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# LOOKING INTO THE CRYSTAL BALL: ECONOMIC, POLITICAL AND TECHNOLOGY OUTLOOK 2015

*January 2015*





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# LOOKING INTO THE CRYSTAL BALL: INAUGURATING THE CANADIAN CHAMBER'S NEW ANNUAL EVENT

On December 1, 2014 in Ottawa, the Canadian Chamber's first annual Crystal Ball Symposium brought together corporate and government leaders to delve into the big trends that are affecting Canadian business.

In a remarkable evening of presentation and debate, experts in key areas — technology, economics and world geo-political trends — peered into the future and gave their predictions.

Our guests — Craig Alexander, Senior Vice President and Chief Economist, TD Bank; Terry Stuart, Chief Innovation Officer, Deloitte Canada and Dan Drezner, Professor of International Politics, Tufts University — were passionate, humorous and fearless as they assessed the Canadian situation.

In the presence of Canada's top public servants and the leadership of the Canadian Chamber of Commerce, our expert guests sketched a picture of the year 2015, which is partly perilous, but, mostly, hopeful.

Armed with the insights and commentaries of these experts and the top civil servants, the Canadian Chamber has prepared its annual forecast report.



*Perrin Beatty, President and CEO of the Canadian Chamber of Commerce, welcomes business, academic and government leaders to the inaugural Crystal Ball Symposium.*

# EXECUTIVE SUMMARY

Huge changes are coming to the global economy in 2015. Emerging markets, which used to be the engines of global growth, have slowed and are much more vulnerable than in the past. Brazil is struggling with stagnation, Russia is about to enter a deep recession and even mighty China was forced to lower interest rates to prop up its bubbly housing market and reduce financing costs for business.

“The world economy is still struggling. The pace of global economic growth is tepid and terribly uneven. [...] The tracking for growth in 2014 is basically the same as last year at around 3%.”

Craig Alexander, Senior Vice President and Chief Economist, TD Bank

Among the rich countries, the news is not much better. The 18 countries of the euro zone collectively eked out growth of barely 0.8% last year, rising to 1.2% in 2015. Japan is struggling to escape recession as the growth-dampening effects of an increase in the value-added tax slammed consumption.

There is really only one major economy that is picking up strength. Fortunately, it's the world's largest, the United States of America, with 20% of global GDP. The American economy is growing at almost 4% thanks to a resurgent consumer and astonishing strength in the corporate sector. Unemployment is down to just 5.8% and wages are rising.

Global financial markets are being pressured because quantitative easing, the injections of additional cash into the U.S. financial system, has concluded, and many analysts believe that U.S. interest rates will rise sooner than expected. Meanwhile, the European Central Bank will provide even more liquidity to a weak banking system, while the Bank of Japan is printing yen in a desperate effort to emerge from deflation.

The withdrawal of U.S. liquidity coupled with an emerging market slowdown has slammed commodity prices. Oil has fallen 50% between June and the end of 2014; coal and iron ore are also down 50% or more, to levels last seen during the great crisis of 2009. The world needs a huge pick-up in emerging market demand before these can recover.

Overall, the end of 2014 saw the U.S. charging ahead, emerging markets in retreat and Europe standing still, all while commodity prices were in free-fall. Normally, in a healthy expansion of the global economy, we see 5% growth, and a tough recession causes growth to fall to 2%. This is why economists were so disappointed about global growth for 2014, expected to come in around 3.3%.

The big question for 2015 is whether the U.S. economic resurgence can pull other markets along with it, like a huge locomotive dragging the global economy forward. We think it can, and that's why we're optimistic that global growth can accelerate to 4.1% in 2015 from 3.3% in 2014. The second big question for 2015: Is Canada ready?



*Craig Alexander, Senior Vice President and Chief Economist, TD Bank, discussed the outlook for the Canadian and global economy.*

“Europe had a double-dip recession, and the pace of growth will be very slow: 1% growth combined with high unemployment. There is a legitimate case to be made that Europe will experience a Japanese-like lost decade.”

