Address and interaction with the students of Noorul Islam College of Engineering

Kanyakumari, Jul 09 2010

Technology is the foundation for the sustained development of the nation

Technology is the nonlinear tool
For accelerated economic growth

I am delighted to meet and interact with the students of Noorul Islam College of Engineering in Kanyakumari. I am happy that since 1989, this college is producing number of Engineering graduates and post graduates from this region for the national development. When I study the vision of the college, I am really impressed, your vision says, It will *"…. deliver excellence with relevance in the field of technical education focusing on the needs of the nation in tune with the technological revolution."* I congratulate the management of the past and the present who have laid the strong foundation to deliver the quality output for the national development. My greetings to all of you.

When I see you young graduating students, I was asking myself, if I was in your place today, what thoughts would come to my mind. One question each one of you has to ask is – "what I will be remembered for?" Dear youth, as you come out of the University with basic knowledge in what ever field you have taken, be it Engineering, Technology, Architecture, Town Planning, Pharmacy, management or whatever be your stage of your education – graduate, post-graduate or doctoral – let me assure you the country has plenty of opportunities. The first is transforming India into an economically developed and societally inclusive nation. For that every one of you will get involve 7000 PURA (Providing Urban Amenities in Rural Areas) connecting 600,000 village where 700 million people live. Another opportunity is that of climate change and global warming, due to excessive usage of fossil fuels, which is a challenge in front of our global society. We have to work for energy independence and every one of you should look at, how you can evolve such a mission using green sources like solar power, wind power, hydro power and bio fuel. Such a mission should also take into consideration the environmental sustainability of our nation and the world. Today, when I am in the midst of students of engineering and technology, I would like to talk on the topic ***"Technology is the foundation for the sustained development of the nation".***

First I would like to discuss research teaching research.

Research Teaching Research

Good teaching emanates from Research. The teachers' love for research and their experience in research are vital for the growth of the institution. Any institution is judged by the level and extent of the research work it accomplishes. This sets in a regenerative cycle of excellence. Experience of research leads to quality teaching and quality teaching imparted to the young in turn enriches the research.

Technology is the non-linear tool available to humanity, which can affect fundamental changes in the ground rules of economic competitiveness. Science is linked to technology through applications. Technology is linked to economy and environment through manufacture of knowledge products. Economy and environment are linked to technology, which promotes prosperity to the society. We have to use innovation to generate high value added products for becoming a global player. The foundation of academic research is creativity.

Now, I would like to present my experience of learning system design, system integration and system management while I was a student.

Learning integrated system design

While I was studying aeronautical engineering in MIT, Chennai, (1954-57) during the third year of my course, I was assigned a project to design a low-level attack aircraft together with six other colleagues. I was given the responsibility of system design and system integration by integrating the team members. Also, I was responsible for aerodynamic and structural design of the project. The other five of my team took up the design of propulsion, control, guidance, avionics and instrumentation of the aircraft. My design teacher Prof. Srinivasan, the then Director of MIT, was our guide. He reviewed the project and declared my work to be gloomy and disappointing. He didn't lend an ear to my difficulties in bringing together data base from multiple designers. I asked for a month's time to complete the task, since I had to get the inputs from five of my colleagues without which I cannot complete the system design. Prof. Srinivasan told me "Look, young man, today is Friday afternoon. I give you three days time. If by Monday morning I don't get the configuration design, your scholarship will be stopped." I had a jolt in my life, as scholarship was my lifeline, without which I cannot continue with my studies. There was no other way out but to finish the task. My team felt the need for working together round the clock. We didn't sleep that night, working on the drawing board skipping our dinner. On Saturday, I took just an hour's break. On Sunday morning, I was near completion, when I felt someone's presence in my laboratory. It was Prof. Srinivasan studying my progress. After looking at my work, he patted and hugged me affectionately. He had words of appreciation: *"I knew I was putting you under stress and asking you to meet a difficult deadline. You have done great job in system design".*

Through this review mechanism Prof Srinivasan, really injected the necessity of understanding the value of time by each team member and brought out engineering education has to lead system design, system integration and system management. I realized that if something is at stake, the human minds get ignited and the working capacity gets enhanced manifold. That's what exactly happened. This is one of the techniques of building talent.

