

Science, Technology and Entrepreneur Spirit in North America and Asia in the 21st Century: A Global Transformation

Luncheon Speech at "Business and Investment Opportunities for US Corporations in Korea and the Pacific Region"
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The Honorable Dong-Seok MIN, Consul General (represented by the Honorable Sang-Ho Lee, Consul), The Republic of Korea, Trade Commissioner Sung Bo Chung, Distinguished delegation from Gumi City, Members of greater Dallas Chamber of Commerce, Distinguished Guests, Ladies and Gentlemen:

Let me first launched a complaint! Meeting with such an outstanding group of Koreans without KIMCHEE is a SIN!

I was extremely excited to learn from the previous speaker Commissioner Sung Bo Chung (who unfortunately will be leaving us to take on a new post in Korea soon) about the construction of a trans-Korean Peninsula railway, from South Korea to North Korea. I have always felt that due to the political situation in North Korea, one of the major and glaring economic shortcomings of the Asia Pacific Rim is that South Korea and Asia Mainland is *de facto* not contiguous! With such a railway, I can see that soon, certainly in the 21st century, the economically robust South Korea can link up with China and ASEAN (Association of South East Asia Nations)! Imagine, a bullet train which can run from Pusan all the way to Singapore! I can see that there might be an "Asian Union", much like the "European Union" formed in the latter part of the 20th century.

What an exciting possibility.

I am greatly honored by the invitation to deliver a luncheon speech to such a distinguished group of guests. I want to especially thank our colleagues from the Dallas office of the Korea Trade & Investment Promotion Agency, or KOTRA, for organizing such a timely and important symposium.

In our Metroplex today, there are more and more such offices of from countries with robust economic development, whose sole purpose is to actively promote mutual business opportunities between our region and their home countries. For example, besides KOTRA, there is also an office of Singapore's Economic Development Board (EDB), an office of China Council for the Promotion of International Trade (CCPIT), and so on.

Allow me to underscore the fact that the presence of these offices is a reflection of the following:

- (a) The Metroplex is indeed a great international region, culturally and economically. We welcome with open arms foreign visitors.
- (b) The Metroplex is great region for the business communities of such foreign countries to invest in.
- (c) Investments from the business communities of the Metroplex in these highly economically robust countries can be economically viable. In other words, our business communities can conceivably "make money" in such countries. After all, we all know that "making money" is hardly a novel thought for companies.

There are so many delegations coming to the Metroplex recently that I almost never go home for dinners! For example, about a year ago, I had the honor of delivering a luncheon speech to a large software companies executives delegation, led by one of the Directors of Science and Technology from Beijing. I detected that the delegation had the same "business" aim. Personally, I must say that meeting all these delegations from the Pacific Rim brings out a great deal of emotions in me. Let me underscore the fact that this has nothing to do with the fact that I have a strong and deep Asian cultural heritage. Rather, the emotion is aroused because I began writing computer codes for my doctoral thesis some 30 years ago and I could kick myself now that I was so focused to be a "cocoon professor" that I never had the entrepreneur spirit, or the courage, to even

dream that the skill I was developing could be a money making machine!
As a physicist , I have not done anything which could be IPO! However, in hindsight, some of the software I developed, by properly twitching, touching up and packaging them, can conceivably be something that are commercializable! Oh well.....

I am therefore extremely excited to see that nowadays there are academic researchers, including graduate students, in all fields of sciences and technologies, who are well versed and are immersed in entrepreneurial issues.

For these reasons, coupled with the fact that as a Vice President for Research in which a large part of my portfolios is to promote and accelerate UTD to become an international economic and intellectual engine, it would be interesting for me to leverage this occasion to talk about the overarching issue of the transformation and interactions of both shores of the Pacific and some of the role of research universities.

Just as most of you, I am of course one of the many many millions of individuals who existed in and benefited by this global transformation. This subject matter is of profound importance to both Asia and North America. If my memory serves me correctly, I remembered in one of my many trips to Asia in the early 80's, I read an article in a magazine (I think it was the Far Eastern Economic Review, but don't hold me to it). In this article, there was a diagram which plotted the number of air passengers between Europe and North America and between Asia and North America as a function of time (year). I remember this diagram well because the two curves, with the Asia one way below the European one in the early 60's (just when the Boeing 707 came on line) crossed around the end of the 20th century. I do not have the data of today, but I suspect that if the prediction of the curve is not correct, it cannot be very far from the truth.