Craig Alexander, Senior Vice President and Chief Economist, TD Bank

Real GDP Growth	2011	2012	2013	2014	2015	2016
Canada	2.5	1.7	2.0	2.3	2.2	2.0
Euro area	1.6	-0.7	-0.4	0.8	1.2	1.7
Japan	-0.5	1.5	1.5	0.9	0.8	0.8
United States	1.6	2.3	2.2	2.2	3.5	3.0
Brazil	2.7	1.0	2.5	0.3	1.4	2.2
China	9.3	7.7	7.7	7.4	7.1	6.8
India	6.6	4.7	5.0	5.6	6.4	6.5
Russia	4.3	3.4	1.3	0.2	-6.0	-2.0
Advanced economies	1.7	1.2	1.4	1.8	2.5	2.4
Emerging economies	6.2	5.1	4.7	4.4	4.9	5.2
<b>World</b>	<b>4.1</b>	<b>3.4</b>	<b>3.3</b>	<b>3.3</b>	<b>4.1</b>	<b>4.0</b>

Source: IMF WEO, The Canadian Chamber of Commerce



# WHAT DOES IT ALL MEAN FOR CANADA?

The Canadian economy outperformed the rest of the G7 in the years after the crisis. While Canada's trade took a hit with exports falling 29% in 2009, its strong banking system and general economic resilience enabled us to get through a relatively mild recession. As business investment declined and exports struggled, Canadian consumers continued to borrow and spend which gave us a healthy rate of growth.

Now, however, the outlook has dimmed because of rising fears about Canada's two key vulnerabilities. Firstly, Canadian consumers have high levels of debt, by some measures even higher than the U.S. before the crisis of 2009. At the same time, the Canadian housing market looks increasingly bubbly, with home prices now overvalued by up to 30% according to the

Bank of Canada. With interest rates likely to rise in the second half of 2015, heavily indebted Canadians could find themselves increasingly overstretched.

For that reason, Canada needs to shift gears to keep its economy on the right track. Consumption growth is falling as consumers put their credit cards away and reduce spending on homes and it needs to be replaced by growth from exports and business investment. We have, indeed, seen significant steps in this direction, but it represents a major transformation for the Canadian economy.

Now, we can add a third vulnerability: the impact of falling oil prices.



# OIL: HEADED LOWER

Oil prices have plummeted 50% between June and the end of 2014. The severity of the decline caught almost everyone by surprise because, for the past four years, oil prices have remained above \$85 per barrel, often much higher, in spite of dramatic increases in global production. The United States saw a transformative boom in shale oil with energy production growing 80% from five million barrels per day (bpd) to just over nine million bpd since 2008. Canada's oil sands production has added one million bpd since 2005. And there have been increases in many other important suppliers.

But in fact, it was the demand side that caused the big surprise. The high prices were sustained because until recently, demand for oil had been rising faster, by 1.9 million bpd each year, even though consumption in the U.S., Europe and Japan had been flat or dropping since 2006. In fact, the increases in oil demand was entirely caused by fast-growing emerging markets, particularly China which accounted for half the world's demand growth in 2011 and 2012.

The big shock in oil markets was the slow-down in emerging markets that caused the International Energy Agency to slash its 2015 demand forecast repeatedly from 1.7 million bpd to 1.4 million bpd to now just a 0.8 million bpd increase. Oil traders were looking at huge production increases in 2015 (an extra 1.4 M bpd from North America alone) that would absolutely swamp the increase in demand.

That's why the world turned to OPEC expecting to see a production cut that would offset the falling demand. But the cartel did nothing, and the Saudi oil minister said publicly that he wanted to drive down prices in order to force production cuts in shale and oil sands. This won't work. In fact, production will continue to rise because most of the long-term investments can tolerate significant variation in revenues over the (often) 30-year lifespan of the project. New projects may be delayed, and indeed some big ones have been cancelled, but prices would have to be really low for a very long time in order to reduce production.

What does it mean for the economy? The Bank of Canada warned that falling oil prices could subtract one-third of a per cent from GDP growth. Even the

grimmiest forecasts have Alberta's GDP growing at 1% this year, down from 4% over the past two years. The province would lag the Canadian average, but it's still a positive number that would reduce the inflationary pressures of breakneck growth.

Cheaper gas is also a welcome boost for consumers. If prices continue at current levels, a typical U.S. household could save \$1,100 and a Canadian family will save \$1,300. That's about \$85 billion dropped into the pockets of North American consumers, a welcome stimulus. Globally, lower oil prices could transfer nearly \$1 trillion from producers to consumers.

"I think oil has overshot on the downside, but that doesn't mean markets can't take it lower in the short term. Oil is ultimately going to come back, but I think we are going to see oil in the \$70s. I don't see it getting back to the \$80s or \$90s."

