BANK OF CANADA
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Innovation, Central-Bank Style

Introduction

Everyone here knows that companies must innovate to thrive. You may not know that the same is true for central banks, even if we're the one kind of bank you wouldn't imagine going out of business.

Just like private companies, central banks are often focused on immediate issues. This is hardly surprising, given what has been thrown our way these past few years: a financial crisis, the Great Recession and then the oil price shock. And a central bank exists in the first place to set a solid foundation for the economy and the financial system.

In recent years, we've kept inflation low and stable. This has made it easier for people and companies to recover from the downturn. Working with other authorities, we also avoided major disruptions in our financial system.

Given this track record, why does innovation matter to the Bank? It matters because the world is moving quickly: who would have imagined 20 years ago that interest rates would be below zero in a number of advanced economies? That Canadian-dollar assets would be held as foreign reserves? Or that there would be a Bitcoin ATM in your local pub?

Confident as we are in how we do things now, the Bank keeps its eyes on the future. Failing to do so would be a mistake for our business and could have real negative consequences for the Canadian economy.

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So, for us, innovation isn't just about reacting to the most recent crisis; it's about pushing ourselves so we're ready for whatever the future holds.

This is why I'm happy to be here this morning. The Rotman School of Management and the Munk School of Global Affairs are world-leading organizations. People here are passionate about innovation.

Now, students here know that to stay ahead of the curve, you need a plan. We have a three-year plan that we're putting in place, and that's what I want to discuss today.[1]

I'll start by talking about how our plan continues our tradition of innovating by questioning the answers. I'll then go over some of the tough policy and research issues that we'll have to tackle and that motivated us to create this plan.[2] This will lead me to explain how we'll get past the obstacles to new ideas by changing our corporate culture. Finally, I'm going to ask you—and all the people who care about what the Bank does—to get involved in a constructive dialogue.

Questioning the Answers

The Bank of Canada was itself an innovation when it was created during the Great Depression to support the economic and financial well-being of Canadians. Over the past 80 years, the Bank has done exactly that by carrying out four main lines of business.

You know about our monetary policy role, because you read about how we set interest rates to return the economy to its potential and meet our inflation target of 2 per cent.

In our financial stability role, we monitor the health of the Canadian financial system and act as the lender of last resort. One example of this work is the extraordinary liquidity that we provided to the system during the 2008 crisis.

We're also the federal government's fiscal agent, which means that we manage about $650 billion in federal debt and around $70 billion in foreign reserves.

Finally, we're responsible for the bank notes in your wallet. More work goes into them than might be evident: developing new security features, combating counterfeiting and researching new trends in electronic payments and digital currencies.

Those responsibilities, combined with a balance sheet of nearly $100 billion, put the Bank at the heart of the Canadian financial system.

Even though the Bank has had the same mandate for 80 years, we haven't been afraid to change our paradigm when circumstances demanded it.

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[1] Every three years, the Bank sets a strategic course for the medium term. Our current plan, which was adopted in June, is outlined in the Bank of Canada's 2016–18 *Medium-Term Plan* and can be found at http://www.bankofcanada.ca/wp-content/uploads/2015/06/central-banking-new-era-mtp-2016-18.pdf.

[2] Not surprisingly, the Bank's strategy was built by answering questions similar to those proposed by former Rotman Dean Roger Martin in his book with A. G. Lafley, *Playing to Win*: What is the Bank hoping to achieve? What areas will it focus on? How will we get better results in these areas? What tools do we need to get there? What does the Bank's senior management need to do to support our strategy?

The change in monetary policy is stark.

Under the Bretton Woods system that prevailed after the Second World War, the U.S. dollar could be exchanged for gold at a rate of $35 per ounce, and other countries pegged their currencies to the greenback. In 1950, Canada was a bit of an international rebel when it became the first industrialized country to adopt a floating exchange rate. Canada returned to a fixed peg in the 1960s, before letting the dollar float for good in 1970. Believe it or not, letting markets determine the value of a currency was revolutionary at the time.

That didn't solve all our problems, to say the least. Inflation became rampant: for a stretch of more than 20 years, it never fell below 2 per cent and sometimes exceeded 10 per cent. Interest rates exploded: for a few months in the 1980s, homeowners paid more than 20 per cent on a 5-year mortgage.

The Bank had to react. Its leaders knew this and researched alternative monetary policy regimes. In central banking, just as in business, it can take a long time to bring an idea to market; it took about a decade to develop the inflation-targeting regime that we adopted in 1991.

