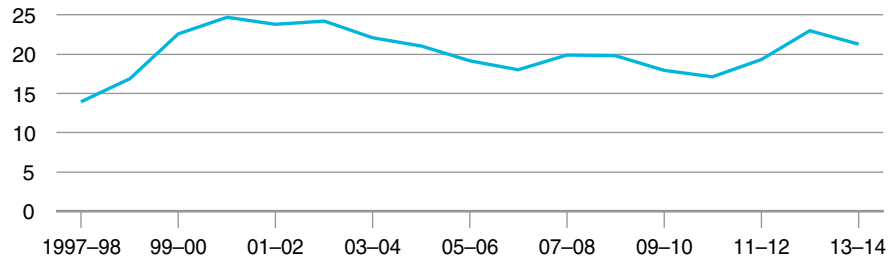
23 Ibid.

24 Service Canada, *Chemical Technologists and Technicians*.

Chart 27

**Chemical Technologists and Technicians**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

market and some have experienced closures and layoffs over the past decade. These firms will likely continue to face a number of challenges in coming years<sup>25</sup> and this will limit employment growth in the chemical manufacturing sector.

On the other hand, the chemical manufacturing industry may benefit from lower oil prices. Oil is an important input in the production of a large number of chemicals and with oil prices expected to remain low for some time, this would benefit the chemical manufacturing industry through lower production costs. This may result in lower prices, which could stimulate growth in the demand for chemical products, and subsequently, for technical professionals in the field. Furthermore, technological innovations as well as increased public awareness of environmental safety may also help support to some extent demand for chemical technologists and technicians in coming years.<sup>26</sup>

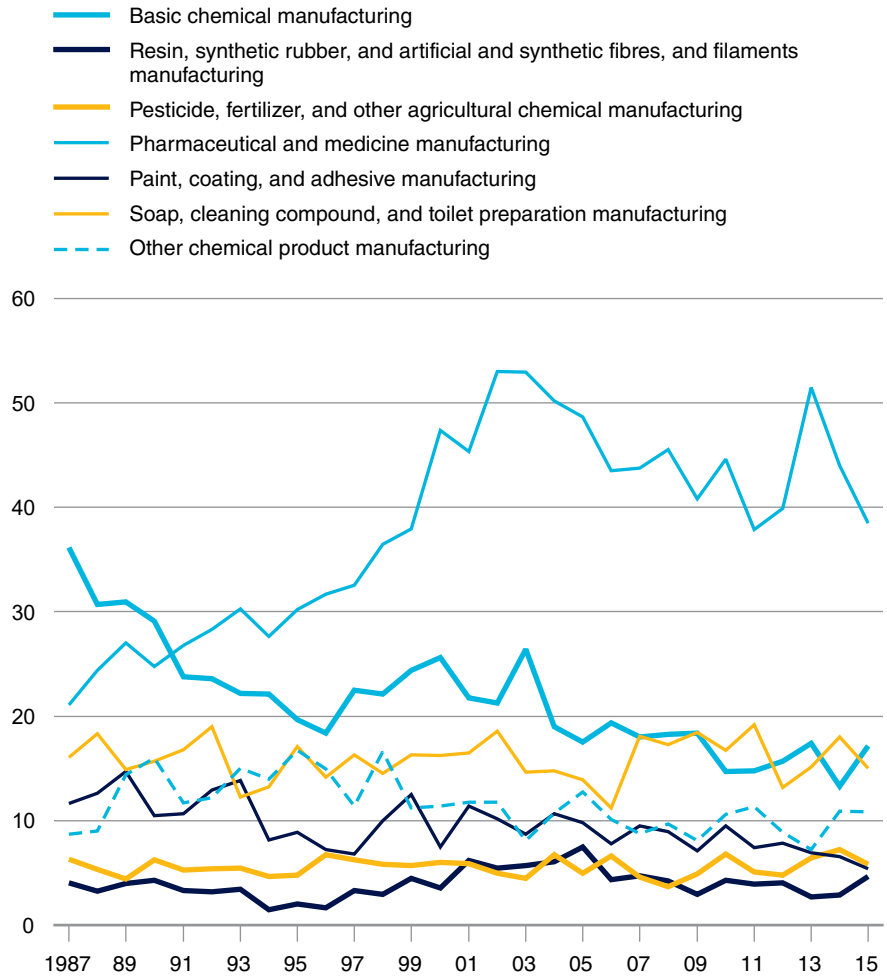
25 Industry Canada, *Canada's Pharmaceutical Industry and Prospects*.

