WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Submarine Cable Network – A Gateway to Information Superhighway for Bangladesh

Md Mostafizur Rahman

Army IT Support Organization, Dhaka Bangladesh.
khan.miraz@gmail.com

ABSTRACT

Since the invention of telegraphy by Samuel Morse in 1837, rapid spread of ICT, such as the World Wide Web, electronic mail, digital telephony, fibre optics and satellites have revolutionised the human society. Most developed and developing countries have utilised this technology for their economic development. In Bangladesh, lack of insight, fear of unknown coupled with financial constraints and lack of expertise in the government agencies resulted in slower growth of the ICT sector. However, Bangladesh Government finally realized the importance of ICT and has declared it as a thrust sector. In order to fulfill the vision Bangladesh has signed the 'Submarine Cable Agreement' with 'Southeast Asia – Middle East – Western Europe 4' consortium on 27 March 2004 that will open a high-speed, low-priced internet and telecommunications gateway to the users from June 2005. Submarine Cable Network is one of the latest technologies available for the development of ICT sector. To derive maximum benefit out of the system, a comprehensive and compatible ICT infrastructure have to be developed to support it. Therefore, the core issue is to determine the effectiveness of the system for ICT development in the country and study the feasibility of developing the required infrastructure within the country's financial constraints. However, the prospect of achieving the Government's vision and mission is full of daunting challenges. A good number of issues need to be addressed by the government if ICT is to be mainstreamed in Bangladesh. This paper endeavours to evaluate the prospect of Bangladesh as an ICT driven nation in the arena of global information superhighway at the backdrop of her recent attempt to join the submarine cable network consortium. In doing so, it would evaluate the existing ICT infrastructure of Bangladesh and determine the prospect of recently signed submarine cable network.

KEYWORDS: Submarine, cable, network, information, superhighway, invention Telegraph,Transmitter, fiber,optics.

1 INTRODUCTION

1.1 The invention of telegraphy by Samuel Morse in 1837 marked the revolution in the field of information and communication technology (ICT). Since then the information revolution has inevitably transformed the world. Today, the ways in which societies interact, conduct their businesses, compete in international markets and set their economic and human development agenda, all depend on the rapid expansion of the information technology. In a broader scope, ICT enables the societies to produce, access, adapt and apply information in greater quantities and for more varied purposes. Most developed and developing countries have utilised this technology for their economic development. Conversely, those who failed to reap the benefit are now facing the danger of being left irreparably behind.

1.2 In Bangladesh, lack of insight, fear of unknown coupled with financial constraints and lack of expertise in the government agencies resulted in slower growth of the ICT sector. Off late, Bangladesh Government realized the importance of ICT and has declared it as a thrust sector. The recent ICT Policy of Bangladesh clearly states that ICT will be used as a key driver for socio-economic development. The vision for Bangladesh is "To build an ICT-driven nation comprising of a knowledge-based society by the year 2006[1]". While the mission is to build a countrywide ICT infrastructure to ensure easy access to information by every citizen and facilitate sustainable economic development by using the infrastructure for human resource development, governance, electronic commerce, banking, public utility
services and all sorts of on-line ICT enabled services[2]. In view of this, Bangladesh has signed the 'Submarine Cable Agreement' with 'Southeast Asia – Middle East – Western Europe 4' (SEA – ME – WE 4) consortium on March 27, 2004 that will open a high-speed, low-priced internet and telecommunications gateway to the users from June 2005. But, the prospect of achieving the government's vision and mission is full of daunting challenges. Introduction of submarine cable network is only one important facet of the overall infrastructure, not 'The Solution' to a resolute infrastructure. It alone cannot meet the ever-increasing need of the highly competitive and demanding world. Therefore, it is essential to identify other compatible ICT tools and devise a modality to integrate all these resources for building a reliable and purposeful ICT infrastructure for Bangladesh.

1.3 The endeavours to evaluate the prospect of Bangladesh as an ICT driven nation in the arena of global information superhighway at the

backdrop of her recent attempt to join the submarine cable network consortium. In doing so, firstly it would briefly enumerate the developments in ICT sector around the globe. Then, it would evaluate the existing ICT infrastructure of Bangladesh with references to developments and reforms being undertaken till date. Then, the article would highlight the salient features of the recently signed submarine cable network and evaluate its prospect within the purview of overall prospect in ICT sector of the country. Finally, based on the findings this article would recommend appropriate measures to be undertaken by the government towards the attainment of her objective. Though the submarine cable network would contribute in many sectors of ICT and also on the overall national economy of the country, yet this article will limit the scope to highlighting its contributions on internet application and telecommunication of Bangladesh only without referring to other essential facets like electronic commerce, electronic governance etceteras. Again, the submarine cable network alone may not have far reaching prospect unless it is meticulously integrated with other tools. Therefore, the prospect of overall ICT sector of the country will mainly be highlighted.

