

United Nations Educational, Scientific and Cultural Organization  
and  
International Atomic Energy Agency

THE ABDUS SALAM INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

**PLANNING FOR ICT BASED EDUCATION IN CHANGED SCENARIO  
TO MEET THE GLOBAL GAPS AND DEFICIENCIES: WITH A FEW CASES  
OF A FEW DEVELOPING COUNTRIES**

Chandan Tilak Bhunia<sup>1</sup>

*Bengal Institute of Technology and Management, Bolpur, India  
and*

*The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy*

and

C. Onime

*The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.*

*“The principal goal of education is to create men who are capable of doing new things, not simply of repeating what other generations have done.” Jean Piaget (1896-1980) Swiss cognitive psychologist.*

MIRAMARE – TRIESTE

June 2010

---

<sup>1</sup> Senior Associate of ICTP.

## 1. Introduction

Tagore once said “we have only one country in this universe, and that is world”. Rabindranath Tagore’s such powerful philosophy may ultimately be realized if today’s tenet of “one world one village” is implemented in future. To achieve this, a trend has already been initiated the world wide. Privatization, Liberalization and Globalization are replacing liberty, fraternity and equality all over the world including the countries of third world. It does not mean that liberty and fraternity have no relevance in today’s society. They are much alive and their universal appeal shall ever remain for the noble human society, but today they are not all. Privatization and universalization shall be the other social partners. This is a wave brought forward by different emerging technologies, which are often interactive, interdependent and diffusive. **Information technology, computer, communication,** microelectronics, Genetic engineering, Biotechnology and Space technology are worthy to name. The developing world in general is lagging far behind the modern technological evolutions and revolutions. Besides the developing countries are hardly have sufficient capital to deal with such fast, rapid and perpetual changes. Developing world in general is labor intensive rather than capital intensive. Therefore, debate on the ability, the suitability and the acceptability of liberalization is continuing and will continue for some more time in the developing countries. Initial mismatch and inertia are parts of life and the fact is that the society never denies mobility. The society ultimately accepts technological changes, which might have been off-touch to the society even a few years back. And irony is that delayed such acceptance is done in quite haphazard and irregular ways. What has happened to the deployment of computer in government sectors in India is anybody’s guess. This is a lesson that the third world always forgets. Consequently the third world continues to lag behind International trend, and losses money as, there is hardly any planning for technological up gradation and applications. We can note a figure to justify this point. Telecommunications lines of India are 66% digitized; whereas figures of Brazil and Hungary are respectively 35.7% and 41%. But the faults’ figures are 218 faults per 100 lines in India and 2 faults per 100 lines in USA and Japan. Better is not the sole dimension of competitive advantages; faster is equally another important dimension. Thus it will be a sound strategy for the developing country to take part in the globalization without any further loss of time, but with intelligent, selective, judicious and strategic applications of globalization process. Analyzing the problems of Third world in depth Dr. Colombo observed “The ability of developing countries to derive all the benefits of the new technologies faces one stumbling block right from the start. Although rapidly and seemingly effortlessly permeating the economic and production systems of the world, these technologies are not available “off the peg”. They have to be absorbed, metabolized, mastered and controlled. Their application calls for a pre-existing capability to insert new ideas, new practices, and new elements into a flexible system. This does not simply exist in the vast majority of the developing countries. Furthermore, it is essential that as the new technologies are introduced into the socio-economic fabric of the third world, they do not impair or destroy existing local cultures---- we must equally concern ourselves with safeguarding the richness of the world cultures, mankind’s “cultural genoma”. Despite these problems I strongly believe that the intelligent

application of the new technologies in the developing countries can indeed speed up process of economic growth”.

## **2. Gap Studies**

In history of social studies one important component of research deals with the findings of reasons and causes of growing gap between rich and poor; and for that purpose to suggest measures and steps to reduce the gap. But the fact remains that the gap has not been reduced even after thousands of studies and the implementation of the recommendations of the studies.