26 Service Canada, *Chemical Technologists and Technicians*.

Chart 28

**Chemical Manufacturing Industries**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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The number of civil engineering technologists and technicians declined up to 2011–12 before rebounding.

## Civil Engineering Technologists and Technicians

### Definition and Job Overview

Civil engineering technologists and technicians<sup>27</sup> “provide technical support and services to scientists, engineers and other professionals, or may work independently in fields such as structural engineering, municipal engineering, construction design and supervision, highways and transportation engineering, water resources engineering, geotechnical engineering and environmental protection.”<sup>28</sup>

More specifically, civil engineering technologists may develop engineering designs and drawings from preliminary concepts and sketches; prepare construction specifications, cost and material estimates, project schedules and reports; supervise or conduct field surveys, inspections, or technical investigations of topography, soils, drainage and water supply systems, road and highway systems, buildings and structures to provide data for engineering projects; conduct or supervise inspection and testing of construction materials; and may supervise, monitor, and inspect construction projects.<sup>29</sup>

Civil engineering technicians may assist in developing engineering specifications and drawings; participate in field surveys, inspections, or technical investigations of topography, soils, drainage and water supply systems, road and highway systems, buildings and structures to provide data for engineering projects; and may perform other technical functions in support of civil engineering activities.<sup>30</sup>

27 Civil engineering technologists and technicians may have the following titles: bridge design technician; building materials technician; civil engineering technician; civil engineering technologist; construction technologist; foundation technologist; highway technician; municipal engineering assistant; soil technologist—civil engineering; specifications writer—construction; structural design technologist; structural investigator.

28 Government of Canada, *2231 Civil Engineering Technologists and Technicians*.

29 Ibid.

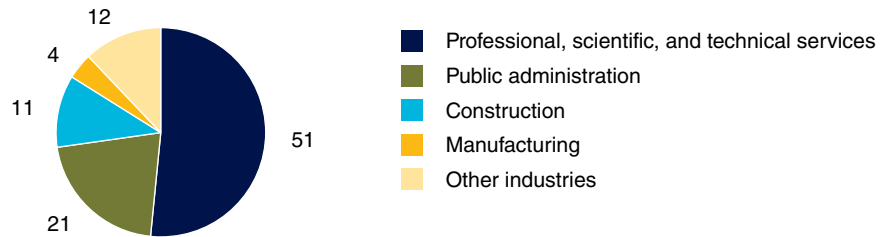
30 Ibid.

## Main Employers of the Civil Engineering Technologists and Technicians

Civil engineering technologists and technicians are employed by the professional, scientific, and technical services industry (e.g., consulting engineering companies), the public sector, construction companies, manufacturing industries, the transportation industry, and many other industries. (See Chart 29.)

Chart 29

### Civil Engineering Technologists and Technicians by Main Industry (per cent)



Note: Totals may not add to 100 due to rounding.

Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

## Recent Employment Trends

The number of civil engineering technologists and technicians increased from 1997 to 2009–10. Their number then declined up to 2011–12 before rebounding again during the following years.

Employment trends in this occupation are mainly influenced by trends in the construction sector. The construction industry experienced strong growth during the decade preceding the 2008–09 recession (boosted by strong increase in private and public investment), which supported the demand for civil engineering technologists and technicians over that period. Significant public investment in infrastructure then helped support the demand for those professionals during and following the recession.