With this important background, it must mean that by the 21st century, something profound globally is happening. Today, more people are crossing the Pacific than the Atlantic. It means that North America, after several centuries of being European-centric, culturally, economically and intellectually, is at least showing a sign of shift. It also means, both shores of the Pacific (the so-called Pacific Rim) shall assume a greater global importance: economic and intellectual, in the 21st century.

I came to the United States in the fall of 1964. My brother came to the United States a year before me. Now, why was that significant? Well, it was because he was probably one of the last batches of Asian students to come to the United States by boat: the so called American Presidential Lines. I was probably the first batch of students to come to the States by the then Boeing workhorse, the Boeing 707. His trip took him from Singapore to Hong Kong to Yokohama to Honolulu to San Francisco. This part took 21 days, THREE WEEKS! He then had to take a Greyhound bus from SF to Kansas City, his destination. My trip went from Singapore to Dubai to Rome to New York. It took a mere 24 hours.

Come to think of it, a long trip like the one my brother took cannot be all negative. After all, I discovered later on that a lot of such students found their spouses on those 21 lonely, or may be not so lonely, days across the Pacific.

To truly understand our current landscape, it is probably useful for us to paint the landscape of both Pacific shores in the 50's and 60's.

Since the theme is “transformation of landscape”, and how any region must adapt with the transformation, let me tell you a very interesting story about Boeing 707, the type of airplanes I came to the United States with in 1964. While it was one of the true workhorses of the Boeing aircrafts, the 707 apparently was not designed to traverse the Pacific nonstop. Therefore, trans-Pacific flights on Boeing 707, which began flying in the mid 50's, usually required a Honolulu refuel stop. Such stops meant additional economic activities for Hawaii. While Hawaii was indeed a beautiful place for vacations, because of the refuel stops, people in those period could easily construct other business reasons to go there. That made Hawaii very prosperous! Unfortunately, as soon as the trans-Pacific enabled Boeing 747's were delivered to commercial airlines in 1969, the economic landscape of Hawaii changed. Majority of the visitors to Hawaii since 1969 were primarily vacationers. This made Hawaii almost a “one industry” (vacation business) State. The moral of this story is “always anticipate change”.

In the 50's, 60's and even part of the 70's, great political instabilities and backward economies existed on the western side of the Pacific. Nearly all countries were in the 3rd world category (with Japan being the only exception that was emerging as a global economic power). Perhaps the

saddest part of being in the 3rd world was the lack of confidence among the people.

The separation of India into East and West Pakistan, caused enormous hardships for the people and even today, it is still one of the unstable points in the world.

From 1962 to 1965, Indonesian Government with President Sukarno at the helm, carried out a rather aggressive policy of “confrontasi” (the Indonesian version of the word “confrontation”) with the newly independent nation of Malaysia. I can remember living in Singapore in the early 60’s where people there were deeply concerned about the possibility of a military confrontation between Malaysia (Singapore was a part of Malaysia then) and Indonesia. I remember well that on a clear day, one could actually see some of the Indonesian islands, that’s how close they were!

The Vietnam conflict lasted nearly a quarter of a century, from 1950 to 1975. The French left the area after the 1954 battle of Dien Bien Pho. Americans departed in 1975.

Between 23 August 1958 - 01 January 1959, there was the 2nd Taiwan Straits tension, the so-called Quemoy-Matsu crises. Such crises brought the United States 7th fleet to that region. The tension in the Taiwan Straits lasted for many years after that.

Further north, although the Korean armistices were signed in 1953, political instabilities on both sides of the 38 parallel did not subside immediately. Even today, the Korean peninsular is and could still be a trouble spot.

For China, the 50’s and 60’s saw a great deal of economic hardship and political turmoil. By the time 1966 rolled around, 10 years of Cultural Revolution was initiated!