The message is that young in the organization, whatever is their specialization, be trained in system design, system integration and system management which will prepare them for competitiveness wherever they take-up work in developing new products, innovation and undertaking higher organizational responsibilities. Teacher has to be a coach like Prof. Srinivasan.

Now let me discuss about convergence of technologies.

Convergence of Technologies

The information technology and communication technology have already converged leading to Information and Communication Technology (ICT). Information Technology combined with bio-technology has led to bio-informatics. Now, Nano-technology is knocking at our doors. It is the field of the future that will replace microelectronics and many fields with tremendous application potential in the areas of medicine, electronics and material science. When Nano technology and ICT meet, integrated silicon electronics, photonics are born and it can be said that material convergence will happen. With material convergence and biotechnology linked, a new science called Intelligent Bioscience will be born which would lead to a disease free, happy and more intelligent human habitat with longevity and high human capabilities. Convergence of bio-nano-info technologies can lead to the development of nano robots that may results revolution in healthcare system. Nano robots when they are injected into a patient, my expert friends say, it will diagnose and deliver the treatment exclusively in the affected area and then the nano-robot gets digested as it is a DNA based product.

Convergence of ICT, aerospace and Nano technologies will emerge and revolutionize the aerospace industry and electronics leading to nano computing systems. This technological convergence will enable building of cost effective low weight, high payload, and highly reliable aerospace systems, which can be used for inter-planetary transportation.

Emergence of new world order

When I was traveling in an Aircraft in the United States, I was told that much of its controls where software driven and most probably developed in India. When I presented my credit card, I was told that it was being processed in the backend server located in Mauritius. When I walked into multiple software development centre, Bangalore, I was fascinated to find that it truly presented a multicultural environment. A software developer from china working under a project leader from Korea working with a software engineer from India and a hardware architect from the US and the communication expert from Germany where all working together to solve the banking problem in Australia.

What message do we get from these events and many such occurrences in the past decades? Do they not indicate a new world order emerging? Technology has made world to come together. For the past few months, I had several opportunities to meet with world specialists, economists and leaders in India, Israel, UK, USA and other countries. The outcome of the discussions led to interesting possibilities for taking education forward in a “borderless world”.

Now I would like to describe my visualization of the distinctive profile of India by 2020.

Distinctive Profile of India by 2020

1. A Nation where the rural and urban divide has reduced to a thin line.
2. A Nation where there is an equitable distribution and adequate access to energy and quality water.
3. A Nation where agriculture, industry and service sector work together in symphony.
4. A Nation where education with value system is not denied to any meritorious candidates because of societal or economic discrimination.
5. A Nation, which is the best destination for the most talented scholars, scientists, and investors.
6. A Nation where the best of health care is available to all.
7. A Nation where the governance is responsive, transparent and corruption free.
8. A Nation where poverty has been totally eradicated, illiteracy removed and crimes against women and children are absent and none in the society feels alienated.
9. A Nation that is prosperous, healthy, secure, devoid of terrorism, peaceful and happy and continues with a sustainable growth path.
10. A Nation that is one of the best places to live in and is proud of its leadership.

Integrated Action for developed India

To achieve the distinctive profile of India, we have the mission of transforming India into a developed nation. We have identified five areas where India has a core competence for integrated action: (1) Agriculture and food processing (2) Education and Healthcare (3) Information and Communication Technology (4) Reliable and Quality Electric power, Surface transport and Infrastructure for all parts of the country and (5) Self-reliance in critical technologies. These five areas are closely inter-related and if progressed in a coordinated way, will lead to food, economic and national security.

India's future missions

Dear graduating friends, I would like to present, what type of opportunities will be available to the professional graduates in the coming years.

1. Agriculture and Food processing: Increase the productivity into 3.4 times and concentrate on Food processing and marketing. Annual investment is around $20 billion.