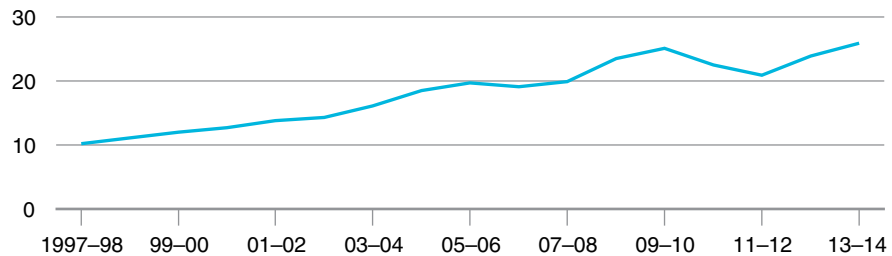


Their number fell in 2010–11 and 2011–12 as the effect of the stimulus package faded away, before increasing again in recent years. (See Chart 30.)

### Chart 30

#### Civil Engineering Technologists and Technicians

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

As described in Chapter 5, the outlook is mixed for the construction sector. Due to the collapse in oil prices, the construction sector is now undergoing a contraction. Furthermore, governments continue to attempt to balance their books, which will likely limit public investment in infrastructure. However, the tide may be slowly turning. A number of provincial governments have announced substantive infrastructure spending plans, and the federal government has recently announced immediate investments in public transit, green infrastructure, and social infrastructure, representing \$11.9 billion invested over five years (as part of the government's 10-year plan). This would help support, to some extent, the demand for civil engineering technologists and technicians in coming years.

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The number of drafting technologists and technicians has been following a downward trend over the past decade.

## Drafting Technologists and Technicians

### Definition and Job Overview

Drafting technologists and technicians<sup>31</sup> “prepare engineering designs, drawings and related technical information, in multidisciplinary engineering teams or in support of engineers, architects or industrial designers, or they may work independently.”<sup>32</sup>

More specifically, drafting technologists may develop and prepare engineering designs and drawings from preliminary concepts, sketches, engineering calculations, specification sheets, and other data; operate computer-assisted design (CAD) and drafting workstations; develop and prepare design sketches; complete documentation packages and produce drawing sets; check and verify design drawings to conform to specifications and design data; write technical reports; prepare contracts and tender documents; prepare construction specifications, costs, and material estimates; and supervise and train other technologists, technicians, and drafters.<sup>33</sup>

Drafting technicians may develop and prepare engineering drawings, plans, diagrams, or layouts from sketches and operate computer-assisted drafting equipment or a conventional drafting station.<sup>34</sup>

31 Drafting technologists and technicians may have the following titles: architectural draftsman; computer-assisted design and drafting technologist; computer-assisted drafting (CAD) technician; design and drafting technologist; drafting technician; drafting technologist; draftsman; electrical draftsman; electromechanical draftsman; electronic draftsman; engineering design and drafting technologist; mechanical draftsman; steel detailer; drafting, structural draftsman; structural steel drafter-detailer; and supervisor, drafting office.

32 Government of Canada, *2253 Drafting Technologists and Technicians*.

33 Ibid.

34 Ibid.

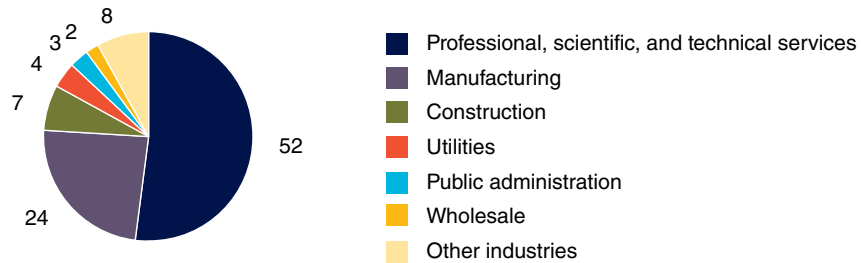
## Main Employers of Drafting Technologists and Technicians

Drafting technologists and technicians are found in a number of sectors including the professional, scientific, and technical services sector (consulting companies), construction companies, utility, resource, and manufacturing companies, as well as the public sector.<sup>35</sup> (See Chart 31.)

Chart 31

### Drafting Technologists and Technicians by Main Industry

(per cent)



Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

## Recent Employment Trends

The number of drafting technologists and technicians has been following a downward trend over the past decade and a half (despite some gains in the early 2000s and in 2007–08). (See Chart 32.)

