Thank you for that very kind introduction.

I am delighted to be here, and I am grateful to the Observer Research Foundation for the invitation to join you today.

The University of Toronto is proud of the ongoing collaborations between our Munk School of Global Affairs and the ORF. This partnership brings together premier foreign affairs think-tanks from India and Canada. It involves international thought leaders from the academy, from industry and the non-profit sector, from the public service and all levels of government. And it extends beyond the borders of our two great nations into international collaborations.

I am very pleased to have the opportunity to build on this growing relationship between our two institutions.

I am also honoured to share the podium this afternoon with Dr. Ramachandran. It is an exciting and, frankly, inspiring time in India and your contributions to public debate on key policy questions facing the country are so important.

Finally, I am humbled by the warm hospitality I have received in India and the lovely welcome I have had from all of you. Thank you.
The title of my talk today makes two important connections. The first connection is between cities and a nation’s place on the global stage. The second is between universities – or research institutions more generally – and smart cities.

I am going to argue that these connections are closely inter-related. Indeed, to a large extent smart cities and universities are ultimately dependent on each other for their success.

But let me start with the connection between cities and a nation’s place on the global stage.

The pace of urbanization in India is staggering – as are the accompanying economic and social opportunities.

In his budget speech in July 2014, Finance Minister Arun Jaitley spoke of an emerging “neo-middle class” with aspirations for a higher standard of living. He said, and I quote…

“Unless new cities are developed to accommodate the burgeoning number of people, the existing cities would soon become unlivable. The Prime Minister has a vision of developing ‘one hundred Smart Cities’, as satellite towns of larger cities and by modernizing the existing mid-sized cities.”
He also announced the Prime Minister’s plans for five new IITs, five new IIMs, and four new AIIMS-style institutions.

Let me say that this is simply a breathtaking and in many ways a visionary plan. PM Modi’s insight that India’s national prosperity is vitally connected to the prosperity of its cities and urban regions is revolutionary at the political level—and at the cutting edge of a good deal of contemporary research and experience.

On the global stage, public policy approaches to urbanization have been evolving steadily over the past seven decades. In the last 10-15 years, we have seen a growing recognition that cities are in fact increasingly critical national resources. They are now appreciated as drivers of innovation, and prosperity—not just locally, but at the national level.

Accordingly, clear-thinking governments around the world are now taking an active interest in ensuring that their cities develop in a sound and orderly fashion. A few examples come to mind:

- In the early 2000s Brazil established a Ministry for Cities and a federal program to finance urban infrastructure led by the National Treasury.

- Germany has a new National Urban Development Policy to coordinate and help finance improvements to central city business districts with funding shared evenly among national, state and local governments.

- Last year the Netherlands established a National Policy for Infrastructure and Spatial Planning.

- An excellent example comes from the United Kingdom, one of the world’s leaders in urban planning and national urban policy. The UK has recently created a Minister for Cities and a national Cities Policy Unit.
  - The national government takes the lead in negotiating tailored “City Deals” with individual metropolitan regions across the country, providing cities with more autonomy and more strategic financial support.
The details differ from case to case, and country to country, but a common idea across many of these initiatives has been to devolve greater decision-making authority to cities for more effective, local responses to specific challenges – in short, the improvement of city systems.

At the same time there is a parallel effort to coordinate or build strategic platforms to foster inter-city networks and cooperation – further developing the coherence of the national system of cities.

A good example of reforming city systems comes from the UK. A 2013 report from the London Finance Commission found that only 1 of every 14 pounds sterling collected in London taxes was spent by local government in London. This has had a predictable impact on infrastructure investment and growth, and efforts are now underway to transfer more tax authority to the London metropolitan region to expand the local capacity for investments in urban infrastructure.