2 Brief Account of the Present ICT World

2.1 The Historical Developments: Today's information age began with the invention of Telegraph Transmitter and Receiver by Samuel Morse in 1837. It was the first instrument to transform information into electrical form and transmit it reliably over long distances. Since then, the history of telecommunication proceeded slowly and gradually. In 1850, an Anglo-France telephone company named Gutta Percha pioneered the underwater cable network for electric telegraphy communication by laying a single-wire cable between England and France. In next 8 years a boom in the laying of submarine cables followed. The first transatlantic cable was laid in August 1858 that joined the old world with the new. In 1956, the first analogue transatlantic coaxial cable, named TAT - 1 came into operation across the Atlantic that triggered an explosion in the arena of worldwide mass telecommunication facility. The increased demand on greater and faster data processing ability and reliability finally marked the invention of first generation fibre-optic cable in 1988, named TAT – 8 (transatlantic) and TPC – 3 (transpacific) respectively. The latest trend in submarine cable network is the use of Dense Wavelength Division Multiplexing (DWDM), which will be used in the proposed SEA - ME – WE 4 cable system.

2.2 Meanwhile, the other important component of ICT also flourished, with the invent of first Electronic Discrete Variable Automatic Computer (EDVAC) by Von Neumann in 1945 and reached a milestone in September 1969 with the advent of Advanced Research Projects Agency Network (ARPANET), the progenitor of global internet. A brief chronology of other important revolutions in ICT sector is tabulated:

Table 1: Major developments in ICT sector

Serial	Year	Event
1.	1971	Ray Tolinson of Bolt Beranek and Newman, Inc invented electronic-mail
2.	1976	Steve Wonniak and Steve Jobs invented Apple 1 computer
3.	1976	Unix-to-Unix Copy Protocol (UUCP) developed
4.	1982	Transmission Control Protocol (TCP)/ Internet Protocol (IP) defines the future of telecommunications
5.	1991	World Wide Web (WWW) released by CERN

Source: History of Information World, Smithsonian National Museum of American History

3 Advantages of Optical Fibre

3.1 The fiber optics technology has many unique advantages. Some of these are appended below:

3.1.1 Immense Bandwidth Potential: The optical carrier frequency in the range of 1013 to 1014Hz offers almost thousand times greater carrying capacity than that of copper cable or wideband radio systems. This enables fibers to simultaneously carry voice, data, image and video signals.

3.1.2 Light Built: An optical fiber is as thin as the diameter of a human hair. Thus even after applying protective layers, they are far smaller and much lighter than corresponding copper cables. This is a tremendous boon to alleviate duct congestion in cities.

3.1.3 Immune to Interference: Fibre-optic cable form a dielectric and are therefore free from electromagnetic interference including nuclear electromagnetic pulses. Thus, they are ideal for installation on overhead electrical power transmission lines. For a land based network system, using aerial route through power line can reduce about 40 per cent of the expense.

3.1.4 High Degree of Signal Security: The light from a fiber does not radiate significantly, ensuring that a transmitted optical signal cannot be obtained non-invasively. Therefore, it possesses a high degree of signal security.

3.1.5 Insignificant Transmission Loss: Negligible loss of power during transmission enables extremely wide repeater spacing (70 to 100km) in long-haul communication links.

3.1.6 Greater Reliability and Ease of Maintenance: The reliability of the system is enhanced due to its low power loss property in comparison to conventional electrical conductor systems. Furthermore, reliability of optical components has predicted lifetimes of 20 to 30 years. Thereby, it reduces the maintenance time and costs.

4 Existing Technologies for Access to Information Superhighway

4.1 A robust communications infrastructure is the gateway to the global information superhighway. Presently, two broad categories of technology are being used to obtain access to the information highway. These are fixed line and wireless technology. These are discussed separately in the succeeding paragraphs.