This declining employment trend was largely influenced by changes in the manufacturing sector. The manufacturing sector suffered growing global competition over the years and sustained heavy job losses from 2004 to 2010. Manufacturing output and exports mainly depend on the design of original products—a task requiring the involvement of drafting technologists and technicians as well as industrial designers.<sup>36</sup> It is no surprise that the number of drafting technologists and technicians has

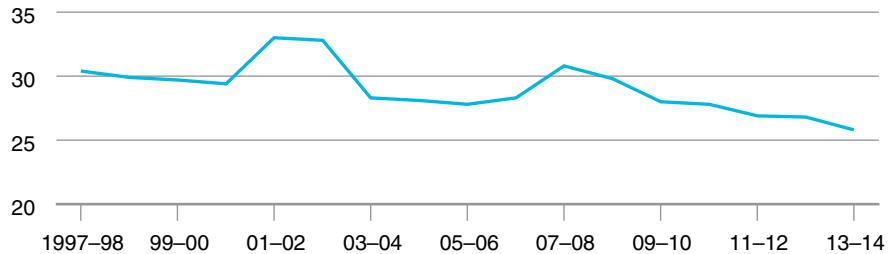
<sup>35</sup> Service Canada, *Drafting Technologists and Technicians*.

<sup>36</sup> Ibid.

Chart 32

### Drafting Technologists and Technicians

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

been following a downward trend over the years. Since we expect only moderate growth in manufacturing production (relative to the growth rates recorded in the 1990s) in coming years, drafting technologists and technicians employment is unlikely to experience major gains.

## Construction Estimators

### Definition and Job Overview

Construction estimators<sup>37</sup> “analyze costs of and prepare estimates on civil engineering, architectural, structural, electrical and mechanical construction projects. They are employed by residential, commercial and industrial construction companies and major electrical, mechanical and trade contractors, or they may be self-employed.”<sup>38</sup>

### Main Employers of Construction Estimators

Construction estimators are found across a number of sectors but primarily in the construction, professional, scientific, and technical services sector and the manufacturing sector. (See Chart 33.)

37 Construction estimators may have the following titles: chief estimator—construction; construction estimator; cost estimator—construction; principal estimator—construction; professional quantity surveyor; quantity surveyor—construction.

38 Government of Canada, *2234 Construction Estimators*.

**Chart 33**

**Construction Estimators' Employment by Industry**

(per cent)



Sources: The Conference Board of Canada; Statistics Canada.

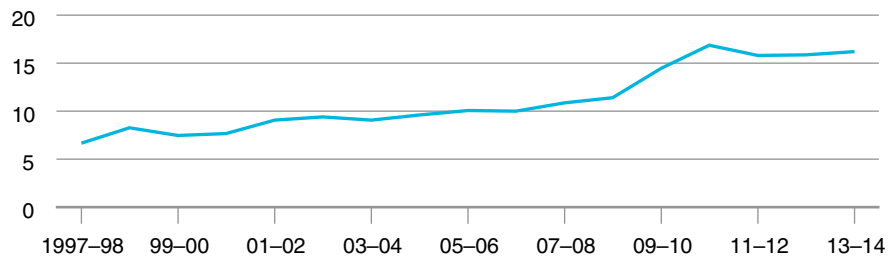
**Recent Employment Trends**

Construction estimators' employment has been following an upward trend over the past decade and a half. The number of construction estimators increased at an even faster pace between 2008–09 and 2010–11, a period characterized by high levels of public infrastructure investment. (See Chart 34.)

**Chart 34**

**Construction Estimators**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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Demand for construction estimators will likely remain soft.

Trends in employment in this profession will depend on factors affecting different segments of the construction industry, including residential, commercial, and industrial and civil engineering construction projects. As such, demand for construction estimators will likely remain soft in 2015 and 2016, in line with weak investment in residential and non-residential construction, but should pick up in 2017 and the following years.

A growing emphasis on research, planning, and cost-control activities could also support demand for construction estimators in coming years.<sup>39</sup>

## Construction Inspectors

### Definition and Job Overview

Construction inspectors<sup>40</sup> “inspect the construction and maintenance of new and existing buildings, bridges, highways and industrial construction to ensure that specifications and building codes are observed and monitor work site safety.”<sup>41</sup>

### Main Employers of Construction Inspectors

Construction inspectors are employed by the public sector, the professional, scientific, and technical services sector (e.g., architectural and civil engineering consulting firms), construction companies, or be self-employed.<sup>42</sup> (See Chart 35.)