A good example of policy-driven investments to enhance the national systems of cities comes from the burgeoning mega-agglomeration of Hong Kong and the Pearl River Delta. Vast national-level investments in water, energy, ICT, and notably transportation – including the soon-to-be-completed Hong Kong–Zhuhai–Macau Bridge, the world’s largest sea-crossing structure – have already yielded tremendous economic and social gains.
My point here is that forward-thinking leaders around the world are increasingly recognizing that “[C]ities now aggregate the productive assets that shape competitiveness…” [Greg Clark and Greg Clark, 2014]

But at the same time, “[T]he processes of metropolitan growth have, in many cases, taken place without clear economic understanding or strategic institutional guidance.” [Greg Clark and Greg Clark, 2014]

Leaders from Brazil to the United Kingdom to Germany to Hong Kong are moving to provide that missing economic understanding and strategic guidance.

This is what makes PM Modi’s initiative so important. The Prime Minister’s plan embraces the critical value of India’s cities to the nation’s future from the outset. This is urbanization by design – not by happenstance.

It is difficult to overstate the importance of this shift. The Government of India’s recent Draft Concept Note on Smart Cities sets out the opportunities that urbanization by design will bring – along with the monumental challenges. I was impressed by the document’s ambition and its candor.

And this brings me to the second connection from the title of my talk: Universities and Smart Cities.
As a footnote here, let me pause to note that in many places around the world universities combine the roles of education and research. This is familiar to everyone here, of course. But I want to make it clear that my remarks about universities extend as well to research institutions and institutions of higher learning more generally, including those many excellent and diverse institutions across India. This is a point I will return to in a few minutes.

Back to the main story… One of the reasons I was so excited to take on the Presidency of the University of Toronto last year is that I have focused much of my academic career on studying the economies of urban regions and the roles that major institutions such as research universities and other leading research institutions play in their development as smart cities. By ‘smart cities’, I mean: cities whose economies are based increasingly on knowledge-intensive forms of economic activity.

This relationship between smart cities and smart institutions like universities and research institutes is crucially important. And it is not nearly as well-appreciated as it should be.

As India embarks on its remarkable plan to build 100 Smart Cities and expand its ranks of institutions of higher education and advanced research, I respectfully suggest that these plans should not be regarded as independent, but as two aspects of the same strategy. Let me hasten to acknowledge that some of the recent commentary from within India expresses a similar view. So I recognize that this idea is not new – but I want to underscore how important this connection is.

Let me elaborate on this argument a bit further.

My starting point is that the relationship between universities and their host city-regions is fundamentally symbiotic. It is mutually enriching, along multiple dimensions.

A strong university helps build a strong city, and a strong city helps build a strong university. Leveraging this relationship creates mutual advantage, leading to prosperity for both the university and the city-region that hosts it. To put it even more directly: cities foster the development of world-class research institutions and universities, while at the same time universities and research institutions foster world-class cities.

The international literature on the geography of innovation and prosperity shows that cities generally, and smart cities in particular, are privileged sites for innovation, entrepreneurship, and the flourishing of ideas and opportunities. The forces underlying this connection are many and varied.
On the demand side…

- Smart cities are home to large concentrations of sophisticated and demanding customers and deep, diverse, and highly competitive markets that spur innovation.

- By providing interesting and important problems to solve, cities naturally stimulate new ideas or products to address them.

- And the best cities, the smartest cities if you will, are constantly evolving and growing, presenting new possibilities.

On the supply side…

- Smart cities offer a geographically concentrated, deep pool of inputs that support entrepreneurship and the development of new products – including a wide array of specialized services and, of course, human capital.

- Indeed, there is growing evidence that the most talented, creative, and entrepreneurial people members of the labour force prefer to live in urban settings offering a high quality of place: cities that are culturally vibrant, physically appealing, safe, with good schools, and open to newcomers and new ideas.
Furthermore, because it is now widely recognized that, in many sectors, innovation is an interactive and iterative process, not a linear one, cities foster innovation particularly well. They bring technology users and producers together in a close, productive dialogue.

Similarly, smart cities foster the circulation of knowledge between firms – including those in the same or related industries, as well as those in seemingly unrelated industries. The capacity to facilitate such ‘knowledge spillovers’ and localized learning provides tremendously fertile conditions for innovation, even in a time when information technologies make it easy for information to be shared instantly over long distances.

