

## **Encouraging Innovation/Growing Partnerships**

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Hello everyone and welcome to the 13th Annual U.S./Canada Technology Business Forum sponsored by the New England –Canada Business Council.

I am delighted to be here with you today to celebrate a relationship that is over three centuries in length -and getting deeper and deeper every year. Our trade in goods alone in 2011 sent \$26.8 billion north across the border and \$18.1 billion south. That does not even count the trade in services or the exchange of resources due to our reciprocal delight with vacationing in each other's countries. That was a delight that I came to early in life -as some of my earliest memories were of loading up our extended families in several cars and journeying off each summer to a cabin on Trout Lake, just outside of North Bay, Ontario. There I learned to fish, canoe, drive a power boat, sleep in sleeping bags, and get along with my brother and sisters on long car journeys. I am sure my late parents would probably not agree that my brother, sister, and I were ever successful in getting along on that car ride. But it never stopped them from the journey.

Our countries have so much in common -as we share common roots and many common values. However, we have enough differences and enough diversity to make the relationship even more interesting. At various points in history, we have chosen different paths -and those too are instructive.

Today, however, we are here to talk about encouraging innovation and growing partnerships. This is THE hot topic around the world. There is very little disagreement that our future and the future of our children depend upon that. I have given variations on this talk in China, Japan, Russia, Germany, South Africa, and many other places.

They all get it. In fact, they are all living it. In many ways they are doing a better job of living it than we are – and we invented it. If that sounds a bit boastful, then please forgive me, but I think that one of the reasons that we struggle with these

issues is because we pioneered many of these approaches –even if not always intentionally – and have been slow to respond as others have looked at what was done and said: “We can do that too! And maybe we can even do it better!”

There is no “secret sauce” for innovation today. We know what we need to do. The prizes go to those who do it best.

Let me begin by summarizing the ingredients of the not-so-secret-sauce:

1. Great research done in great research universities.
2. Capital investments from venture capitalists, angel investors, banks and other investors.
3. Development of an educated workforce with the skills and talents needed to both create and operate the new businesses and new products
4. Investments in infrastructure by government and the private sector.
5. Creation of a nurturing culture for new businesses.
6. Ensuring a business climate that will allow capital to be deployed productively and allow businesses to flourish and make the re-investments needed to build an industry from an idea.

I will say a bit about each of these in turn.

We know that innovation is generated disproportionately around great research universities. While this may have started first here in New England, it spread quickly to California -especially around Stanford University and UC Berkeley. Much to the chagrin of Massachusetts, they did it even better. We watched ruefully as our extraordinarily innovative mini computer industry disappeared with the rise of Silicon Valley and the microcomputer industry. Perhaps we forgot that innovation is a journey and not a destination. Innovation is continuous. Failure to innovate is disastrous.

Once, following one of my talks, a prominent scientist got up and described something as “*the stable product of long evolution.*” Grinning broadly, I looked at my friend and asserted “Al, you are a great scientist and so you certainly know that evolution does NOT produce stable products.” Ok, some products, like dinosaurs, can hang around a very long time – in their particular case 135 million years. But,

they were not stable. We humans are a comparative “flash in the pan,” but we all hope that we can have a long run too.

So it is with innovation. Yesterday’s brilliant idea is today’s dinosaur.

Research is indeed the rocket fuel of innovation.

What happened in Massachusetts after World War II was fueled by investments that had been made in Universities around important technologies –particularly radar, electronics, and nuclear science. The California experience was boosted by investments made in great research universities and by the ever growing demands of a consumer society that was hungry for the fruits of the developing technologies.

But what happened in Massachusetts, California and other places did not go unnoticed around the country and around the world. Imitation is the sincerest form of flattery, and there is no shame in learning from others and avoiding their mistakes. In the 1950’s, North Carolina was a largely rural and agricultural state, but they knew they needed to organize themselves to become something quite different. In 1959, they launched the Research Triangle Park, drawing on (and investing in) the nearby research universities: The University of North Carolina, Duke, and North Carolina State University. The rest is history. The park today is home to over 170 global companies. The largest single US installation of IBM is located in the park with over 11,000 employees.

But, even imitators can be imitated, and before long Austin, Texas, Pittsburgh, Pennsylvania, and many other locations were already developing their own intentional regional strategies for innovation.