39 Service Canada, *Construction Estimators*.

40 Construction inspectors may have the following titles: bridge inspector; building construction inspector; construction inspector; highway construction inspector; home inspector; housing construction inspector; mine inspector; construction, plumbing inspector; pre-stressed concrete inspector; safety officer—construction.

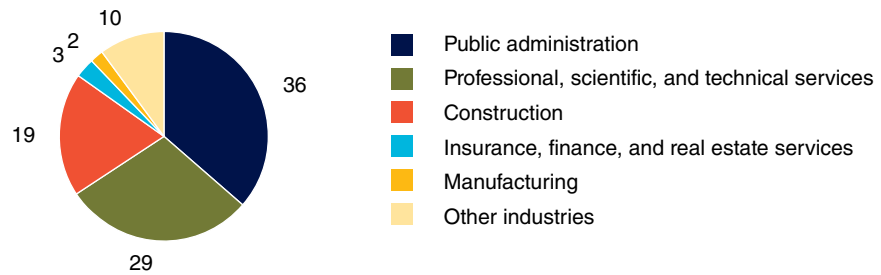
41 Government of Canada, *2264 Construction Inspectors*.

42 Ibid.

**Chart 35**

**Construction Inspectors' Employment by Industry**

(per cent)



Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

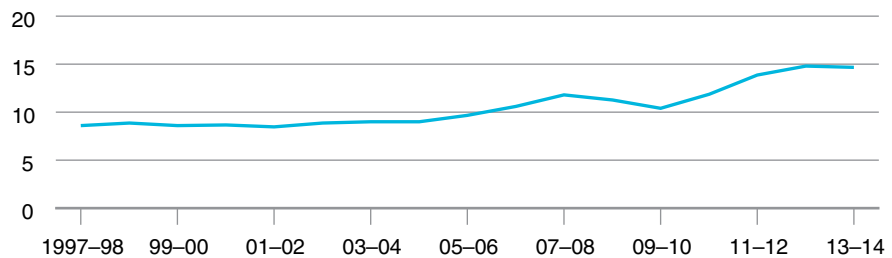
**Recent Employment Trends**

Employment for this occupational category increased at a strong pace from 2005–06 to 2007–08 but declined in 2008–09 and 2009–10 during the 2008–09 recession. Employment started to grow again in 2010–11 but stalled in 2013–14, in line with softer residential and business construction activity. (See Chart 36.)

**Chart 36**

**Construction Inspectors**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

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As construction picks up in 2017, employment for construction inspectors should follow suit.

The construction sector is estimated to have contracted in 2015 and construction activity will likely remain subdued in 2016 as well, which will limit the demand for construction inspectors in the near term. As construction picks up in 2017, employment for construction inspectors should follow suit.

## **Industrial Engineering and Manufacturing Technologists and Technicians**

### **Definition and Job Overview**

Industrial engineering and manufacturing technologists and technicians<sup>43</sup> “may work independently or provide technical support and services in the development of production methods, facilities and systems, and the planning, estimating, measuring and scheduling of work.”<sup>44</sup>

More specifically, industrial engineering and manufacturing technologists may develop and conduct production, inventory, and quality assurance programs in manufacturing or in other industries; design plant layouts and production facilities; develop and carry out work study and related programs; develop and carry out industrial health, safety, and fire prevention plans, and programs and conduct safety training programs; and develop applications using CAD/CAM (computer-assisted drafting, computer-assisted manufacturing) for the control of robots, computer numerical control (CNC) machines, and other manufacturing processes and operations.<sup>45</sup>

Industrial engineering and manufacturing technicians may assist in the design of plant layouts; conduct work measurement or other studies; collect and compile operational or experimental data and assist in

43 Industrial engineering and mechanical technologists and technicians may have the following titles: CAD/CAM programmer; industrial engineering technician; industrial engineering technologist; loss prevention technologist; manufacturing technician; manufacturing technologist; planning technician; plastics manufacturing technician; pulp and paper manufacturing technologist; quality assurance technologist; scheduling technician; manufacturing, textile technologist; time study analyst.

