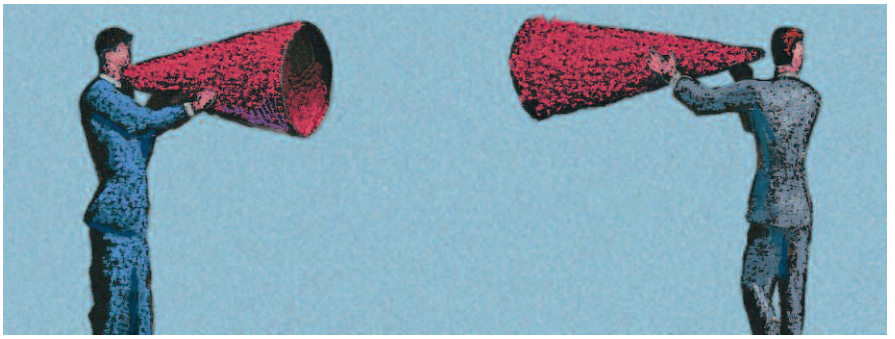
Engineering and the economy

MARC A. ROSEN, PHD, P.ENG.



Engineering contributes significantly to the current prosperity of the country and will almost certainly continue contributing to Canada's wealth and standard of living. In this context, it is helpful to examine, from an engineering perspective, several factors expected to influence the Canadian economy in the future, especially within the next 10 years.

Most financial reports indicate the Canadian economy at present is vibrant and growing. Financial analysts have observed that since early 2003 Canadian corporate profits have increased by 39 per cent, federal corporate tax receipts by 34 per cent, and overall revenues by 14 per cent. This has led to the projections of annual surpluses in the recent federal economic update of up to $20 billion, and to expectations that governments will cut taxes and make strategic investments.

Some of the key issues impacting the economy over the next decade are likely to include energy and natural resources, globalization, manufacturing, productivity, demographics, immigration, research, technology and education. Engineering plays a key role in, or is impacted by, each of these.

Energy and natural resources

Energy and natural resources have contributed notably to the success of Canada's economy. Canada is fortunate regarding indigenous resources, having more than most other major economies. Significantly rising global demand for energy and other natural resources has given Canada the largest increase to national revenues in three decades. Much of the recent increase in demand has come from China and other emerging economies. Canada has been receiving record high prices for the resources it sells. Engineering expertise allows Canada to exploit its resources to a higher degree.

Rising prices for fossil fuels and other resources will likely continue as the main factors shaping the economy in the future. The effect will not be distributed evenly across the country. The main benefits will accrue in the producing provinces in the west, while the impact will be negative in the main industrial provinces in central Canada. Provincial debates will likely continue about appropriate sharing of the benefits of Canada's energy and other resources, although engineering expertise will be required by energy producers and consumers alike.

In the future, energy issues are likely to be more severe, with some predicting that global energy demand will rise by 50 per cent over the next few decades, with developing nations responsible for 80 per cent of the growth. Engineering expertise will be essential in utilizing existing resources effectively and developing new energy sources.

The manner in which Canada uses the economic advantages provided by its energy and natural resources will, in part, determine how well the economy performs in the future. Improving the efficiency of resource recovery and energy utilization will be beneficial in terms of increasing the reserves of Canada's resources, and engineering will play a key role in this area. In addition, Canada needs to continue to diversify its economy, with more emphasis on knowledge-based activities, so that it remains competitive in the future when its resources become scarcer or more difficult and expensive to access. The role of engineering in increasing the segment of Canada's knowledge-based economy is important.

Globalization

Globalization has been an increasing phenomenon in the world economy for a century, but has become a significant concern in the last decade due to the rate at which large economies such as those of China, India, Russia and Brazil, are industrializing. Engineering, being a discipline without borders, has helped drive industrialization.

These countries now deliver a large array of inexpensive goods to Canada, but also provide challenging competition for traditional engineering and manufacturing industries, and the IT sector. The offshoring of engineering and manufacturing work to locations where the work can be done less expensively is significantly affecting the engineering workforce in Canada, and is cause for much concern for the future.

Globalization effects include downward pressure on wages in engineering and other areas in industrial countries like Canada.

The automotive sector is one example where global pressures have forced significant actions in Canada and the U.S. to remain competitive. Some analysts have said large parts of the North American auto industry could be outsourced to China in a decade, greatly impacting the traditional core of Ontario's and Canada's economy.

Emerging economies are also expanding their higher value-added production and services, causing more pressure on the engineering profession in Canada. Canada benefits from some high-end outsourcing from the U.S. in areas like software design and engineering, but increasingly this work is gravitating to places like India and China.

An impact of globalization, therefore, is that the amount and quality of employment in emerging economies rises, while part-time, lower-end service jobs in Canada increase.

Resource-related jobs pay well at present, but the key to keeping wages rising will be the creation of more value-added jobs in areas like engineering. Canadians will need to invent, design, market, finance and advertise the products countries such as China produce, and increasingly consume, as well as the services that our aging population will increasingly demand. More engineering work will likely involve self-employment.