That strategy was not confined to the United States. In China Tsinghua University, sometimes called the MIT of China, launched an innovation strategy that has transformed its region. Today you drive down the broad street leading to Tsinghua’s Stalinist era main building and you can look up and see skyscrapers labeled Microsoft, Google, CERNet, and so on. It was there I met the father of the Chinese internet, and I saw many burgeoning start-ups like Lenovo –founded with investments from the Chinese Academy of Sciences. It is presently led by a

graduate of Shanghai Jiao Tong University, which has acted as the hub of technologically driven economic development in Shanghai.

In India, the creation of the Indian Institutes of Technology stimulated major economic development. Remember that earlier I had mentioned that the largest IBM installation in the United States was in Research Triangle Park? Well, the largest IBM installation in the world is in India. Half of IBM's Global Service Employees are located in India and that is expected to represent over 150,000 employees!

## **Capital**

If the research done at great research universities, and in industry, is the rocket fuel of innovation, then one needs an oxidizer to get the combustion going.

Availability of capital provides the oxidant that fires up the innovation economy. Not just any kind of capital. Innovation requires capital that is willing to take large risks in return for the availability of large potential rewards. If the rewards are not possible, then there is little likelihood that capital would want to take the risk of investing in innovation. Venture investors love to say "no risk –no reward," but we always need to remember that no reward means no risk will be taken.

Boston has been a great center for the development of the biotechnology industry, but this is an extraordinarily difficult industry. The costs of bringing a new drug to market are very long. The costs are high. The chances for ultimate success are small. No reasonable person would ever invest money in this industry unless there was some way to protect that investment long enough to earn a reasonable return. It is estimated that it takes nearly \$1 billion to bring a biologic to market and that the overall chances of success are about one in ten. This is why the late Senator Kennedy led the fight to allow twelve years of data exclusivity to Biologics. Recently the President has suggested that he wants to reduce that to seven years- which has many quite nervous. Policy questions like these are far more than academic exercises.

## **Creating a Nurturing Culture and Business Climate**

Great research universities and abundant capital are necessary components, but they are far from sufficient. If there are not mechanisms for bringing research into

production and if there is not a nurturing business climate, the process does not work.

Tom Chmura, the Vice President for Economic Development at the University of Massachusetts often refers to a study he did at SRI for NSF that compared the Michigan and Pennsylvania investments during the 1980s. These investments in STEM areas were intended to help these states recover from the recession. At that time it was popular to refer to these areas as the “Rust Belt

*He notes that “The Michigan investments were solely focused on university R&D in the life sciences at the major Michigan research universities. As you might expect, it all helped lead to stronger life science R&D programs at those schools but all the evidence of economic activity happened in New Jersey (where big pharma licensed Michigan technology) or Massachusetts and California (where any start-ups coming out of Michigan usually ended up). Michigan had done nothing to build up the entrepreneurial eco-system, encouraging VC investment, developing incubators, etc. and thus was not able to “capture” the economic potential of their R&D.”*

The Ben Franklin Partnership program created by Pennsylvania made more strategic investments. The intent was to develop the culture for nurturing new businesses. They had seed funds for technology commercialization and programs intended to bridge the “valley of death” between the technology development stage and the early commercialization stage. They decided to use state pension funds to bring in venture capital funding. They created incubators. They funded matching grants to industry R&D collaborations. This more complete strategy allowed Pittsburgh to capture a much larger share of the economic development potential of the new ideas generated by their universities and industries than did Michigan.

### **Workforce and Education**

It is becoming depressingly obvious that workforce and education is an area in which North America is falling behind the rest of the world –and it is especially true in the United States. At a time when the emerging economies are making breathtaking investments in education, we are making breathtaking DIS-INVESTMENTS in education. One of the primary reasons that companies like IBM, Google, Microsoft, General Motors, and other companies have been making

investments in other countries is to get access to the educated workforce and intellectual capital which is the key to their future.

According to the National Academy of Science Report: *Rising Above the Gathering Storm*;

In South Korea, 38% of all undergraduates receive their degrees in natural science or engineering. In France, the figure is 47%, in China, 50%, and in Singapore, 67%. In the United States, the corresponding figure is 15%.

Some 34% of doctoral degrees in natural sciences (including the physical, biological, earth, ocean, and atmospheric sciences) and 56% of engineering PhDs in the United States are awarded to foreign-born students.