2. Infrastructure: Apart from rural and urban infrastructure, one hundred million homes have to be built with energy efficient and water efficient systems. Annual investment in this sector will be around $80 billion per year.

3. Automobile: The export has to be 50% of our output. We are expecting a business volume of $200 billion by 2016 from the existing $45 billion.

4. Ship Building: High Dead weight ships have to be built in the country. This will have a business volume of over $50 billion.

5. Information and Communication technology: We have to keep pace with the growth inspite of global recession by applying ICT for India. We are expecting to reach business volume of $200 billion per year by 2012.

6. Pharma: India must account for atleast 25% of generic drug produced world over. Pharma vision aims to reach the business volume of $50 billion by 2016.

7. Aerospace: 70 seater passenger jet aircraft has to be designed and developed involving 20 billion dollars of market for the next 10 to 15 years.

8. Rail-vision: Railway length has to be increased, metros have to come for faster transportation and multi-level station systems have to become operational to reduce city crowding, average speed of the train has to be doubled. Average annual investment will be over $25 billion.

9. Energy Independence: By 2030, we should attain energy independence through renewable energy sources such as solar and wind; nuclear and bio-fuels for transportation. Average annual investment will be over $30 billion.

Now let me talk about the present economic environment.

Economic Environment

I was asking myself what type of innovation is needed to enrich the Indian economy and other world economies which are presently in turbulence. I had discussion on this subject with the experts of many management institutions. It came to light that the Indian economy will be less affected due to the world financial crisis. This is due to (i) the Indian banking system has always been conservative which has prevented the crisis (ii) The liberalization process in India has its checks and balances consistent with the unique social requirements of the country (iii) The Indian psyche is generally savings oriented and living within means is part of the mind set. This situation has reduced the effect of global turbulence in the Indian economy. However, the resultant effect will be reduction in export and reduction in outsourcing. The drop in annual growth rate of GDP could be around two percent. This is the time we need innovation in our thinking to rejuvenate the agricultural sector particularly through value addition and the small and medium scale industries and enterprises for making higher levels of contribution to the GDP. Simultaneously, we have to enhance the rural and urban infrastructure particularly through the establishment of 7000 PURA complexes (Providing Urban Amenities in Rural Areas) spread in different parts of the country. The mission of PURA is employment generation with value added skills through connectivities and give a push to the growth in GDP of the nation.

PURA Mission for sustainable development: PURA envisages development of infrastructure for bringing rural prosperity through creation of three connectivities namely physical, electronic, knowledge leading to economic connectivity. The theme of PURA, apart from concentrating on reinforcing agriculture, will emphasize on agro processing, development of Rural Craftsmanship, dairy, fishing, silk production, so that the non-farm revenue for the rural sector is enhanced, based on the core competence of the region. Also the PURA complexes will be driven by renewable energy such as solar, wind, bio-fuel and conversion of municipal waste into power. In this approach, the aim is to make sustainable development using the core competence of the rural sector.

Periyar PURA (Tamil Nadu): I have worked with Periyar PURA Complex pioneered by Periyar Maniammai College of Technology for Women, Vallam, Tanjore consisting of a cluster of 65 villages having a population of over one lakh for the last 5 years. This model PURA complex has all three Connectivities - physical, electronic and knowledge - leading to economic connectivity. This has resulted in large-scale employment generation and creation of a number of entrepreneurs with the active support of 1800 self-help groups. Two hundred acres of wasteland has been developed into a cultivable land with innovative water management schemes. Villagers are

busy in cultivation, planting Jatropha, herbal and medicinal plants, power generation using bio-mass, food processing with dedicated marketing centers. This model has emanated independent of any government initiative by a Women Engineering college.

PURA complexes

On similar lines, the Noorul Islam College of Engineering in association with the government and private may like to take up a rural development mission in their region using the core-competence of that region in sugarcane, millet, grains, jute, processed food, silk, craftsmen based items such as carpets, locks, leather goods, decoration items made of brass and many other agriculture and horticulture products and also tourism.