It is worth highlighting that these same supply and demand features that make smart cities privileged sites for innovation, entrepreneurship, and the flourishing of ideas and opportunities also make them ideal sites for universities and research institutions to flourish.

For example, universities and research institutes thrive in part by solving problems brought to them by demanding customers – who become partners in an interactive innovation process.

The ability of universities to attract their most important inputs – faculty and students – depends directly on the quality of life in the city around them.

And the creativity and ingenuity of their faculty and students is enhanced by their exposure to interactive learning opportunities and rampant knowledge spillovers locally.

Those same creative, energetic, and entrepreneurial people, who can choose where they want to live, often decide to live where there are good schools and hospitals, vibrant neighbourhoods, stable property values, and so on… and all of these features are more likely to be present when one of your neighbours is a research-intensive institution or educational centre.

So my point is that smart cities and universities or research institutions thrive in the same environments and fuel the same outcomes.

But I also believe that the evidence supports a stronger conclusion: that the partnership between smart cities and universities has a propulsive effect – whereby each enhances the strengths of the other. This means that if smart cities are going achieve their full potential, they will need to leverage the advantages of nearby universities or research institutions.

To illustrate this idea, let me tell you a brief story of a fellow named Bill Buxton.
This story comes from my own city.

Back in 1975, a 26 year-old graduate student arrived at the University of Toronto intent on designing his own digital musical instruments. (Here he is with one of his prototypes.)

Bill Buxton graduated with an MSc in computer science, joined the faculty at U of T, where he is still an adjunct professor, and in 2013 received an honorary degree from his alma mater.

In the intervening years, he and his colleagues in the Dynamic Graphics Project, based in the University of Toronto’s Department of Computer Science, pioneered many innovations in human-computer interaction. As far back as the 1980s, their work led to the development of the multi-touch screens so ubiquitous today on all our smart phones and tablets.
Here he is in 1992 demonstrating the Active Desk he helped develop at U of T.

Recall that the human-computer interface paradigm in the 1970s and 1980s was dominated by punch cards and monochrome text displays. Even the mouse remained in relative obscurity until 1984.

In 1994, Buxton joined a firm in Toronto called Alias/Wavefront – now part of Autodesk – and helped lead a revolution in human-computer interfaces and digital graphics.

Alias/Autodesk was and remains a hotbed of innovation and entrepreneurial activity in Toronto, producing leading-edge software for 3D design, engineering, and entertainment – including their famous 3D rendering software Maya used in many films.

In addition to disrupting and reinventing the way humans interact with computers, Buxton’s contributions at Alias/Autodesk helped earn the company three Academy Awards. The image below shows then CEO Doug Walker holding an Oscar.
It is telling that around the time when Buxton and his colleagues were developing multi-touch screens at U of T, 1 in 4 of Ontario's jobs was in manufacturing, and sectors such as automotive parts and final assembly dominated the our provincial economy.

Today the Toronto region is the 3rd largest technology hub in North America, comprising some 43% of Canada’s tech sector investment. And firms such as Alias/Autodesk have played a key role in building and maintaining Toronto’s standing in this regard.
Since the days when Buxton first joined Alias/Autodesk, the firm has employed more than 100 graduates of the University of Toronto and there has been frequent movement of employees and faculty between the firm and the University – in both directions, across a boundary that can best be described as porous.

Indeed, more than half of the full-time employees recruited from the University of Toronto are still working at Autodesk today, and virtually all of them are still in Canada. Several have returned to the Department of Computer Science at U of T, and several have gone on to start new companies, including those with faculty positions in the Department of Computer Science.

It is very important to emphasize that, when Silicon Graphics acquired Alias/Wavefront in 1995 (it became part of Autodesk some years later), it decided to keep this research and development group in Toronto – instead of moving it. The symbiotic relationship with the University of Toronto was one of the primary motivations underlying this decision. The presence of the University has been critical in enabling Toronto to retain Alias/Autodesk in the city.