In the US science and technology workforce in 2000, 38% of PhDs were foreign-born.

Estimates of the number of engineers, computer scientists, and information-technology students who obtain 2-, 3-, or 4-year degrees vary. One estimate is that in 2004, China graduated about 350,000 engineers, computer scientists, and information technologists with 4-year degrees, while the United States graduated about 140,000.

Is it any wonder that many corporate and academic leaders are calling upon the government to reverse misguided immigration policies and make it possible for foreign born graduates of our Universities to remain in the United States?

Statistics that demonstrate just how many start-up companies have been created by immigrants are particularly compelling. The Kauffman Foundation showed that *“Thirty-one percent of the engineering and technology companies founded from 1995 to 2005 had an immigrant as a key founder compared with the national average of 25.3 percent.”*

Canada has some similar stories. Mihalus “Mike” Lazaridis is a Greek born in Istanbul Turkey who emigrated to Canada, studied Electrical Engineering at Waterloo University, founded Research in Motion(RIM), created the BlackBerry (aka Crack Berry), and become the Chancellor of the University of Waterloo. It was a contract from General Motors that got him started. A small government loan helped move this forward and venture capitalists eventually invested over \$30

million -with an initial round of \$5M. It is having a tough time now, but that is the way of the world. Innovation does not produce stable products. It must be a continuous process.

Someone should check to see what is in the water at Waterloo, I first went there to evaluate the development of the Maple mathematical software developed in 1980 by the Symbolic Computation Group at the University of Waterloo. I ended up buying a lot of it for my institution! For many years it vied with Mathematica to be the top selling symbolic math software.

### **Infrastructure**

Investments in infrastructure have always been an important aspect of economic development. When water transportation was the dominant means of moving goods to market in North America, we built ships and canals. In the mid-19<sup>th</sup> century it was the railroads that tied the regions together and generated economic activity. With radio and TV, it was the assignment of the electromagnetic spectrum. The automobile stimulated the building of roads and bridges and culminated in the Eisenhower Interstate Highway system.

I have already mentioned the incredible investments in research universities in California after World War 2, but it all began with the Morrill Land Grant act of 1862 which created the great state flagship research universities. I note in passing that this year marks the 100<sup>th</sup> anniversary of this incredibly far-sighted investment. Today these great state research universities, along with the fewer and smaller private research universities, are the centerpiece of every region's economic development –just as they were for North Carolina.

In recent years, the construction of the internet has facilitated an entirely new set of industries, but it has also broken down the limitations of distance. This allows software developers in India to compete with those in Toronto and Chicago.

We are sorely in need of new investments in infrastructure. Without them we will struggle to create the kind of future and the kind of jobs that we would want our children to have.

We need investments in energy, transportation, and education –and that is just a start.

This is all the more challenging since we find ourselves short of investment funds to do those things that we need to do.

The lack of investment in infrastructure is already constricting our futures.

The National Academy of Sciences addressed this lack of investment with a few chilling pieces of data:

*Chemical companies closed 70 facilities in the United States in 2004 and tagged 40 more for shutdown. Of 120 chemical plants being built around the world with price tags of \$1 billion or more, one is in the United States and 50 are in China. No new refineries have been built in the United States since 1976.*

Recently several analysts who were addressing the surge in gasoline prices pointed at the lack of investment in energy infrastructure and warned that prices were expected to continue to rise because of this. This will hit our region particularly hard as the refineries presently providing most product to the region have recently been closed.

## **Collaboration**

So there you have it. There is nothing mysterious about the recipe for innovation and economic success. We know exactly what we need to do.

It will not be easy. But it IS within our power.

One key aspect of our strategy must be **collaboration**. Many of the tasks that face us are too large to be easily accomplished by any one region -or even any one country. Collaboration is not always an easy thing to do. Here in Massachusetts we have often been accused of missing the collaborative gene. But we are learning.

Two years ago, at a dinner of the research university Presidents in Massachusetts we were chatting about how we might work together. The mere fact that we were talking about it was something entirely new to the region! A few days later I got a call from Susan Hockfield, President of MIT. She shared with me her aspiration for MIT to create a “green high performance computing center” as a resource for their faculty to accomplish their research. She asked if UMass had similar aspirations. I said that we certainly did, but that we had not found a way to make it

happen. She replied that she had concluded that MIT could not accomplish this on their own and wondered if we were open to exploring collaboration. Of course we were, and we arranged for the key members of our teams to meet in my offices the following week. We quickly concluded that this was not only desirable, but feasible. Susan and I also concluded that we needed to invite the other large research Universities to join the collaboration. I agreed to call the President of BU, Bob Brown and she agreed to call the President of Harvard, Drew Faust to invite them to join our collaboration.