4.2 Fixed Line Technologies: Among various fixed-line technologies, two commonly used one are digital subscriber line (DSL) and cable. In Asia and Europe DSL is preferred while the state is reverse in the America. Besides these, fibre optic cables are also gaining popularity now a day. The salient features of these technologies are briefly highlighted below:

4.2.1 DSL Technologies: DSL technologies use existing copper twisted pair wiring. They utilise different frequencies to split voice and data services over the same standard phone line since phone networks only use a small portion of the available bandwidth for voice traffic. DSL can be of many variants, namely symmetrical DSL (SDSL), asymmetric DSL (ADSL) or single pair high-speed DSL (SHDSL). In asymmetric DSL more bandwidth is allocated to download than to upload. This makes it ideal for web browsing and typical Internet usage. On the contrary, SDSL offers equivalent traffic flow in each direction and like SHDSL, cannot share the line with analogue signals.

4.2.2 Cable Modem Technologies. Cable networking enables the user to send data in both directions using different channels on separate block of 6 MHz frequencies (6 MHz of frequency corresponds to roughly 30 Mbps), which makes internet access over cable a viable and preferred solution.

4.2.3 Fibre Optic Cable Technologies: Fibre optic cable uses lasers or light emitting diodes (LEDs) to transmit pulses of light (Figure 4) through extremely fine strands of silicon. As the light uses higher frequencies, they can carry thousands of times more data than either electric signals or radio waves. However, actual laying of the cable and the termination equipment are costly affairs.

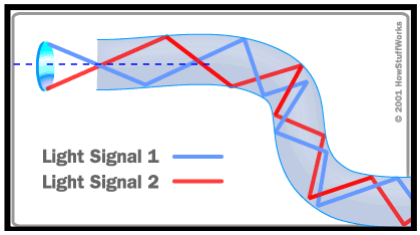

Figure 1: Fibre-optic Cable

Source: *Outukumpu cable products 2004*

4.3 Wireless Technologies: Wireless technologies for broadband can be further subdivided as fixed wireless, satellite, wireless local area network, mobile and free space optic technologies. These are briefly discussed below:

4.3.1 Fixed Wireless Systems: Fixed wireless systems use frequencies between 900 MHz to 40 GHz. Higher the frequencies greater is the data transferring ability, but again lesser is the effective range.

4.3.2 Satellite Technologies: Satellite technologies are usually more expensive than other methods of delivery, but provide a viable option to rural and remote areas. Again, the disadvantages are latency, security weaknesses, less bandwidth, and poor signal quality.

4.3.3 Wireless LAN Technologies: A wireless local area network (WLAN) is an area network with at least one segment using electromagnetic waves to transmit and receive data over short distances, in place of wired networks, by establishing an access point. Cheap rate, the mobility benefits of wireless connectivity, off-the-shelf availability, and easy installation make it preferable.

4.3.4 Third Generation Mobile Technologies: Mobile telephone networks may one day be the preferred broadband conduits. IMT-2000 (3G systems) is sometimes called the broadband for mobile phones. IMT-2000 has five possible radio interfaces based on three different access technologies (FDMA, TDMA and CDMA).

4.3.5 Free Space Optic (FSO) Technologies: Free space optics (FSO) use the same laser technology used in fibre optics, but without wires, taking advantage of the speeds reachable by using infrared light waves. Though line-of-sight is required, speeds of up to 1.25 Gigabit per second can be maintained.

4.3.6 Power line communications: In power line communication, electrical signals act as a carrier for data transmission to and from end-users. It has the unique advantage that a separate infrastructure is not needed and the system uses the existing infrastructure of the power lines.

5 An Overview of the ICT Infrastructure in Bangladesh

5.1 Development Process of the ICT Sector in Bangladesh: With a population of 135.1 million, Bangladesh is one of the most densely populated countries in the world. But, its telecommunication and information infrastructure is among the weakest in Asia. Bangladesh stepped into the information world in 1964 by introducing an IBM 1620 mainframe computer at the Atomic Energy Centre, Dhaka and the universities. Though Bangladesh got associated with the information world in 1993, but the major developments in the field of information and communication technology

mostly got life in last 2/3years. A chronological development in this field is tabulated figure:

Table 2: Development Chart of ICT Sector in Bangladesh

Serial	Year	Event
1.	1993	Introduction of internet using UUCP[3] (off-line) e-mail
2.	1996	Pradeshta Limited introduced first online internet using Internet Protocol (IP) connectivity
3.	June 1996	Government decided to allow private companies to act as Internet Service Provider (ISP)
4.	1997	Bangladesh Telephone and Telegraph Board (BTTB) introduced nationwide dial-up network of internet
5.	2000	Government deregulates Very Small Aperture Terminal (VSAT) for private sector
6.	July 01, 2001	Grameen Phone (GP) Limited launched Wireless Application Protocol (WAP) and Short Message Service (SMS)
7.	March 2003	Government legalised Voice Over Internet Protocol (VOIP)
8.	March 27, 2004	Government signed Submarine Cable Network contract with SEA-ME-WE 4 consortium.