I was only in North America part of this period. I think that while the situation in North America was far more stable than the Pacific western shore, there were also uncertainties.

Perhaps the most spectacular and sad event was the assassination of President John F. Kennedy in 1963, the year before I arrived in this country, in a place which is just 18 miles from where I am standing now, and the

assassinations of Robert F. Kennedy and Martin Luther King Jr. towards the end of the 60's.

Some historians in the United States refer to the 50's and the 60's as the age of the civil rights movement. 1954: Brown v. Board of Education; 1955: Montgomery Bus Boycott; 1957: Desegregation at Little Rock; 1960: Sit-in Campaign; 1961: Freedom Rides; 1962: Mississippi Riot; 1963: Birmingham and the March on Washington (where MLK delivered his famous speech of "I have a dream"; 1965: Selma. The movement was monumental, but it took some blood in getting it going!

Then of course, the Cold war was in full swing, so was the anti-war movement!

So, with all these gloom and doom, why did the Pacific shores not collapse into an economic abyss? How did Asians develop a strong sense of confidence in the past several decades?

There are of course many reasons for the regain of confidence of Asians. For me personally (and for the thousands and thousands of Asians of my generation), I could point to Tseng Dao Lee and Cheng Ning Yang. Assisted by Madame C. S. Wu, they overturned one of the longest held belief, almost a dogma, in physics: mirror symmetry for all the forces in nature. This discovery won them the highest accolade in science, the 1956 Nobel prize in physics. Of course, I would be remiss if I did not mention that there were other outstanding Asians who won the Nobel prize in physics before Lee and Yang. Two came to mind were Hideki Yukawa of Japan in 1949 and Venkata Raman of India of 1930. Later on, individuals like one of my all-time personal favorite physicists, Subramanyan Chandrasekhar of the University of Chicago, also won the Nobel prize. Chandrasekhar was a "humble giant" of the scientific world of the 20th century. Their influence and impact on the Asian landscape certainly cannot be underestimated. These great men and women instilled in the millions and millions of Asians a profound sense of confidence. Such confidence, I believe contributed to the confidence one observes today in Asia.

Lee and Yang, and literally thousands of Asian Americans like them, and people like Chandrasekhar, play another important role in the past several decades. They were one of the important bridges between the East and the

West. These were people who stood firmly on the European-centric American stage and gave their fellow non-Asians a comfort level never known before in North America.

Since I grew up in Singapore, I know that area best. In the 50's and 60's, it took 12 bloody years, in 1960, to bring closure to the Malaya jungle insurgency. The closure of this episode allowed gave the Malaya peninsula breathing space to become one of the economic miracles of Asia.

One of the most important successes of that period for the Western side of the Pacific is unquestionably the Tokyo Olympics of 1964. This was the first Olympics to be held on Asian soil. The Tokyo Olympics gave the Japanese an opportunity to show the world that they are now ready to play on the world's economic stage.

Perhaps two of the most exciting developments of the Pacific Rim in the 60's and 70's were the intellectual and economic transformation of the South Korea and Taiwan.

I have an interesting personal observation about South Korea which attests to the fact that this is a nation of hard workers! As I mentioned earlier, I came to the US in 1964. In 1969, I returned to Singapore to visit my mother. It was just the time that Singapore was at the threshold of an economic explosion. I could see tall skyscrapers are being constructed all over the country, in a 24x7 manner. I was told that since Singapore was, and still a country of small population, the only way one could accomplish that was to bring in foreign construction workers, as engineers, as electricians, as mechanics, and so on and the best country where there was a great supply of such workers was South Korea. So, planes load after planes load of Korea workers of all sorts came to Singapore to build the country!

And build they did!

In the early 70's, academic and economic opportunities began to emerge in South Korea and Taiwan so that significant numbers of scientists and technologists, armed with their entrepreneurial spirit, began to return from North America. They brought with them not only their technical skills, but also their "capitalistic skills" as well. A majority of them became the economic and industrial backbones of not only Taiwan and South Korea, but of Asia and maybe the world!