A few research findings report

“

1. If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next 100 years. The most probable result will be a sudden and uncontrollable decline in both population and industrial capacity.
2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his or her individual human potential.
3. If the world's people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be their chances of success.”
4. Improved human resources amount to improving both quality and quantity. The quantitative axis of improving human resource generation in India has an acute problem associated with population growth whose effect is the increase in gross enrolment ratio. This ratio expressed as a percentage of the population in only tertiary education in India had jumped from 4.9% in 1970 to 6.5% in 1995. Again it does not mean that generation of human resources is significant in India. In 1990, the total number of scientist and engineers per million population was 2807, 1665, 158, 3317 and 109 respectively in the Developed countries, the Europe, the Developing countries, USA and India. This reflects the poor position of India. India needs to generate improved human resources by opening more and more colleges and universities. Analysis of the technical education will be relevant as in recent past private investment to increase man power generation in technical education has been increased manifold in India. India ranks below even most developing countries in terms of enrolment per 100,000 inhabitants. Out of several other parameters behind such a poor position, one was the non-availability of higher education institutes. With private participation, the opportunities of higher studies increases, and this may increase the enrolment figure comparable to other developing countries. In such a scenario private investment is most welcome. Adam Smith said, “it is not from the benevolence of the butcher or the baker that we expect our dinner, but from their regard to their own interest.” Here lie all theories of investment by private sectors.

Profit or in gentle word return on investment as often told in the education sectors, is the ultimate motive. The profit motive has natural attraction for quality degradation. Low teacher-student ratio of the existing private institutes in general has this reflection. However profit only motive is dangerous and counterproductive in education sectors.

5. Fig. 1 portrayed the quality gap of higher education among developed countries and developing countries.

To us those conclusions spelled put not doom but challenge – how to bring about a society that is materially sufficient, socially equitable, and ecologically sustainable, and one that is more satisfying in human terms than the growth-obsessed society of today.”

Science is changing, Technology is changing, Art is changing, Economy is changing and then Education has to change as an inevitable consequence of this changing scenario. India is badly lagging to move out of its century old inertia, first and foremost of which is to accept (at governmental and political level) the fact that higher education currently is not a cost centre but a profit centre subject to proper planning. Education needs to be taken as strategic investment for social growth and to create aggregate wealth and greater equity. Questions are obvious: Why and How? International mobility of students is foregone conclusion of globalized education. Attracting foreign students has become a strong component of development. This has several reasons. First, it is generally the brightest students who opt for higher education in globally top universities, and they contribute to national quality in research and education by staying and working in those foreign countries. This benefit is to exceed the cost as often found in American system. The percentage of foreign students out of total students in higher education in USA, UK and Australia were 4, 11 and 19 in the year 2003. In these countries, the discovery and attraction of international talents is a major developmental strategy. They have the reasons to accept the strategy to move with global changing pattern that is the increasing foreign students over the years and the much faster increase in higher education than that in per capita product. The percentage of foreign students in the world was 3 and 4.3 respectively in 1990 and 2003. The percentage of students in higher education in the world and the gross world product per capita were 23.5 and 5361.7 respectively in the year 2003, whereas the figures in the year 2000 were 20.1 and 5237.1 respectively that gives a clear evidence faster increase of higher education than that in per capita product. Second, the cost borne by foreign students become export earning of money. Third, the availability of world class top universities of the peg and at the door within the country will benefit in stopping brain drain on which account India is a huge sufferer.

### **3. Solution Therefore**

To become world leader in higher education, several issues require proper addressing in India. The experience of higher education in world top universities suggest for several reforms in India. Higher education in India must address: Quality Driven, Market Driven (to meet dynamics of supply and