Noorul Islam College of Engineering with its strength of students having multiple disciplines, like engineering, management, IT can deploy the dynamic human resource and knowledge for implementing a PURA complex in this region. The students guided by their professors and in collaboration with the government and private sector should form interdisciplinary teams which will engage themselves in ground level implementation. Also the university should evolve a PURA and integrated development course for all streams which will be the laboratory and the platform for the channelizing the energy and competency of the young students towards the mission of nation building. The ground level experience and the cross-discipline learning opportunity will also enhance the overall development of the students over the 3-4 years they spend in their educational career with Noorul Islam College of Engineering.

Conclusion: The knowledge society in 21st century

Let me now discuss with students, the profile of knowledge society which you are going to experience in the country next few decades in this century. The world in the 21st century will be a knowledge based society with multiple opportunities. I was reading a book, “Empires of the Mind” by Denis Waitley. This book gives, what type of the new world which we are facing now? What was yesterday and what is today. I have modified certain points of the author to suit our conditions. I have also added a third line which relates to action of university.

It specially says that ***“what worked yesterday, won’t work today”.***

Yesterday – natural resources defined power
Today - knowledge is power
University will be a powerhouse for knowledge

2. Yesterday - Hierarchy was the model
Today- synergy is the mandate
University will be enabler of intersection of mutiple faculties towards mission goals

3. Yesterday – leaders commanded and controlled
Today – leaders empower and coach
Potential Leaders will be empowered through exposure to the needs of sustainable development

4. Yesterday - shareholders came first
Today – customers come first
Education should inculcate sensitivity to "customer" needs

5. Yesterday - employees took order
Today – teams make decision
University can inject team spirit

6. Yesterday - seniority signified status
Today – creativity drive status
University is the breeding environment for creativity

7. Yesterday – production determined availability
Today – Competitiveness is the key
Competitiveness is powered by research and university has to have the motto of "teaching-research-teaching"

8. Yesterday - value was extra
Today – value is everything
Objective Value judgment to be introduced in education

9. Yesterday – everyone was a competitor
Today – everyone is a customer
Educated customer is also from university

10. Yesterday - profits were earned through expediency
Today – Work with integrity and succeed with integrity.
Education with value system is the need of the hour

In the knowledge economy the objective of a society changes from fulfilling the basic needs of development to that of empowerment. The education system will be promoted by creative, interactive self learning – formal and informal education with focus on values, merit and quality. The workers instead of being skilled or semi-skilled will be knowledgeable, self-empowered and flexibly skilled. The type of work instead of being structured and hardware driven will be less structured and software driven. Management style will emphasize more on delegation rather than giving command. Impact on environment and ecology will be strikingly less compared to industrial economy. Finally, the economy will mostly be driven by knowledge and knowledge driven institutions and industries. The emphasis in knowledge society will be on sustainable development.

I am sure, the education system in Noorul Islam institutions provides, technology and knowledge to the students as a foundation for their career and thereby facilitating the development of the nation.

My greetings and best wishes to all the members assembled here success in their mission of becoming societal transformers of this region.

May God bless you.

Oath for the Students

1. Technology is a life time mission. I will work, work and work and succeed.

2. Wherever I am, a thought will always come to my mind. That is what process or product I can innovate, invent or discover.

3. I will always remember that “Let not my winged days, be spent in vain”.

4. I realize I have to set a great technological goal that will lead me to think high, work and persevere to realize the goal.

5. My greatest friends will be great scientific -technological minds, good teachers, good books and good internal environment.

6. I firmly believe that no problem can defeat me; I will become the captain of the problem, defeat the problem and succeed.

7. I will work and work for removing the problems faced by planet earth in the areas of water, energy, habitat, waste management and environment through the application of science and technology.

8. I realize, I am as young as my faith, as old as my doubt; As young as my self-confidence, as young as my fear; As young as my hope and as old as my despair. I will develop faith, self-confidence and hope.

9. My National Flag flies in my heart and I will bring glory to my nation.

By, Dr. APJ Abdulkalam

www.abdulkalam.com