Targeting inflation seems like an obvious choice today, now that it's been replicated in all major advanced economies. When we started studying it, however, many economists would have told you that it was unworkable. Not afraid to innovate, we were the second central bank in the world to set an inflation target, a few short months after New Zealand. It was a few years before the idea of targeting inflation was fully accepted by the Canadian public, and the Bank took a lot of heat for it.

These days, most central bankers see inflation targeting as a success. It is credited with contributing to the "Great Moderation"—the 25 years or so before the financial crisis, when the performance of advanced economies was unusually good.[3]

I wish I could say that was the end of the story. In reality, this success probably distracted central banks from confronting the hard questions about the buildup of financial risks that led to the global crisis.[4] It's a stern reminder that we must resist confirmation bias and complacency. If the Bank's history teaches anything, it's that we must always be ready to consider questions that challenge our old answers.

How do we do that? By giving innovative thinking a central place in our strategic plan and by creating a corporate culture that fosters different perspectives and challenges the status quo. As former Governor David Dodge once said to Bank staff, "we can have clashes of ideas secure in the knowledge that there are no winners or losers … what we're doing is exploring all aspects of an issue."[5]

[3] L. Benati and P. Surico, "VAR Analysis and the Great Moderation," *American Economic Review* 99, no. 4 (2009):1636–52.
[4] O. Blanchard, G. Dell'Ariccia and P. Mauro, "Rethinking Macroeconomic Policy," *Journal of Money, Credit and Banking* 42, no. s1 (2010): 199–215.
[5] D. Dodge, "Town Hall Meeting," Bank of Canada, 18 May 2004. Available at http://www.bankofcanada.ca/2004/05/town-hall-meeting.

Focusing on Critical Central Bank Issues

Let me turn to what's in our plan. The Bank of Canada remains committed to inflation targeting and to the expert execution of all of its responsibilities. The Bank is also committed to exploring how best to contribute to the Canadian economy in a world that is going through fundamental structural change.

It's in this context that the Bank is seeking to advance the frontiers along all its business lines. Let me focus on monetary policy. The current inflation-targeting framework is working well, so the bar for change is high. But history tells us we can't cling indefinitely to a particular way of doing business.

One important challenge for central banks now is that conventional monetary policy is stretched to its limits in some countries, where policy interest rates are at, or below, zero. Because of this, a number of countries are using innovative monetary policy measures to return inflation to target. Canada was fortunate to avoid the worst of the crisis, thanks to the relative strength of our economy, our prudently managed and resilient financial system, and well-anchored inflation expectations. Tiff Macklem, my predecessor and your dean, can take a lot of credit for that.

It's not surprising that we are focusing our research firepower on the monetary policy lessons from the crisis.

The first lesson is that we have to be innovative with the instruments we have in our monetary policy toolbox. Structural changes have reduced the economy's potential to grow without creating inflation, so the neutral rate of interest is lower than it was before the crisis.[6] That means that, if we continue to target a 2 per cent inflation rate, it's more likely that policy interest rates will fall to zero than in the past.

Remember, only a few years ago, many believed zero was where monetary policy was out of bullets. We now observe that some European countries have tested this limit. There, central banks are charging commercial banks for their deposits, and governments are effectively getting paid to borrow. We published today an interesting staff paper that looks at the experience of negative nominal interest rates in a number of countries, such as Denmark and Switzerland.[7] It finds that the cost of securely storing cash is the main constraint on how low rates can go in these countries. It's too early to tell how effective negative rates are at creating additional demand. However, it seems that, in the experience of these countries, the exchange rate channel might be particularly important.

Our staff, along with many other central bank researchers and academics, are also assessing how effective other innovative monetary policy measures have been. Today, we are publishing other staff research papers that cover some of these issues.

The Bank of Canada was one of the innovators when we used a tool called forward guidance. That's when central banks communicate their intentions on the

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[6] For more context, see R. R. Mendes, "The Neutral Rate of Interest in Canada," Discussion Paper No. 2014-5, Bank of Canada, 2014.

[7] H. Jackson, "The International Experience with Negative Policy Rates," Staff Discussion Paper No. 2015-13, Bank of Canada, 2015.

path of the policy rate or other policy actions. The evidence suggests that forward guidance, when it is clearly communicated and credible, can be an effective policy tool.[8] It probably works best when it's reinforced by other policy actions.

Other innovative tools central banks have experimented with to ease monetary conditions are different kinds of asset-purchase programs. We studied the experience of the United States, Europe and other places, like Japan. These central banks designed their purchases based on the part of the market they most wanted to affect. To lower yields further out the curve, they purchased longer-term government bonds.[9] To improve credit conditions in specific areas, they bought distressed assets such as corporate bonds and mortgage-backed securities. Our research found that these purchases were successful in affecting yields.[10]

Research in this area will continue, at the Bank and around the world, because the situation continues to unfold and it will take years to understand all the effects of these innovations.