demand in international and national labor market), and Technology Supported (ICT based) with Research & Innovation Driven. For quality improvement in world scale, more funding in higher education is absolutely essential. Improved infrastructure in laboratories, libraries, ambience and environment needs money. To attract and retained talented young in teaching and research careers, salaries and perks must be at par with international standard. As of today India is reportedly lagging by 4 to 10 years in design and development compared to international scenario. Any measure to meet the gap by borrowed technology is bound to be counter productive. National higher education system should take quantum leap to bridge the gap. After all the university level education, innovation, research and development are the roots of nation's technology development. The application of Internet and Computer Technology (ICT) in imparting training, teaching and research is common in higher education in practically all universities and colleges in developed world. The ready availability of advanced topics, research paper, design idea and interaction with remote experts through Internet has made the higher education qualitative at affordable cost. The digital and Internet access with sufficient bandwidth should be provided in all higher educational establishments on highest priority at no time. This is badly needed for improving teaching. The concept of Wired U or Networked U ("U" means university) should appear in shaping universities in India as such universities will efficiently transit to new knowledge, information and research at virtually no running cost, and will be immensely beneficial to faculty members in their functions. Workers will find Wired U or Networked U increasingly efficient to earn and update heir knowledge base by distance learning around the globe. Knowledge workers will be updated making widespread benefits to students, environment and organization as a whole. Higher education must be supplemented with new knowledge (research productivity) and development (Innovation) to be at par with that of developed nations. G-8 UNESCO World Forum calls Education, Research and Innovation as the three partners for sustainable development. Nearly fifty years ago Economics Nobel Laureate Robert Solow showed " that nearly 90% of the growth in economic output in the United States between 1909 ad 1949.....was due to a well funded comprehensive effort to develop and then apply science & technology to economic development." After participation in globalization, the quality and productivity of India's research is on decline state if the share of world's total publication is considered. In 1990-2000, the growth in the world's publication share was 17.64%, -27.45% and -12.61% respectively in Japan, Russia and India. This clearly indicates the India's failure in adaptability to changing global higher education process and to utilize the effectiveness to become leader, although talent is no dearth in India. It is needless to say responsibilities of failure duly fall on faulty if not fully wrong policies and priorities of the government and its related bodies like university grants commission and all India council for technical education.

#### **4. Why ICT Based Education**

ICT based education at all levels have numerous advantages over conventional mode of imparting education. These are:

- EDUCATION COMES FIRST FOR DEVELOPMENT, thus if developing countries cannot afford education to human mankind, let low cost ICT based system does that. Science and education are the common heritage of human mankind as noted by Abdus Salam
- “Good teachers are costly, but bad teachers cost more” - Bob Talbert. ICT provides a corrective & effective solution to this basic issue
- ICT is anytime, anywhere, all subjects, all manners’ provider of all levels of education
- ICT does not create any inequality (gender, caste, color, country, religion) in providing education
- It is cost effective refreshing service provider without hesitation and irritation
- ICT makes education and expertise available at everyone’s door; it has no limitation on geographical coverage area. With coming up IPN (Inter Planetary Internet), one day education through ICT may be interplanetary service provider.
- ICT provides portable and movable education.
- “Teachers, I believe, are the most responsible and important members of society because their professional efforts affect the fate of the earth” - Helen Caldicott. ICT works in that direction in perfect tune and attitude.
- ICT is paper-less or less-paper, chalk & blackboard free and thus environmental friendly education provider
- ICT evaluation is just on time solution
- ICT likes to increase productivity and quality by repetitive learning and re accessing
- Today information is resource and knowledge is power. ICT provides any one to access vast information resource available on Internet and Networking to make one self powered in knowledge
- ICT guarantees lifelong education and training
- ICT may provide more than one expert on one’s machine for teaching & training
- ICT provides an opportunity of collaborative learning globally
- ICT gives confidence to learn by doing and while doing
- ICT enhances teachers’ quality both in terms of teaching and research