Craig Alexander, Senior Vice President  
and Chief Economist, TD Bank

We are likely to have oversupply in 2015, which will put further downward pressure on prices, so it's possible that oil could temporarily drop below \$40. Over the longer term, oil prices will depend heavily on a resurgence of demand driven by a healthier global economy. The Canadian Chamber expects that it will pick up with the U.S. economy expanding at 3.5% and emerging markets growing at 4.9%. This will provide healthy support to oil demand, pushing prices back towards the \$70 range. This would put the Canadian dollar somewhere between 83-85 cents, providing a nice boost to manufacturing exporters and generating more balanced growth in Canada.

# EMERGING MARKETS

Emerging markets are seeing slower growth rates for a number of reasons. The first is increased financial pressures from the removal of monetary stimulus. Up until the end of 2014, the U.S. Fed's program of quantitative easing was purchasing billions of dollars of bonds every month and replacing them with cash. As a result, U.S. banks have approximately \$2.4 trillion of excess reserves. This liquidity found its way into all sorts of places, including commodities in equity markets, but also in emerging markets. For nearly five years, investors could borrow at near zero rates in the United States and invest the funds at much higher rates of return in emerging markets. This gave countries throughout Asia and Latin America a cheap, near limitless source of USD borrowing.

At the end of 2013, when the U.S. Federal Reserve started gradually reducing the amount of quantitative easing, these flows reversed and currencies dropped right across the emerging market world. Many countries also had to raise interest rates to defend the currencies and convince investors to leave their money there. For example, Brazil has seen a 30% decline in the value of the real, while India has seen a 25% decline in the rupee, despite repeated interest rate hikes. The trouble is that higher interest rates make it more expensive to borrow and slow down the economy.

Obviously, the most extreme financial stress has been seen in Russia. Following the Russian invasion of Crimea, Western countries imposed sanctions that made international borrowing extremely difficult, if not impossible, for Russian banks and companies. Despite Russia raising interest rates from 5% back in March to just over 10%, the ruble has been falling as nervous investors leave Russia. The exodus of capital combined with falling oil prices set the Russian currency into a tailspin. In a single night, the Russian

"Many emerging markets were too dependent on ever-rising commodity prices. Some were too dependent on cheap foreign capital. At a time when their economies were growing fast, many governments stopped making the tough decisions to put their economies on the right basis for long-term prosperity."

Craig Alexander, Senior Vice President and Chief Economist, TD Bank

central bank raised interest rates to 17%, and still the ruble is falling. The Russian economy is now projected to contract by 5- 6% in 2015.

China is not vulnerable to a withdrawal of U.S. dollar liquidity because its currency is not freely convertible. However, China's GDP growth is expected to be approximately 7.1% in 2015 according to the IMF. This is a significant decline when you consider that for the 20 years up to 2007, the country's average real GDP rose by an average of 11% per year. China's economy is now US\$9 trillion, so that 7% increase is on a much larger pie and is a much bigger boost to the global economy. The growth is also more balanced, shifting away from investment and export dependence towards a more broad-based expansion of consumption, thanks to rising wages. Are there vulnerabilities in China? Certainly. China has high debt levels, but the banks are well capitalized and with \$4 trillion in foreign exchange reserves, there



is more than enough of a safety cushion to weather any downturn. China also has soaring real estate prices and areas that are overbuilt. But don't forget that two million people per month move from rural areas to the cities. This means that China has to add the equivalent of three New York Cities every year to keep up with the rise in urban dwellers. Finally, China has repeatedly demonstrated the capacity and willingness to effectively stimulate the economy. In November 2014, China cut interest rates and down payment levels for the first time since the 2008 global financial crisis in a sign that the government is

worried that further fall in home prices could threaten the economy. China's growth may slow, but it is also becoming more balanced, shifting away from investment and export dependence towards a more broad-based expansion of consumption, thanks to rising wages.

Real GDP Growth	2011	2012	2013	2014	2015	2016
Brazil	2.7	1.0	2.5	0.3	1.4	2.2
China	9.3	7.7	7.7	7.4	7.1	6.8
India	6.6	4.7	5.0	5.6	6.4	6.5
Russia	4.3	3.4	1.3	0.2	-6.0	-2.0
Advanced economies	1.7	1.2	1.4	1.8	2.5	2.4
Emerging economies	6.2	5.1	4.7	4.4	4.9	5.2
<b>World</b>	<b>4.1</b>	<b>3.4</b>	<b>3.3</b>	<b>3.3</b>	<b>4.1</b>	<b>4.0</b>

Source: IMF WEO, The Canadian Chamber of Commerce

# U.S.A.: PICKING UP SPEED AND CHARGING AHEAD

The one major economy that is picking up strength is the United States of America. The U.S.A. represents 20% of global GDP and it's picking up speed. After 4.1% growth in the second quarter and 3.6% in the third, gas prices are acting like a \$75 billion tax cut, fuelling the expansion.