The second lesson from the crisis is that policy-makers must consider the risks and vulnerabilities in the financial system when setting monetary policy. In the lead-up to the crisis, the world economy was bolstered by financial tailwinds that were poorly understood. In its aftermath, the global recovery is being held back by financial headwinds that we also don't understand well. To address this blind spot, the Bank is making a big investment in economic modelling and research.

Economists use theoretical and statistical models to forecast the future and study different policy scenarios. A good model allows us to isolate the cause-and-effect relationships at play in a complex system. Our workhorse models, such as the Terms-of-Trade Economic Model, do a good job of assessing the impact of economic shocks.[11] But they can't handle the behaviours and market disruptions that give rise to financial crises. So this is an area where we are pushing the frontiers.

It's a big challenge to integrate the financial sector and its interactions with the economy in our models in a realistic way. It's even more difficult when you consider the fact that finance is being transformed by technological and social trends, as well as post-crisis regulatory reforms.

[8] K. Charbonneau and L. Rennison, "Forward Guidance at the Effective Lower Bound: International Experience," Staff Discussion Paper No. 2015-15, Bank of Canada, 2015.
[9] E. Santor and L. Suchanek, "Unconventional Monetary Policies: Evolving Practices, Their Effects and Potential Costs," *Bank of Canada Review* (Spring 2013): 1–15.; S. Kozicki, E. Santor and L. Suchanek, "Unconventional Monetary Policy: The International Experience with Central Bank Asset Purchases," *Bank of Canada Review* (Spring 2011): 13–25.
[10] A. Reza, E. Santor, and L. Suchanek, "Quantitative Easing as a Policy Tool Under the Effective Lower Bound," Staff Discussion Paper No. 2015-14, Bank of Canada, 2015.
[11] J. Dorich, M. K. Johnston, R. R. Mendes, S. Murchison and Y. Zhang, "ToTEM II: An Updated Version of the Bank of Canada's Quarterly Projection Model," Technical Report No. 100, Bank of Canada, 2013; O. Gervais, and M.-A. Gosselin, "Analyzing and Forecasting the Canadian Economy Through the LENS Model," Technical Report No. 102, Bank of Canada, 2014; S. Alpanda, G. Cateau and C. Meh, "A Policy Model to Analyze Macroprudential Regulations and Monetary Policy," Working Paper No. 2014-6, Bank of Canada, 2014.

This effort will yield a big payoff to public policy. Our models will inform the discussion with our federal partners on the right mix of policies—monetary, fiscal or macroprudential—that authorities should use to handle a specific problem and support the economic and financial well-being of Canadians. We need to understand better under what circumstances it would be appropriate for the Bank to use monetary policy for financial stability purposes.

Models are just the starting point. No model can give the whole picture. That's why we engage with the outside world to gather some of the missing pieces, here and abroad. This allows us to ask the right questions and apply our judgment.

Considering Alternative Futures

Innovation doesn't stop with simply adapting our theoretical frameworks and gathering information on the world as we see it today. We must also challenge our thinking by contemplating alternative futures.

The international monetary system could look completely different 20 years from now. China is increasingly opening its financial markets and liberalizing capital flows with the rest of world. While this is clearly positive for the global economy in the long run, this is a huge change and the transition could be bumpy at times. That means we need to think about how the world financial system will evolve and what Canada's place in it will be. Will the renminbi become a reserve currency? How would that affect the demand for other reserve currencies, including Canadian-dollar assets?

Global and domestic payment systems—the backbone of the financial system—could also look completely different. Technology is advancing and new players like PayPal and Apple Pay are competing with the traditional ones. The Bank will help lay the groundwork for the next generation of Canada's payment systems.[12]

Then there are disruptive technologies, such as the distributed ledger that's at the heart of Bitcoin, or peer-to-peer lending facilities like the Lending Club. These developments are pushing more and more financial activity outside the traditional financial sector. The sharing economy is upending entire industries. Here, I'm thinking about things like peer-to-peer home rental services such as VRBO and mediated services such as Uber.

These types of trends raise questions for the Bank. Consider a cashless society where everyone uses e-money, which is monetary value stored electronically and not linked to a bank account. If this money were denominated in Canadian dollars, who should issue it? Who should earn the seigniorage?[13] The central bank, as it does today, or the private sector? What would the financial system look like in each case? The Bank needs to consider all these questions. Cash is a public good that many people still prefer, especially for smaller transactions.[14]

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[12] J. Chapman, J. Chiu, S. Jafri and H. Pérez Saiz, "Public Policy Objectives and the Next Generation of CPA Systems: An Analytical Framework," Discussion Paper No. 2015-6, Bank of Canada, 2015.