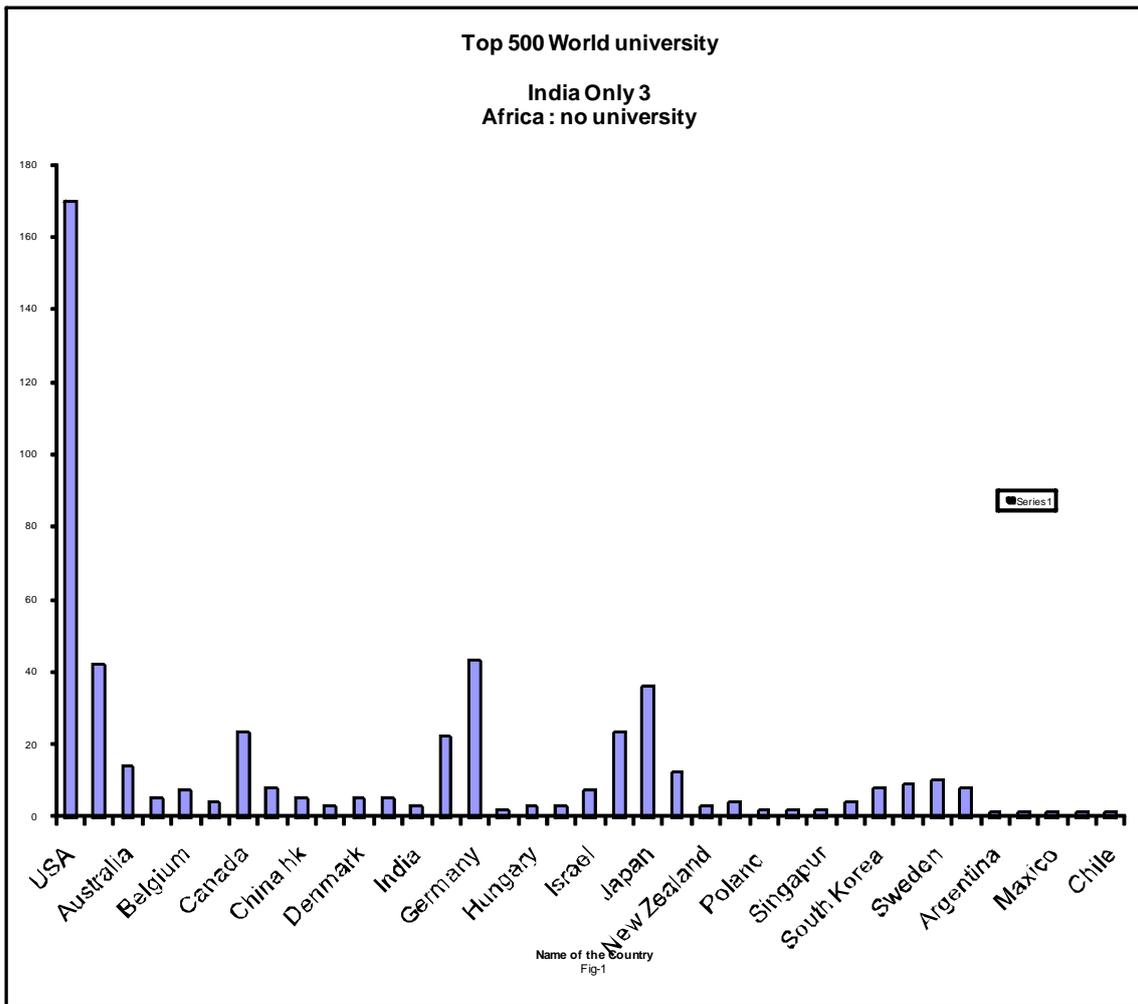


Figure 1: Distribution highest ranking Universities in World.

Even though ICT based education & training has appealing advantages, it is not without others challenges these are particularly relevant to the developing countries. Any attempt to imparting ICT based education & training to remove inequalities will be an exercise in futility until & unless 1) low cost affordable ICT systems are made available with adequate bandwidth and wireless infrastructure to the common people in the developing countries and 2) existing digital divide (fig.2) is removed falling which there will emerge another class disparity. ICT has widen an opportunity which in all fairness the developing countries must adopt and exercise in innovative manner to exert out its full potentiality & viability for national development and meeting out the existing gaps and deficiencies if any.