Source: Sayeedur Rahman, Current Status of Information and Communication Technology in Bangladesh, AABEA Biennial Convention-2002, Washington DC October 12, 2002.

5.2 Steps Undertaken by the Government for Development of ICT Infrastructure

5.2.1 Organisational Reforms: Starting in 1997 the government gradually reformed its various sectors/organisations to develop proficiency in meeting the challenges of the future world. The major efforts are tabulated in Table.

Table 3: Organisational Reforms

Serial	Year	Reform/Action
1.	June 1997	A high level committee was formed headed by Professor Jamilur Reza Chowdhury to formulate a comprehensive action plan for development in ICT sector. The committee submitted the report by September 1997
2.	2000	Government enacted 'Software Copyright Act-2000'
3.	January 2001	The IT Task Force was formed with the Honourable Prime Minister as Chairman (Detail organisation of the IT Task Force is shown at Annex A to this paper)
4.	January 2002	Government formed Bangladesh Telecom Regulatory Board (BTRC) with Syed Margub Morshed as its Chairman
5.	April 2002	'Ministry of Science and Technology' has been renamed as 'Ministry of Science and Information & Communication Technology' (MOSICT)
6.	October 2002	The National IT Policy was approved
7.	2002	The Intellectual Property Rights (IPR) was upgraded, ICT Law and ICT Act (Electronic Transaction) was formulated

Source: Dr Md Omar Faruque Khan, ICT Secretary, ICT Status, Issues and Future Plans for Bangladesh.

5.2.2 Infrastructure Development: Meanwhile the government also carried out following developments in different fields:

5.2.2.1 BTTB implemented multi-metering on local calls from July 01, 2002. However, to save the dial-up internet users from paying this up charge, BTTB allotted individual access code to all the ISPs against their old phone numbers.

5.2.2.2 In 2002, government transformed all the four Institutes of Technologies (BIT) to Science and Technology Universities. At the same time, it put all the BITs, 38 universities and 31 Colleges under National University offering Undergraduate Degree in IT related fields.

5.2.2.3 Government established one ICT Incubator Centre at the BSRS Bhaban at Karwan Bazar on November 01, 2002.

5.2.2.4 Government also established ICT Business Promotion Council under Ministry of Commerce and a Business Promotion Office by EPB at Sillicon Valley, United States of America.

5.2.2.5 Government has also undertaken a project to establish a Hi-tech Park near Kaliakoir, which will house software and ICT-enabled service industries, electronics related equipment and products and etcetera.

5.2.3 Fiscal Support. The government also undertook several measures to ease up the financial constraints faced by the IT industry.

5.3 Different Sectors of the ICT Infrastructure

5.3.1 Telecommunication Infrastructure: Liberalisation of the telecom sector for private investment in early 90s resulted in appreciable rise in mobile telephone sets in the country. That has greatly contributed in raising the teledensity, but till date the overall state is not encouraging. The present teledensity is about 0.83 per cent[4]. The mid-term target of the government is to raise the figure to 3.3 per cent by 2005 (which seems quite optimistic), while the long-term target is to attain 10 per cent teledensity by the year 2025[5]. In view of this, all analog exchanges at 64 District Headquarters have

been converted to digital by December 2002. A National Digital Data Network (DDN) has been implemented by BTTB, which will integrate the whole country under a single digital network for voice and data communications. All Upa-Zillas (Sub District) analogue telephone exchanges will come under digital exchange within December 2005. As per the National Telecom Policy, 1998, the telecom sector (fixed line, mobile and the internet) is liberalised for private investment. The other important details are tabulated in Figure 4.