At the same time, in addition to helping drive the innovative dynamism of the Toronto (and indeed, the world) economy, Autodesk – through its close partnership with our University – has also been a force of stability and prosperity generation over the long term. Indeed, the company has helped both the city and its largest university attract and retain creative talent in the form of faculty and students.

It is talent like this that has played a key role in enabling our Computer Science department to attain its remarkably high world ranking (#10 in 2014 ARWU ranking by Shanghai Jiao Tong University)

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**Shanghai Jiao Tong, ARWU**

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*Overall field ranking  Specific subject ranking*
This story of the relationship between a world-leading multinational software firm and the city of Toronto is a clear and compelling demonstration of the propulsive effect arising from the symbiotic partnership between the university and its host city-region.

Of course, as everyone here knows very well, this story has analogues in a dozen other centres of research and innovation around the world: in Boston, New York City, San Francisco, London, Beijing...

These data show the top 15 urban-agglomerations by number of indexed research publications for the periods 1996-98 and 2011-13.

Notice the prevalence of the world’s global city-regions on the list. With one or two notable exceptions, this could be a list of the world’s economic, cultural, or socio-political powerhouses as easily as research powerhouses.

A report released at the end of 2014 in the UK called *Universcities: The Knowledge To Power UK Metros* put the point bluntly. An unnamed venture capital fund manager told the authors of the report: “Ultimately, money flows where ideas flow.” In other words, economic activity – and the money to finance it – is clustering most intensively around those places that excel at producing new ideas.
So how does India fit into this analysis? It turns out that research publication productivity and international collaboration are exploding in India, with cities like Delhi and Mumbai leading the way.

This graphic shows the number of international authors collaborating on publications with an author based in India. The growth is exponential – a factor of 10 since 1996.

It is also striking to see the growth in the number of countries with 100 or more collaborations with Indian authors – there were 6 in 1996 and nearly 60 in 2014. I expect it will not be long before Mumbai or Delhi appear on the list of the world’s top publication-producing urban regions I showed a moment ago. I would argue that these data have profound implications for PM Modi’s extraordinary plan for smart cities and urbanization in India.

I hope I have started to persuade you that smart cities and institutions of higher education and advanced research have a special relationship. Access to clean water, proper sanitation, resilient infrastructure, transparent and efficient institutions, sustainable and reliable power … these are all critical components of smart cities. But they are necessary though not sufficient conditions for ensuring maximal success. The partnership between smart cities and universities is, in my view, the crucial element that enables both entities to reach their full potential.
As I suggested at the beginning of my remarks, the Government’s plan to build new Smart Cities and new higher education infrastructure should not been seen as independent initiatives – but as co-initiatives.

This observation may have significant implications for the plan’s implementation. Even as India advances its agenda of urbanization by design, it will advance its education by design agenda as well.

As with the plan to build smart cities, there are tremendous opportunities and challenges for India as it builds higher education and advanced research capacity. What will it look like?

With India’s extraordinary history and a remarkable trajectory in the past twenty years, I would not try to anticipate the details of how India’s system of higher education and advanced research will evolve. I am certain it will be incredibly diverse, like India itself, encompassing everything from world-class research universities to Open University on-line institutions to smaller industry-led educational facilities… and a host of other options.

But there are fascinating questions and opportunities in the details. What will the mix of private and public institutions be? What will the funding model look like? What is the balance between research intensity and education? There are hundreds of options and I do not pretend to have all the answers.

However, I do know two things. First, whatever the configuration of India’s higher education and advanced research infrastructure, the partnership between India’s dynamic universities or research institutions and their host smart cities will be vibrant and powerful.

And second, I also know that the world is taking notice and will be watching. India’s extraordinary tradition of disruptive innovation and creative genius simply cannot be ignored.

I don’t underestimate the magnitude of the task or the difficulties ahead. But I am convinced that India will create new models of urban innovation and new systems of advanced research and education. Together, these advances will lead to ever-higher levels of national prosperity.

The University of Toronto – and no doubt other leading institutions from around the world – is eager to collaborate with India, just as we are eager to learn from India’s continuing and remarkable achievements.

Thank you for your kind attention.