44 Government of Canada, *2233 Industrial Engineering and Manufacturing Technologists and Technicians*.

45 Ibid.



the development of estimates, schedules, specifications, and reports; collect and analyze data and samples in support of quality assurance and industrial health and safety programs; and develop manufacturing and processing procedures and variables, set machine or equipment controls, oversee production, and inspect processes.<sup>46</sup>

### Main Employers of Industrial Engineering and Manufacturing Technologists and Technicians

Industrial engineering and manufacturing technologists and technicians are employed mainly by manufacturing industries but also by the professional, scientific, and technical services sector, the wholesale and retail trade sector, and many other industries. (See Chart 37.) Still, “regardless of the industry in which they work, their duties are directly related to manufacturing production.”<sup>47</sup>

Chart 37

#### Industrial Engineering and Manufacturing Technologists and Technicians by Main Industry

(per cent)



Note: Totals may not add to 100 due to rounding.

Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

46 Ibid.

47 Service Canada, *Industrial Engineering and Manufacturing Technologists and Technicians*.

The manufacturing sector faced difficult conditions during the past decade and a half.

### Recent Employment Trends

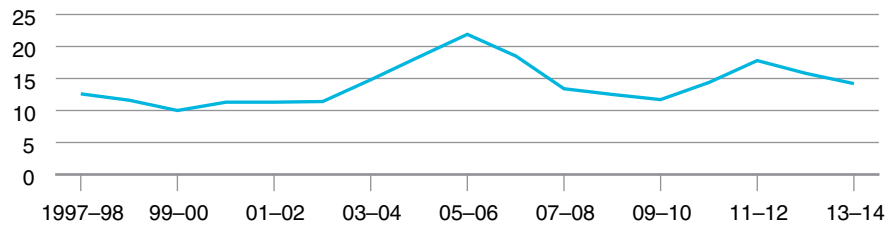
The number of industrial engineering and manufacturing technologists and technicians has shown limited growth over the past decade and a half.

Demand for industrial engineering and manufacturing technologists and technicians depends to a large extent on trends in the manufacturing sector. The manufacturing sector faced difficult conditions during the past decade and a half. As a result of the strong Canadian dollar, growing global competition and the 2008–09 recession, the manufacturing sector experienced significant job losses between 2004 and 2010 and has seen next to zero gains since. Reflecting the overall trends in the manufacturing sector, the number of industrial engineering and manufacturing technologists and technicians increased in the first half of the 2000s before declining during the second half of the decade. Despite some improvement since the 2008–09 recession, the number of industrial and manufacturing technologists and technicians remains below its peak of 2005–06. (See Chart 38.)

Chart 38

#### Industrial Engineering and Manufacturing Technologists and Technicians

(employment level)



Sources: The Conference Board of Canada; Statistics Canada.

Yet, all is not doom and gloom for industrial engineering and manufacturing technologists and technicians. The growing importance given to productivity is a positive factor, which could stimulate demand

for industrial engineering and manufacturing technologists. Productivity growth factors such as “quality management, production and delivery logistics and the use of information technology in the manufacturing process” are growing in importance, and these could be factors supporting the demand for industrial engineering and manufacturing technologists and technicians in coming years.<sup>48</sup>

Another factor influencing the demand for industrial engineering and manufacturing technologists and technicians, and also linked to the growing importance of productivity gains, is the level of investment in the manufacturing sector. The construction of a new plant or the installation of new equipment in an existing plant would require the participation of these technologists and technicians. Under the supervision of engineers, these technologists and technicians may need to “evaluate options, develop production methods, and plan the optimal use of human resources, equipment and materials.”<sup>49</sup> The recovery of the U.S. economy, the growing demand for Canadian manufactured products, and the growing need to increase productivity in order to remain competitive may support demand for such professionals in coming years.