My call to Bob Brown was revealing. “Jack,” he exclaimed, “you may be calling the wrong guy. I am the only guy I know who has failed twice to do this.” Bob had been the Provost at MIT and he knew that they needed to have a facility like this. However, he was unable to get the cooperation of the state government to attract the federal money to do something like this. This lack of collaboration was precisely why there was no high performance computing center in New England. Bill Gunther, the President of MassInsight, described the region’s flawed strategy as “we’re smart, send money.” It was not a very compelling argument!

I told Bob that was precisely why we needed him to join our collaboration. He knew all the ways we could fail!

Here is the good news: MIT, UMass, Harvard, Boston University, Northeastern, EMC, CISCO, and the Commonwealth of Massachusetts joined together to raise over \$160 million to build and equip a Massachusetts Green High Performance Computing Center driven by hydropower. It is under construction and should open later this year.

Maybe we have grown a collaborative gene?

There are other examples as well. Former governor Romney asked UMass to take the lead in developing the Massachusetts Technology Transfer Center (MTTC) to help smaller institutions in Massachusetts begin to commercialize their research. MIT, UMass, and Harvard (in that order) are three of the top 20 institutions in revenue from the commercialization of research. They may not need the help. But Massachusetts has many other smaller, but outstanding institutions, that are creating ideas that could become products. MTTC facilitated collaboration between the large institutions and the small.

Governor Deval Patrick created the Life Science Center, the Clean Energy Center, and Information Technology collaboration. The Life Science Center was funded at \$1 billion over ten years and the others were not far behind. In each case a Board was created to use the funding a seed money to generate collaborations and innovations. Their record so far has been outstanding. (Disclosure: I was a founding member of the Mass Life Science Center Board and the Mass Clean Energy Center Board.) We also created a Mass Life Science Collaborative (to advise the Life Science Center) that was co-chaired by the Presidents of Harvard, MIT, UMass, and Genzyme.

We are seeing collaborations that we never imagined between industries, governments, and private and public universities.

The good news is that the United States and Canada have a number of past successes in collaboration. We can build on those, but we need to find ways to put aside some of the obstacles to collaboration. When the auto industry was built, it grew up on both sides of the Detroit River. Although they are in two different countries, they are closer together than my house is to this hotel! We have collaborated on a variety of energy issues. We have collaborated on building and operating the St. Lawrence Seaway -although the United States was not always the best collaborator.

I guess that is why collaboration is sometimes described as “an un-natural act performed by two non-consenting adults” -or nations or universities for that matter.

No one ever said it would be easy.

The recent resignation of Maine’s Senator Olympia Snowe illustrates just how frustrated many of us become at the lack of cooperation on so many issues.

We know what we need to do.

We know what investments we need to make.

We know we need to collaborate to succeed. The word is too small and too complex for go-it-alone strategies.

We know all of these things and now we need to find out how to do what we know needs to be done.

In this room are many persons who fight this good fight every day. One of the easiest votes I ever took was to vote to give some state of Massachusetts money to Mass Challenge to help them create a program that would focus on bringing innovative ideas into the market place. It was a great investment. Many of you come from the venture capital community who invest in ideas. Many will fail, but a few will change the world. Thank you for taking the risk.

The United States and Canada have worked together for over three centuries. It was not always easy, but it was always important. We have fought major wars together. We have built major industries together. On Thursday, December 6, 1917 a huge explosion of a munitions carry cargo ship devastated Halifax, Nova Scotia. The Boston Red Cross and the Massachusetts Public Safety Committee quickly organized to try to provide help. Canadians never forgot that. For Christmas in 1918, Halifax sent a Christmas tree to Boston as thanks. The tradition was revived in the 70's -with the tree standing on Boston Common each year since as the official Boston Christmas Tree.

Our history is a shared history with all that this implies and all the challenges that this brings. Our future will be shared future –whether we acknowledge that fact or not, it will be so.

Thank you so much for taking the time to come top day and giving attention to some very important and challenging issues. Innovation and collaboration will help us define that future together.