The main reason for optimism about the U.S. economy is U.S. consumers: they're back! Consumption represents 70% of U.S. GDP, so if the average American is confident and spending, then the lion's share of the U.S. economy will see healthy growth. Indeed, surveys show that U.S. consumer confidence is at its highest level since January 2007. Why are Americans so cheerful? Firstly, the job market is improved. It's taken a long time, but the U.S. economy added 321,000 jobs in November and the unemployment rate fell to 5.8%. This means that the big fear factor, Americans worried about losing their jobs, has largely dissipated. And even more importantly, wages are starting to climb.

Secondly, U.S. consumers are in a much better financial situation. Consumer debt is way down and, with interest rates still at zero, debt servicing costs are at a 20-year low, leaving more money in people's pockets. Also, home prices are in much better shape; they've now recovered almost half the decline that occurred during the great crash of 2008, which puts them in modest 2005 levels. The home is typically the largest asset held by a household, so recovering prices makes people feel richer.

And finally, we can see that consumers aren't just feeling good, they are actually spending. Retail sales are up 5% year-over-year, the healthiest growth rates since 2005.



If the U.S. consumer is in good shape, American business is in even better shape. In the third quarter of 2014, corporate profits hit an all-time high of almost \$2.1 trillion, the highest in history, and well above the roaring '90s even after adjusting for inflation. U.S. businesses are also holding around \$6 trillion of cash, the most liquid balance sheets since the 1950s. U.S. capacity utilization is almost back to its pre-crisis peak and productivity gains are trailing off, so if a business wants to increase production, it'll have to invest. U.S. business investment has been picking up impressively, and corporations have enormous resources to deploy, so once they're absolutely sure that the economic recovery is here to stay, we can look forward to a booming increase in business investment.

Finally, if we look at the U.S. government, it looks like political gridlock will be a permanent feature of Washington D.C., at least until 2016. However, we can be sure that government spending will be a hindrance to the economy. Consider that in 2013, the government shutdown in the spending cuts from the budget control act subtracted around 1.6% from U.S. GDP, a huge hit to a still frail economy. In 2014, fiscal drag from reduced government spending was minimal, and in 2015, it could actually provide some stimulus.

Today, the Canadian Chamber of Commerce is forecasting that the U.S. economy will grow by 3.5% in 2015. An amazing boom by our largest trading partner is great news for the Canadian economy. Canada's exports to the U.S. are up about 13% in 2014, and Export Development Canada is calling for a further 6% growth in 2015. With a falling loonie boosting our export competitiveness, this year's export gains could be even greater.

<b>Real GDP Growth</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
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<b>World</b>	<b>4.1</b>	<b>3.4</b>	<b>3.3</b>	<b>3.3</b>	<b>4.1</b>	<b>4.0</b>

Source: IMF WEO, The Canadian Chamber of Commerce



# WHAT ARE THE BIGGEST RISKS?

When we look at the biggest risks facing the global economy, we almost automatically think of economic or financial crises. In fact, the biggest potential problems we face come from political risks.

Firstly, slower growth is increasing popular anger and dissatisfaction with governments. When the economy is booming and income is rising, people are less concerned with income inequality, corruption, accountability and government services. In fact, economic weakness has contributed to widespread protests and dissatisfaction in countries like Brazil, Turkey and India. And this is not just a challenge in emerging markets. In Europe, over a span of two years from 2009 to 2012, six different governments were voted out of office or toppled mainly because of public outrage over the crisis in the euro zone. Greece may well elect a populist left-wing Syriza government purely out of despair from economic hardship.

For countries that are dependent on oil, these stresses can be doubly difficult. Venezuela is likely to default in 2015, and Iran's economy is teetering while societal strains are nearing the breaking point.

But Russia is now by far the world's greatest source of political risk due to its size, Moscow's aggressive actions on the world stage and the depth of its

coming economic crisis. The big question is how Russia's president, Vladimir Putin, will respond to plummeting oil world prices.