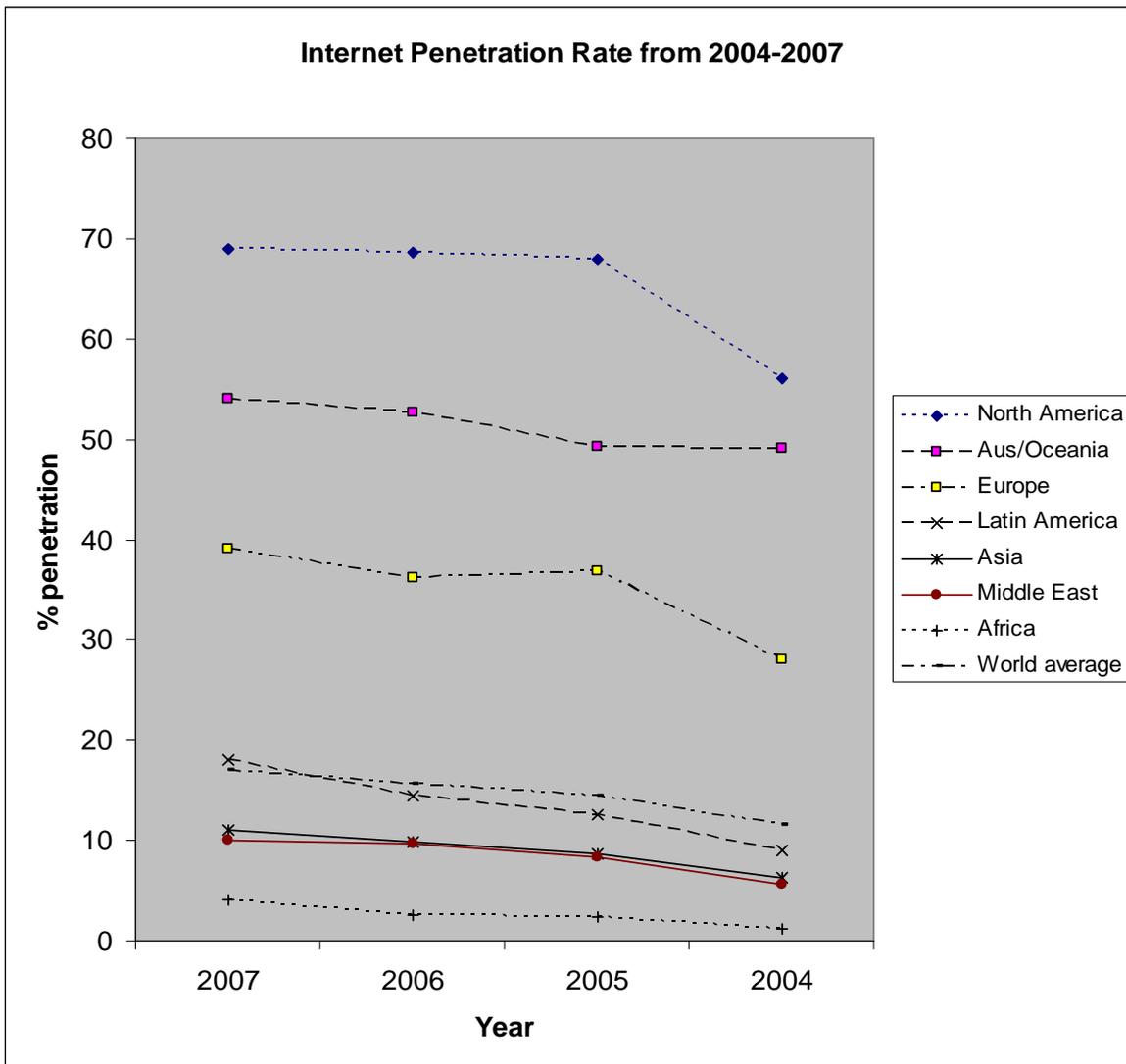


Figure 2: Typical Digital Diaparity over the countries in the world.

## 5. Conclusions and Suggestions

*“The foundation of every state is the education of its youth”, Denis Diderot(1713-1784), French Author & Philosopher.* This must be the only solution and suggestion for the developing nations to go for ICT based schools, colleges and universities.

## Acknowledgments

This work was done within the framework of the Associateship Scheme of the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.

**Further Reading:**

1. C. T. Bhunia, Imbalances in Technical Higher Education, J ICFAI Higher Edn, ICFAI University Press, Vol-1, No.-3, PP-71-74, 2006.
2. <http://ed.sjtu.edu.cn/rank/2004/statistics>.
3. C. T. Bhunia, Institute-Cum-Industry, J University News, Aug. 1994, pp. 15-18.
4. C. T. Bhunia et al., Technical Education & Training for the information Age, J Productivity, Jan-March'99, pp.-579-587.
5. C. T. Bhunia, Higher education – Restructuring and Productivity, J University News, Jan'2000, pp. 1-4.
6. C. T. Bhunia et al., Threats and Opportunity in the Higher education in the Context of GATT, J University News, vol-43, no. 44, 2005, pp.-15-16.
7. C. T. Bhunia, Changes for Technical Education, Atlantic Publishers & Distributors, New Delhi, 2008.
8. C. T. Bhunia and C. Onime, Digital Divide and Digital Opportunity: Comparison, Analysis and Strategies for Sustainable Development in Developing Nations, Intl J HIT Trans on ECCN, Vol 2, No5, pp 266-278, 2008 (ICTP Preprint No.IC/2007/042).
9. C. T. Bhunia, Basic Investigation on e-Learning, CSI Communication, March'2005, Mumbai, pp. 17-21.