## **Mechanical Engineering Technologists and Technicians**

### **Definition and Job Overview**

Mechanical engineering technologists and technicians<sup>50</sup> “provide technical support and services or may work independently in mechanical engineering fields such as the design, development, maintenance and

48 Ibid.

49 Ibid.

50 Mechanical engineering technologists and technicians can have the following titles: aeronautical technologist; heating designer; HVAC (heating, ventilating, and air conditioning) technologist; machine designer; marine engineering technologist; mechanical engineering technician; mechanical engineering technologist; mechanical technologist; mould designer; thermal station technician; tool and die designer; tool designer.

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Mechanical engineering technologists and technicians experienced job losses between 2005–06 and 2007–08.

testing of machines, components, tools, heating and ventilating systems, power generation and power conversion plants, manufacturing plants and equipment.”<sup>51</sup>

More specifically, mechanical engineering technologists may prepare and interpret conventional and CAD engineering designs, drawings, and specifications for machines and components, power transmission systems, process piping, heating, ventilating, and air-conditioning systems; prepare cost and material estimates, project schedules, and reports; conduct tests and analyses of machines, components, and materials to determine their performance, strength, response to stress, and other characteristics; design moulds, tools, dies, jigs, and fixtures for use in manufacturing processes; inspect mechanical installations and construction; prepare contract and tender documents; supervise, monitor, and inspect mechanical installations and construction projects; and prepare standards and schedules and supervise mechanical maintenance programs or operations of mechanical plants.<sup>52</sup>

Mechanical engineering technicians may assist in preparing conventional and CAD engineering designs, drawings, and specifications; carry out a limited range of mechanical tests and analyses of machines, components, and materials; assist in the design of moulds, tools, dies, jigs, and fixtures for use in manufacturing processes; assist in inspection of mechanical installations and construction projects; and participate in the installation, repair, and maintenance of machinery and equipment.<sup>53</sup>

51 Government of Canada, *2232 Mechanical Engineering Technologists and Technicians*.

52 Ibid.

53 Ibid.

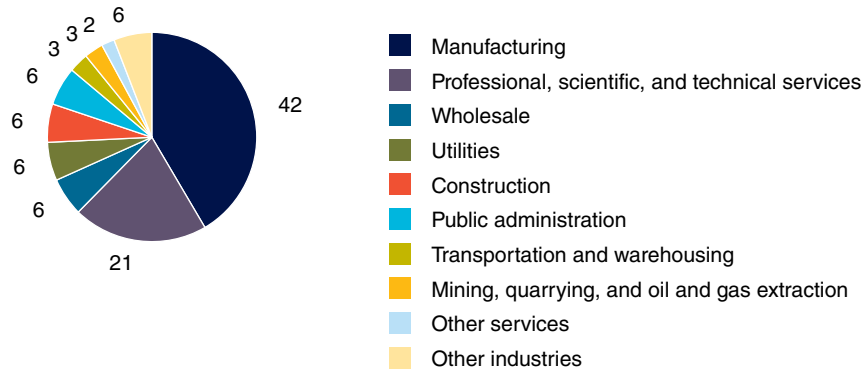
## Main Employers of Mechanical Engineering Technologists and Technicians

Mechanical engineering technologists and technicians are employed by the manufacturing sector, the professional, scientific, and technical services sector (consulting engineering companies), the wholesale and retail trade sector, utilities, the construction sector, and the public administration sector. (See Chart 39.)

Chart 39

### Mechanical Engineering Technologists and Technicians by Main Industry

(per cent)



Sources: The Conference Board of Canada; Statistics Canada, Labour Force Survey, National Household Survey.

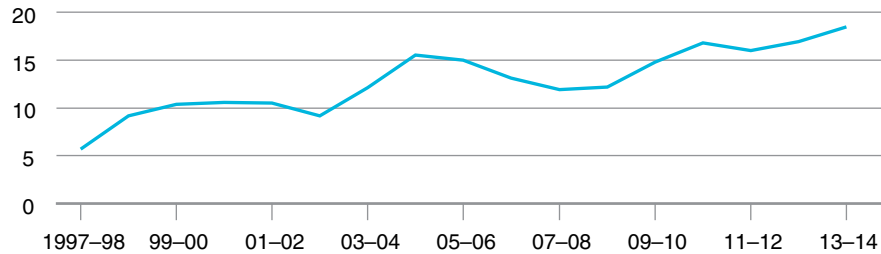
## Recent Employment Trends

Given the difficulties faced by the manufacturing sector during the 2000s, mechanical engineering technologists and technicians experienced job losses between 2005–06 and 2007–08. However, in contrast to total manufacturing employment, their number has been following an upward trend since 2009–10 (despite some weakness in 2011–12). (See Chart 40.)