[13] Seigniorage is the revenue earned from the issue of money. In 2014, the Bank of Canada's seigniorage was about $1.3 billion.

[14] B. Fung, K. Huynh and G. Stuber, "The Use of Cash in Canada," *Bank of Canada Review* (Spring 2015): 45–56.

As we think about alternative futures, we have to envision a world in which people mostly use e-money, perhaps even one that's not denominated in a national currency, such as Bitcoin. This would create a new dynamic in the global monetary order, one in which central banks would struggle to implement monetary policy. And, central banks couldn't act as lenders of last resort as they do for their own currencies. This means that households and businesses could suffer important losses if such an e-money were to crash. We need to anticipate this and manage the risks and benefits that could arise from the broader adoption of e-money.

The Bank will explore these and many other trends over the course of our three-year corporate plan. To do this, we're expanding the range of techniques we use for analysis. For example, we've begun to capitalize on "big data" to do things that aren't possible with traditional economic statistics. Prices collected from retail websites can be used to study pricing behaviour. Social media used by people of all ages to express likes and dislikes may become a vital source of data to understand the perception and credibility of monetary policy. We're also drawing on techniques from behavioural economics to study such things as how people form expectations.

If we don't start now to find new approaches to handle these and other alternative futures, we won't be prepared for whatever comes our way.

Cultivating Inquiry and Informed Risk Taking

Our strategic plan focuses on new ideas. And if we want the new ideas to match our ambitions, we need the right corporate culture. No matter how successful it is, any business faces natural obstacles that can get in the way of innovation. That is why we are being proactive to make sure they don't get in our way.

The first obstacle to innovation is homogeneous thinking. It's human nature to have affinity with people who think the same way and use the same jargon. But the echo chamber you create is limiting.

People at Rotman and Munk know you often have to look outside your own industry to find ways to improve. We certainly did this during the financial crisis with the creation of liquidity facilities, which involved economists, market experts, IT specialists, lawyers and accountants.

Scientists in our Currency Department also cast a wide net when they develop new security features for bank notes. A few years ago, they turned a material used in cancer therapy research into a machine-readable security feature. We got a patent for this innovation.

The second obstacle to innovation is that people generally avoid conflict. Not everyone enjoys being at the centre of debate or playing devil's advocate. Having smart and entrepreneurial people is critical to generate innovation, but it's not sufficient; you must also have a culture that values inquiry and encourages people to speak freely.

There is a lot of wisdom in the concept of integrative thinking proposed by former Rotman Dean Roger Martin: often, two ways of looking at a problem can offer insights. Leaders have to give the example. Good leaders have flexible minds and are open to being challenged. They take the time to listen. They look at all facets of a problem to come up with the best strategy. They don't step on newly sprouted grass too early.

So we've added innovation as a formal topic of discussion at our senior leadership meetings. We've also put innovation at the heart of our leadership expectations. These expectations are being integrated into our leadership training and embedded in performance management, recruitment and other management practices. Practically speaking, this focus will translate into our managers spending more time with employees and on their employees' ideas. Leveraging our most important asset—our people—will spur creative ideas and diversity of thought.

We're also implementing new practices to help staff assess the kinds of alternative futures I mentioned earlier. We're developing an innovation lab for cross-functional groups to assess the implications of low-probability, high-impact economic scenarios. I expect this inquisitive "black hat" perspective will benefit our everyday operations as well.[15]

The last obstacle to innovation I'll mention is aversion to risk, which is common among central bankers. This is understandable, given our responsibility as economic stewards. There are no take-backs and writedowns in central banking.

That said, we can't escape the fact that innovation entails risks. A company that creates iPads and iPhones will occasionally produce a Newton.

Mark Zuckerberg had it right when he said, "In a world that's changing really quickly, the only strategy that is guaranteed to fail is not taking risks."[16]

We have to find a way to embrace risks and the occasional failure that comes with risk without jeopardizing our mission.

This is why we're fostering a culture of informed risk taking. To support it, we have a risk-management framework that helps us anticipate, mitigate and manage the risks that could undermine our ability to fulfill our mandate. It also gives us scope to do groundbreaking research and improve our operations and business practices.

Reputation figures prominently in our risk analysis. It deserves special attention because it is vital to the success of all of our work. Monetary policy is a good example of this, because it's more effective when people believe that the Bank will achieve its inflation target. Our credibility took years to build and we intend to preserve it.