Table 7: Telecommunication Infrastructure

Serial	Heading	Statistics
1.	Number of Telephones (Land Lines)	0.76 million
2.	Number of Cellular Phones	3 million
3.	Teledensity	0.83 per cent
4.	Total International Circuits	3700
Serial	Heading	Statistics
5.	International Trunk Exchange	3
6.	Satellite Earth Station	4
7.	Fibre-optic Cable Network	1800 kilometres

Source: Md Abdul Hakim, Secretary BTRC, presentation paper delivered at Asian Pacific Meeting on WSIS Implementation and Preparation for API. Ministerial Conference on March 29-31, 2004.

5.3.2 Fibre-optic Network: 1800 KM long optic fiber network of Bangladesh Railway is being utilized by the private Cellular Phone Operators namely, GP. Besides, BTTB began to lay fiber optic links throughout the country in 1986, along with the installation of new digital switches. Starting with the optical fiber link between Dhaka's Maghbazar and Gulshan telephone exchanges, all intra-city inter-exchange connections are now established through short distance fiber-optic links. The intercity portions between the major cities started with the completion of the STM-16 fiber link between Dhaka to Chittagong in 2001[6]. As on today, fiber optic links have already been established in most cities of the country (50 out of 64 districts)[7] by STM-4 and STM-1 optical link. A map showing the existing fibre-optic network within the country is shown at Annex B to this paper.

5.3.3 Microwave Network / Satellite: The microwave link network in Bangladesh is based on four geo-stationary ground satellite stations that are solely used for international telecommunication. These satellites primarily rely upon the IOInmarsat synchronous orbit satellites located above the Indian Ocean[8]. Among these, the first two are standard "A" stations; one located at Betbunia, about 40 km from Chittagong and the other at Mohakhali, Dhaka. The third one is a standard "B" station located at Talibabad, about 30 km north of Dhaka. The fourth one, of standard "F", is in Sylhet. The microwave links carry the intra-country portion of the traffic. The international channels are then transmitted through a STM-16 Optical Fiber transmission system at Dhaka. The Sylhet Earth Station caters for the international trunk service for Sylhet and adjoining areas. This satellite station is directly connected to the international gateway switch of British Telecom in UK. In addition, there are two more international terrestrial links: the first is the microwave link from Chuadanga near Kushtia linked to Krishnanagar at India, while the second one is an UHF link from Attari near Dinajpur linked to Bhadrapur at Nepal.

5.3.4 Software Industry: Bangladesh has already had a measure of penetration in the world of software markets. Till date, a total of 83[9] Bangladeshi software firms have been regularly exporting software and ITES in 26 countries. Through this export Bangladesh is earning about US $ 30 million per year. There is a good opportunity for local ICT companies to enter into joint venture agreements with foreign companies. To promote software export ICT Business Promotion Council has been set up under the Ministry of Commerce and a Business Promotion Office has been set up by EPB at Silicon Valley, United States of America.

5.3.5 ICT Incubation Centre: Establishment of the ICT Incubation Centre at Karwan Bazar is a reckonable effort by the government. At present, about 48 IT/software related companies have set up operations in this complex. The complex is equipped with 24-hour power supply and internet gateway facility from the Development of ICT Infrastructure.

5.3.6 High Tech Park: The government is planning to set up a High Tech Park with all modern infra-structural facilities at Kaliakoir near Dhaka within a complex of about 230 acres of land at a cost of Taka 2,522.5 million (US$ 43.5 million)[10]. It would house software and ICT-enabled service industries, telecommunications, hardware assembly/component/VLSI design (possibly manufacture also), optoelectronic equipment, bio-technology and related linkage industries, including a hi-tech University to provide technical support and for conducting R&D at the park facilities.

5.3.7 BTTB Internet Service: BTTB is providing both dial-up and broadband access facilities for the internet users. BTTB is presently providing dial-up internet service to telephone users of all 64 districts and 164 Upazillas (35 per cent) having digital exchange. As per the statistics, in about 60 Upazillas users are actively accessing the internet facilities.

Table 5: Telecommunication Infrastructure

Serial	Heading	Statistics
1.	Number of Internet User	0.1 million
2.	Number of Computer	0.5 million
3.	Number of ISP	195
4.	Number of VSAT Provider	31
5.	Number of VSAT User	70
6.	Internet Backbone of BTTB	10 megabit per second (mbps) (6 mbps down + 4 mbps up)
7.	Usual Bandwidth of ISPs	64 kilobit per second (kbps) to 2 mbps

Source: A K M Habibur Rahman, Divisional Engineer, BTTB, *Data and Internet Services: BTTB Scenario*

5.3.8 Broadband Internet Service: The broadband Internet service has been extended to 23 places at 13 district head quarters[11] for Corporate organization, Banks, Universities and Colleges, Multi-national companies etc. The broadband Internet access up to 2 Mb/s is being provided by telephone cable through DDN. Special discount is available for Educational and Research Institutes and Government offices to promote e-governance.