Chart 40

**Mechanical Engineering Technologists and Technicians**

(employment level, 000s)



Sources: The Conference Board of Canada; Statistics Canada.

Employment trends in mechanical engineering technologists and technicians are in large part shaped by trends in retooling investment. Investment in machinery and equipment (M&E) declined in 2013, increased very slightly in 2014, and fell in 2015. Although depressed oil prices will continue to limit demand for M&E in the oil and gas sector in 2016, most of the damage from the oil price collapse will have taken place in 2015. Outside the energy sector, the lower Canadian dollar will boost demand from the U.S., forcing businesses to boost capacity by increasing their M&E purchases. As such, M&E purchases are projected to start growing again in 2016. This growing investment should help support demand for mechanical engineering technologists and technicians.

## CHAPTER 7

# Conclusion

### Chapter Summary

- The engineering and applied science technicians and technologists group includes an array of different occupations involved in every segment of the economy and contributed \$54.7 billion to the economy in 2011—3.3 per cent of Canadian GDP.
- The trends, challenges, and opportunities facing the industries employing most technicians and technologists have a strong influence on the demand for such professionals.
- Many of the challenges facing the Canadian economy point to the need for productivity gains. Putting productivity-enhancing strategies into practice and maintaining a high productivity level in the economy would likely involve the participation of technical professionals such as engineering and applied science technicians and technologists.
- These technical professionals will need to continuously improve and renew their skills in order to adapt to changing industrial conditions and contribute to productivity growth.

**The engineering and applied science technicians and technologists group includes a wide range of occupations, from user support technicians to electrical and electronic engineering technologists and technicians to civil engineering, mechanical engineering, industrial engineering, and geological, mineral, and drafting technologists and technicians, just to name a few. They are involved in every segment of the economy and thus contribute to output generated by all industries.**

Demand for these technical professionals is influenced by numerous factors. There is no one-size-fits-all trend analysis applicable to all categories of technicians and technologists. Yet, most of the engineering and applied science technicians and technologists are found in the professional, scientific, and technical services sector, the manufacturing sector, construction, public administration, information, cultural and recreation, and mining, quarrying, and oil and gas extraction sectors. The trends, challenges, and opportunities facing these industries will have a strong influence on the demand for engineering and applied science technicians and technologists.

Overall, the Canadian economy will continue to face a number of challenges in coming years, including weak oil prices, growing global competition, the aging population, slower labour force growth, and growing public spending on health care. Many of these challenges point to the need for productivity gains. For example, as our aging population increases demand for services such as health care, faster productivity growth would improve our ability to fund health and social programs.<sup>1</sup>

1 Muzyka and Hodgson, "To Boost Productivity"



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A large proportion of technical professionals are part of the baby-boom generation.

Public investment in infrastructure and promoting business investment in M&E and innovative products are key factors that would help achieve productivity gains in Canada.<sup>2</sup> Putting these strategies into practice and maintaining a high productivity level in the economy would likely involve the participation of technical professionals such as engineering and applied science technicians and technologists.

These technical professionals will need to continuously improve and renew their skills in order to adapt to changing industrial conditions and contribute to productivity growth. An additional issue to consider is the impact of the baby boomers' retirement on the availability of technical professionals in the economy. As for many occupations, a large proportion of technical professionals are part of the baby-boom generation (those born between 1947 and 1966). The oldest baby boomers have already started to retire. Yet, since they are much more numerous at the tail end of the generation, we can expect the retirement rate to accelerate over the next decade and a half. This growing wave of retirement will lead to the need to find and train individuals to fill positions that become vacant. Along these lines, it would be valuable to undertake further research to assess the number of new workers required in coming years in order to replace those soon-to-be-retired technical professionals.

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2 Ibid.

## APPENDIX A

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