If we take appropriate risks, our actions will stand the test of time, even if they initially face criticism. The most important thing for the Bank is to do the right thing, not the most popular one.

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[15] In Edward de Bono's Thinking Systems approach, the black hat is one of six thinking modes and focuses on how things could go wrong. See E. de Bono, *Six Thinking Hats*, (New York: Back Bay Books, 1999).

[16] Tobak, S. "Facebook's Mark Zuckerberg—Insights For Entrepreneurs," CBS MoneyWatch, 31 October 2011. Available at http://www.cbsnews.com/news/facebooks-mark-zuckerberg-insights-for-entrepreneurs.

Seeking Constructive Dialogue

To get to the right answers, we need to engage with people outside the Bank. If we don't engage, we leave ourselves open to confirmation bias and tunnel vision.

John Maynard Keynes wrote during the Depression that "It is astonishing what foolish things one can temporarily believe if one thinks too long alone, particularly in economics."[17] That's truer now than ever.

What I've learned since joining the Bank of Canada over 14 years ago is that we need to be deliberate in reaching out to people beyond our own four walls. We do it through consultations with the public and market participants. We also talk to about 100 firms every quarter as part of our *Business Outlook Survey* to get a sense of what entrepreneurs see on the ground. As part of our plan, we devised new ways to reach out.

First, we've recently launched a program in which outstanding scholars will work with Bank researchers.[18] We will benefit from this injection of outside leading-edge thinking. We're also hosting conferences on the most important economic and financial issues facing Canada. Earlier this year, we held a conference on disappointing global growth rates. And we're getting ready for others, on e-money and inflation targeting.

Second, we're engaging domestic and international counterparts more than ever. It's important that people outside the Bank understand what we're working on when it's still in the early stages, not when it's all baked into policy.

That's why, this week, we've expanded the range of work we post on our website. We've started publishing staff research papers under a new process that's independent of Governing Council. These papers are works-in-progress that will eventually be submitted to peer-reviewed journals. We're also publishing staff analytical notes and discussion papers on timely and topical issues.[19] That way, people can benefit from our analysis while it's fresh.

We expect that this kind of work, at times, will show results that are not fully aligned with the views of the Bank's Governing Council. That's okay. The innovation process demands that researchers have the intellectual space to explore ideas.

Third, it's not all about us. The Bank's culture emphasizes sharing our knowledge. Few people know that we provide technical assistance to other central banks. Our assistance spans the globe and runs the gamut of issues, from economic models to bank note quality inspection to business continuity.

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[17] J. M. Keynes, *The General Theory of Employment, Interest and Money,* 1936.

[18] More information on the Bank's Visiting Scholar Program can be found at http://www.bankofcanada.ca/research/visiting-scholar-program.

[19] J. Muellbauer, P. St-Amant and D. Williams, "Credit Conditions and Consumption, House Prices and Debt: What Makes Canada Different?" Staff Working Paper No. 2015-40, Bank of Canada, 2015; C. Friedrich, K. Hess, R. Cunningham, "Monetary Policy and Financial Stability: Cross-Country Evidence," Staff Working Paper No. 2015-41, Bank of Canada, 2015; B. Feunou, J.-S. Fontaine, J. Kyeong and J. Sierra Jimenez, "Foreign Flows and their Effects on Government of Canada Yields," Staff Analytical Note No. 2015-1, Bank of Canada, 2015.

One area where our help is frequently solicited is web design, because our website has been recognized as the best in central banking.

Closer to home, we've introduced new programs to encourage the next generation of researchers, including the Graduate Student Paper Award[20] and the Governor's Challenge. The Governor's Challenge is a monetary policy competition for undergraduate students in economics that is going on right now.

These efforts have a big payback. We learn from other central banks' experiences and from the original ideas students have.

Conclusion

Let me wrap up. If there's one idea I want to leave you with today, it's this: when the world is moving around you, standing still is a risky strategy.

At the Bank, we put innovative thinking at the centre of our strategic plan to make sure that we can navigate what's ahead. For us, innovation comes from taking a hard look at what we're doing and considering alternatives. Hubris is the enemy of sound policy. Innovation comes from involving people, like you here today, in our quest to find the best answers.

Our commitment to innovation extends to all parts of our business. It will give us the tools to support Canada's economic and financial well-being for the next 80 years and beyond.

[20] The Bank of Canada Graduate Student Paper Award is conferred annually at the Canadian Economics Association Conference. The purpose of this award is to promote high-quality research in the subject areas relevant for the Bank of Canada's mandate. See http://www.bankofcanada.ca/research/research-paper-awards.