Demographics

Canada's population is aging. The proportion of the Canadian labour force over 45 is reported to have grown to almost 42 per cent from less than 32 per cent 20 years ago. That phenomenon will affect living standards and the Canadian economy. When Canada's gross domestic product per capita grows, increased labour productivity is normally responsible for part of the growth and an expanding labour force is responsible for the rest. By 2015 or so, the labour force will start to shrink, so the contribution from an expanding labour force will be reduced or eliminated. This problem can be partly offset by increasing the supply of labour from abroad through immigration and by raising retirement ages so that people work longer, although the latter may be difficult since the average retirement age for Canadians has fallen to 61 from about 65 in the past 20 years. Nevertheless, increased productivity will likely have to make up most of the shortfall in growth of the economy to maintain or improve Canada's living standards.

For the engineering profession, this demographic trend implies that there will be a shortfall of engineers in the not-too-distant future. Also, demands will increase for engineering in areas related to aging, such as the development of better health care technologies. Most importantly, perhaps, engineers will be expected to contribute heavily to the need for increased labour productivity, through their creativity and capabilities for innovation.

Immigration

Immigration helps to maintain or increase the size of the labour force in Canada, and thus contributes to economic growth. But Canada has to integrate these people into the labour force if they are to contribute to improving our living standards and prosperity. Less than 20 per cent of Canadians have a university degree, but over 40 per cent of immigrants do, so integrating immigrants into the labour force beneficially utilizes these human resources.

This trend will affect engineering in that it indicates that increasing numbers of engineers will come from abroad in the future. These individuals must be integrated into the profession and workforce as straightforwardly as possible. Issues such as barriers to quick licensure need to be addressed.

Manufacturing

The Canadian manufacturing sector currently employs more than two million people, about 13 per cent of Canada's work force of 17 million. The Canadian manufacturing sector faces labour force problems as it attempts to compete with manufacturers in emerging markets. To remain competitive, some companies will cut costs and employees. Others, many economists feel, will shift to better-quality production using more skilled workers, by investing in employees who can produce more value-added products through engineering, design and innovation. Many manufacturers will find future success by focusing on high-precision and niche products, and low to medium volumes.

Canadian manufacturers will need to recruit significant numbers to maintain current levels of competitiveness. The aging population means Canadian manufacturers must recruit another 400,000 workers by 2012, according to estimates from the Canadian Manufacturers and Exporters (CME). At present, there are skills shortages in some sectors and almost 40 per cent of manufacturers say the availability of qualified personnel is worsening, according to a recent CME survey. CME data show that the percentage of companies reporting difficulties in finding qualified personnel is highest for the category of engineers, where 18 per cent report difficulties.

Data indicates that the proportion of the manufacturing workforce with a post-secondary education increased from 42 per cent in 1997 to 47 per cent in 2003. That trend will have to accelerate to meet the demands for higher-level skills and knowledge in manufacturing in the future. Ontario recently launched a new Advanced Manufacturing Investment Strategy (www.ontario-canada.com/ont-can/en/expanding/ex_amis.jsp) to attract more investment to the province and secure high-value jobs in Ontario by keeping companies globally competitive.

Productivity

Canada's productivity is not ranked as high as many other industrial economies. For instance, productivity grew annually from 2000 to 2004 by an average of 0.9 per cent in Canada and 3.5 per cent in the U.S. Measures proposed to increase productivity include reducing high school dropout rates, investing in education, cutting corporate taxes, improving trade relations with the U.S. and other countries, improving infrastructure (e.g. power grids, roads), and increasing competitiveness.

Engineers will play a key role in increasing productivity to keep Canada competitive, by developing new technologies and cutting costs through efficiencies.

Ireland, which has achieved a 7.9 per cent average annual growth rate since 1995, is often cited as an example of the potential

impact of measures to increase productivity. In the 1990s, that country cut corporate taxes from 40 per cent to 12.5 per cent, opened its economy to foreign investment and invested heavily in education. Ireland is now one of the top countries in terms of labour productivity, foreign trade and production of high-technology exports.

Research, technology, education

The key to improving the economy for Canada is to invest in such important areas as research, technology and education. Technology is becoming more and more pervasive in society, and research is what keeps the country at the leading edge and competitive with other countries. Engineering is central to all of these areas. It is important that Canada make these investments now, while it benefits from revenues from fossil fuels and other resources. When these revenues decline at some time in the future, investments in research, technology and education can give the economy a competitive advantage.

The Ontario government appears to recognize the need to invest in a better-skilled workforce. It recognizes that in the future there will be fewer jobs requiring low skill levels, and more that need the high-level skills of engineering and design. Canada cannot easily compete against India and China for low-value products. To have a high standard of living and be productive and competitive, Canada needs to have a human resource strategy that ensures workers have the right skills.

The future

The decisions that the country makes regarding priorities and investments, using its financial, human and other resources, will affect how the economy fares in the future. Engineering will certainly play a key role in ensuring Canada is competitive and productive, enabling a high standard of living and prosperity.

Marc A. Rosen, PhD, P.Eng., is dean of the faculty of engineering and applied science at the University of Ontario Institute of Technology in Oshawa, and past president of the Canadian Society for Mechanical Engineering. He can be contacted at marc.rosen@uoit.ca.