On one hand, the fall in oil prices has revealed the true extent of Russian economic weakness and the ephemeral nature of Russian geopolitical strength. With oil prices of \$120 per barrel, the Russian budget will break-even and it can invade Crimea, create mischief in Ukraine and threaten Europe. With oil prices at \$70 per barrel, Russia can afford to do nothing. Instead, market panic increases with each passing day as ordinary Russians convert the rubles into hard currencies to get their wealth out of the country.

The ideal solution would be for Vladimir Putin to withdraw troops from Ukraine and cut a deal with the West to ease sanctions. That would ease the panic and stabilize the ruble. But there is zero chance of this happening because of political realities in Russia. Putin enjoys 85% approval ratings among the Russian people thanks to his show of strength in standing up against the West. The Kremlin has constructed a narrative that blames all of Russia's problems, economic and political, on Western interference and attempts to "defang the Russian bear." So Putin is cornered with no choice but to rage against worsening

"All the most important factors for stability will have no impact on Vladimir Putin. He did not get where he is by playing it safe. He has a lot of risk appetite. Despite massive negative shocks to the Russian economy, he is still riding 85% popularity. He sees declining benefits from economic engagement with the West because Russia is paying the price now. This is a country that, in terms of economic performance, will be on the decline going forward, but has a long list of historical grievances. That is a recipe for Putin to continue acting in a bellicose way, to bolster his standing through his impressive propaganda resources, while continuing to rally the country around the flag as long as possible. I would not be sanguine if I was living in the Baltics or in Ukraine."

Dan Drezner, Professor of International Politics, Tufts University

“The international political system has demonstrated surprising resiliency. Think of resiliency as a form of aerobics: the more the system gets stress-tested, the better the system gets at handling that stress. So the system has got to be really good by now. Think of what has happened since 2008: Europe’s sovereign debt crisis, Fukushima, the Arab Spring, Chinese assertiveness in Asia, Russian aggression in Europe, Ebola epidemic, Middle East falling apart yet again, U.S. debt ceiling shenanigans. [...] And yet the global economy keeps on going, no double-dip recession.”

Dan Drezner, Professor of International Politics, Tufts University



*Dan Drezner, Professor of International Politics of Tufts University, Massachusetts, discussed geopolitical hot spots and offered assessments of their implications for the North American economy.*

crisis caused by Western influence. This means that political stunts and military actions will become increasingly attractive as a way of distracting the Russian people from the true source of their misery.

More generally, from Russia to the Middle East to Africa and Latin America, politically unstable countries that suddenly come under pressure from lower commodity prices, particularly lower oil prices, will be more vulnerable than ever before.

However, there are also reasons for optimism about global politics. Firstly, the global institutional system is more stable and resilient than ever before. Countries did coordinate and work together during the crisis of 2008. Europe did come together to find a political solution to its currency crisis, negotiating bailouts and new governance structures. Globally, there was no rejection of the Washington Consensus or retreat to isolationism and anti-trade populism. Countries increasingly recognize a path to prosperity, and success is being open and integrated into the global economy despite its flaws.

The second reason is that the U.S. will retain its leadership role in spite of its many challenges. America remains much more powerful than other

global actors and its power is rising. The U.S. dollar is still the central currency, and the U.S. is likely to be the principal growth engine for the global economy for the next four or five years. More importantly, the major challengers have greater problems to worry about. China is facing a slow growth scenario and is most preoccupied with domestic politics, while others like Russia, Venezuela and Iran are in free fall.

There are also political positives to watch—such as political reforms in India and the reopening of diplomatic relations between the U.S. and Cuba—that can significantly improve the outlook.

All over the world, politics is the risk to watch in 2015.

*Canadian businesses seeking more detailed political and economic risk analysis for trade and investment decisions can consult Export Development Canada’s Country Risk Quarterly, available here: <http://www.edc.ca/EN/Knowledge-Centre/Economic-Analysis-and-Research/Pages/country-risk.aspx>*

# TECHNOLOGY – A WORLD TRANSFORMED

Canada needs to be very concerned about productivity and innovation, because it is facing a number of significant challenges. We have a very high wage workforce, the highest safety standards, an often heavy regulatory burden, small domestic markets and high input costs. Consider that Canada is ranked 15<sup>th</sup> in the world in competitiveness and 22<sup>nd</sup> in innovation by the World Economic Forum. That is why it is so important to be innovative in developing and adopting new technologies. Otherwise, we will be competing on price with Vietnam and South Carolina.