Just a few days ago, UTD was most honored by the visit of an archetypical Korean industrialist/scientist of that generation, the former Minister of Science and Technology of the Republic of Korea, the honorable Dr. Jung Uck Seo. Dr. Seo is a man of great charm, great wit, worldly, and innovative. Under his leadership, both in the government, and in the private sector, where he was President of SK Telecommunications, a telecom giant of Korea, Korea's electronic industry became what it is today: Global dominance.

What is the Pacific Rim like in the 21st century?

There are still problems, of course. North Korea comes to mind immediately. China is struggling with a very large population, but there is frantic enormous economic growth coupled with a new level of political maturity and stability. Taiwan and Korea are now technological powerhouses. There are now so many Japanese Nobel laureates in Japan that it almost is no longer news (I am kidding, of course). Quite recently, there is talk about 10+1 (where 10 is the 10 ASEAN countries and 1 is China) becoming a free trade zone in a decade. The economic implication of 10+1 (or 10+3) is so very dizzying! There is also constant talk about India's technology prowess, as I mentioned earlier.

On this side of the Pacific, despite some recent economic downturns, and despite of global uncertainties due to terrorism, the United States, and indeed all the countries in North America, have seen and continue to see unparalleled economic and technological growth. Despite of the recent SARS pandemic, traffic between North America and the Western shore of the Pacific remain intense. All you need to verify about this is to try to buy an airline ticket to Asia today!

With the transformation and entrepreneur sprit on both shores of the Pacific, and with more and more people leveraging the new communication tools, the gap between the shores is never more narrow.

For one thing, the world is much tighter today then merely a decade ago, never mind about 3 to 4 decades ago. I do not believe that there will be anyone here who will argue with me that in the past decade, Internet has totally changed our life, our business, and indeed, our complete existence, even our warfare.

Just imagine, merely 10 years ago, in 1993, United States was still in the “Internet Stone Age”. There were more .edu’s than .com’s. Most people were still using the old “bitnet”, where bit is the acronym for “Because It’s Time”. People who had home connectivity probably were connected with the 9600 “baud”, or in modern terminology, 9.6 kilobits per second (kbps) rate.

Let me give you another anecdote. Eleven years ago, my colleague from Oak Ridge National Laboratory Mike Strayer and I went to Beijing to work with colleagues at the Institute of Applied Physics and Computational Mathematics there to set up the 2nd International Conference in Computational Physics in 1993. I remembered Mike and I, together with our Chinese colleagues, struggled heroically for a couple of days to find a way to connect to the bitnet. We of course failed. In fact, if I am not wrong, in 1993, there wasn’t a single website existed in China.

Today, there is a large number of websites in China, and the rate of increase is literally dizzying and frightening. Let me quote for you a recent data.

“By the end of June, 2002, the number of Internet users in China have reached 45.8 million, an increase of 19.3 million or 72.8. percent over the same period in 2001, according to a report released by China Internet Network Information Center”

Although the number is not out yet for 2003, I would not be at all surprise that soon, within a few years, there will be close to 100 million Internet users in China. While that number is only 8% of China’s population, it is nearly the entire population of Japan and HALF of that of the United States. Even more amazing, in 1997, there are only 650,000 Internet users in China! So, up to now, only much less than 10% of the Chinese are linked to the Internet. It is sobering to think what that country, or the entire western Pacific shore, or for that matter, the entire world will be like if the number reaches 20%, or more!

For Korea, it is simply amazing that of all the Asia Pacific Rim nation, it has the highest household internet penetration. If memory serves me right, it is well over 35%.

The connectivity world has also changed so drastically. Just a few years ago, OC3 or 155 Mbps, that is 1500 times faster than the old 9600 baud, was

considered very very high speed. Now, for the Internet-2 backbone, for example, we are already talking about OC192, or 10 Gbps, or 10,000,000,000 bps! Indeed, highspeed backbones are now reaching more and more country. Nowadays, if you are only connected via the old 56 kbps at home, like me, people would laugh at you. More and more people are now connected to the “broadband”

I can of course go on and on about this, with 3G and possibly 4G wireless communication coming on line, with cyber security, with super highspeed data engines, such as the ASCI Red or ASCI Blue reaching many teraflops, and with interoperability. But I think you will all agree with me that Internet has made the world that much tighter (as opposed to “that much smaller”. Every time I fly to Asia, I wished the world is smaller...)

At the same time, everything we do nowadays, whether it is business, education, defense, homeland security, ... what have you, has an Internet flavor. In fact, my good friend Jack Pellicci, Group Vice President of Oracle has an interesting measurement of time, and that is “Internet year”. Roughly speaking, an Internet year is approximately 5 real years! In other words, we do everything faster, everything more “agile”. In the age of agility, we must recalculate and reevaluate how we do things in this new paradigm on both shores. Companies that can take advantage of this new paradigm will be the successful ones in the 21st century.

Finally, let me say how research universities can play in this landscape on both shores? With the wisdom of a Monday morning quarterback, and the fact that there is some sort of economic implosion since 2001 for the telecom industry, I think there is at least one important lesson one can learn from it. The lesson has a simple name called “CHURN”!

Let me explain what I mean by CHURN. I first learn this term from a UTD faculty member named Don Hicks and from my friend Richard Seline. Of course any confusion of the meaning is mine and not theirs.

From the outset, “CHURN” is intimately related to research universities. I think no one will argue with me that for the Metroplex, research institutions must be the economic focal point and the engine for producing regionally, nationally and globally competitive workforce for the 21st century. This is NOT A LUXURY, but a MUST! The first lesson from the past decade is that research universities must mix, or “churn”, the economy. For example,

when the downturn, or implosion, came around for the telecom industry, it was probably not wise to suggest to a laid-off employee of telecom company A to send his/her resume to telecom company B.

Usually that is “dead on arrival”.

It would have been much more productive if there exist platforms where a wireless expert in telecom company A could discuss with a business manager, or technologist, or both, of a medical device company 1, and come up with a novel way of combining the wireless technology with the medical device to form a new and better product. New and better product can produce better business plan, and better business plan usually has a higher probability of making MONEY.

Now, how do research universities come into the churning equation? Well, the desired platform I mentioned earlier is what an outstanding research university, or a group of outstanding research universities, can do, does well, and should and must do continuously. After all, such universities are always hunting for new ideas, hunting for new sciences, hunting for new technologies, hunting for other new innovations, nowadays, hunting for ways to technology transfer and spin-off such technologies, and last but not least, hunting for new ways to connect dots, these dots being new science, technology and entrepreneurial ideas, that are seemingly unconnected. To be truly successful, outstanding research universities must and should embrace the regions surrounding industries to make sure that different industries can interact in a highly mixing manner, and value add, intellectually and economically, to the business. With this, it can contribute to economic sustainability. This is what scientists refer to as “non-linear mixing”! This is the fundamental principle of churning!

Examples of such universities which have made true, enormous and fundamental economic differences to the regional intellectual and economic landscape that come to mind are the eight powerful research universities in the greater Boston area, UC Berkeley, Stanford in the Bay area, UC San Diego in the San Diego area and Georgia Tech and Emory University in the greater Atlanta area. Korean academic powerhouses, such as Seoul National University, Pohang Institute of Technology and Korean Advanced Institute of Science and Technology (KAIST) are the economic and intellectual engines of the country.

In fact, KAIST recently has totally changed the paradigm, in fact breaking of tradition, of academic leadership of Korea by hiring Robert B. Laughlin, Professor of Physics of Stanford University and Nobel laureate of physics in 1998.

Incredibly, even just after two and a half years, 21st century is already posing serious economic, intellectual, technological, political and military challenges for the both shores of the Pacific.

I believe that the Chinese have the most appropriate phrase to describe the current global situation, and that it is embedded with “*wei-ji*”, or “dangerous opportunities.” Indeed, there are enormous and incredible opportunities in seeking solutions, and business opportunities, to these complex global challenges. Some people say that technology can solve all these problems. In my opinion, this is not true. Only people can solve problems. And to solve these problems of a global scale, one needs to find people with global thinking and global outlook. To solve these problems require bold creativities and innovations never before known to mankind.

There is no doubt in my mind that many of these people will and shall emerge from research universities, in North America and in Asia!

Thank you.