“Canada is phenomenal at creating start-ups. We create start-ups 25% faster than in the U.S. and are much more prolific. The first five years, we have great start-up companies and they grow aggressively. Then something happens and they seem to fall off. They either get acquired or they become ‘lifestyle companies.’ So we have the gazelle factor in the front end and then the ‘water buffalo’ effect later on.”

Terry Stuart, Chief Innovation Officer,  
Deloitte Canada

Firstly, Canada requires a fundamental transformation of R&D policy. Canada’s innovation policy framework must be revitalized to adopt new incentive options, such as the “innovation box” approach to R&D funding that reduces taxes and promotes domestic intellectual property activity. If a patent is developed right here in Canada, then the revenues arising from it should be taxed at a lower rate.

We often hear that Canadians are risk-averse, but is it true? In a survey by Deloitte, Canadian CEOs ranked themselves on a par with American CEOs in terms of risk appetite. However, Deloitte looked more deeply, creating a risk-behaviour index, in order to gauge the behaviours that demonstrated risk appetite. The researchers found Canadians are 25%-27% below U.S. colleagues.

The second critical determinant of competitiveness is access to capital, for start-ups and companies moving from innovation to commercialization. These fast-growing companies often depend upon venture capital (VC) as the lifeblood that can take a company from idea to market. It may take years to develop and commercialize a new technology or product and capital is critical to sustaining an innovative company before the revenues start to flow. Canada is phenomenal at start-up companies, but after the first five years, something happens—they get acquired. Some analysts suspect this could be the lifestyle effect, that entrepreneurs have enough money to live comfortably and buy the cottage in Whistler so they don’t grow beyond that stage. Instead, we think that



*“Just 4% of companies are actively engaged in export markets. Why? Fear and uncertainty: people say ‘it’s very risky to export’. But the data tell a very different story. The companies that export have a much stronger business resiliency. They last longer, they live longer and they are more profitable. They are also more innovative because they have to be.”*

*Terry Stuart, Chief Innovation Officer,  
Deloitte Canada*

a big part of the problem is access to capital because Canada’s venture capital industry is still small and hitting below its weight, particularly when compared to much larger industries in the U.S. During the course of 2014, the Canadian Chamber spoke with dozens of entrepreneurs leading fast-growing companies who say one of the biggest hurdles they face is securing capital to take their companies to the next level. The Canadian Chamber of Commerce will advocate a number of initiatives to boost incentives to expand the overall pool of capital and to attract more angel investors and international funds to Canada.

The final and crucial determinant of competitiveness is exporting. This is a big challenge for Canada because only 4% of its companies are focused on exports. We often hear that it is very risky to export due to complex international risks and currency fluctuations, which seem more challenging than domestic business. In fact, the research shows the opposite. The companies that do export last longer and are more profitable because they have market resiliency. The statistics show conclusively that exporting companies are lower risk than domestic-only companies.

*Terry Stuart, Chief Innovation Officer, Deloitte Canada, discussed the big trends in technology.*

### *Transformative Technologies to Watch*

*Artificial intelligence: The intelligence exhibited by software or machines that are programmed to learn and become progressively better decision-makers.*

*Digital medicine: Increasingly, computers are used to store medical information but they can also be used to generate new medical knowledge by analyzing patterns in illnesses, treatments, DNA, physical characteristics, etc. In doing so, computers make it possible to develop “digital medicine” that is potentially more precise and more effective than current medical practice.*

*Robotics: Automated machines that can take the place of humans in simple tasks, dangerous environments or manufacturing processes. They are becoming cheaper, more sophisticated and more useful every day.*

*3-D printing: These primarily additive processes, in which successive layers of material are laid down under computer control, are used to produce objects of almost any shape or geometry. The objects are produced from a 3-D model or other electronic data source. 3-D has been around for 30 years but now it is becoming so cheap that it will transform manufacturing and enable mass customization.*

*Sensor technology: Machines that can perceive the environment and then talk to other machines will have a fundamental impact how we do business. From the automatic application of fertilizer in agriculture to revolutionizing our homes, this technology will be transformative.*



The Canadian Chamber of Commerce would like to thank the experts who participated in our inaugural Crystal Ball Symposium on December 1, 2014. Their insights and expertise were of enormous benefit to us and to all of the participants. Any errors or omissions in the report are the responsibility of the Canadian Chamber of Commerce.

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