6 The Submarine Cable Network Contract

6.1 The Deal: The government signed an agreement on March 27, 2004 with thirteen other counties to set up submarine cable beneath the sea of the three continents[12]. The country is joining the fourteen-member consortium is known as Southeast Asia – Middle East – Western Europe (SEA-ME-WE) -4 to reduce telecommunication cost remarkably, and giving Internet browsers to get high-speed gateway to the cyber-world. BTTB Chairman Nurul Islam signed the agreement on behalf of Bangladesh.

6.2 The Members: The network will link 14 countries from France to Singapore via Italy, Algeria, Tunisia, Egypt, Saudi Arabia, United Arab Emirates, Pakistan, India, Sri Lanka, Bangladesh, Thailand and Malaysia through 16 landing points.

6.3 The Salient Features of the Project: Alcatel and its co-contractor Fujitsu have been awarded the Sea-Me-We 4 project on a turnkey basis. The project will deliver a new terabit cable with the capacity of 12.8 terabit per second, which is more than 32 times the initial capacity of the previous Sea-Me-We 3 system, and supports a huge data growth, leased line and broadband services. The project work includes construction of cable landing stations, a 22,000 kilometres trunk route and another 1,200 to 1,400 kilometres branch route through the seabed. Delivering the first ever Bangladesh submarine cable system, the new cable network will utilize Alcatel's submarine and terrestrial optical networking solutions based on the most advanced technologies recently delivered to the market.

6.4 Finance: To launch the initial work of setting up the cable connection beneath the sea the Executive Committee for National Economic Council (ECNEC) approved a fund to provide ten per cent Bangladesh's mandatory contribution to the consortium for implementing the project. The fund was disbursed on April 2004. All members of the consortium have to pay ten per cent of their own expenses to run the initial works. ECNEC has ensured the initial project fund of Taka 654 crore[13] for 22, 500 kilometres for optical cable network.

6.5 Tasks at the Country's End: Though BTTB initially selected Chittagong as the landing station, later they planned to shift the location to Cox's Bazar. Sources said the high risk of cable cut due to fishing and anchoring in the Chittagong coast has prompted this dispute. BTTB has already set up 160 kilometres high-speed optical fibre cable link from Cox's Bazar to Chittagong at the cost of Taka 40 crore.

6.6. Prospect of the System: Most importantly, the data transfer capacity of the country thorough the submarine cable network will be 10 gigabyte per second[14], that is, 68 times more than the present capacity. The present costly satellite based data transfer process with only 150 mbps capacity will be outdated if the installing of submarine cable goes successful. Secondly, it will contribute in breaking the digital divide between the developed and the developing countries.

7 Evaluation of the ICT Infrastructure in Bangladesh

7.1 Major Constraints: The major constraints that may impede the country's journey towards the information superhighway are manifold. This paper would highlight the constraints under few generalised heads in succeeding paragraphs.

7.2 Human Resource Constraints:

7.2.1 Scarcity of Specialised Computer Experts: Still the number of computer graduates is very few compared to actual requirements. Our major software developers pivoting database applications may not achieve success unless they acquire specialised network based data communication solution complemented by devise based interface developments. But, with our existing 1:40 student to faculty member ratio even at BUET the prospect is far reachable.

7.2.2 Insufficient Course Curricula: The course curriculum for computer related subjects even at graduate and postgraduate level are too outdated or even obsolete. Most of these do not reflect the current market needs.

7.2.3 Inadequate Facilities for High Level IT Training: Facilities for high-level training in IT are inadequate and not up to the standard. Absence of continuous quality control, monitoring and negligence in maintaining desired standard is also eminent.

7.3 Infrastructure Defects:

7.3.1 Inadequate Telecommunication Facilities: Existing telecommunication facilities are not adequate for a smooth and rapid development of export oriented IT industries. We need more telephone lines at cheaper rates. About 350,000 demands for connection are known to be pending.

7.3.2 Internet Connection and Telecommunication Facilities Expensiv: The rate of internet connection and specially international call service is too high compared to any of our neighbours.

7.3.3 Slow Internet Connectivity: Slow Internet connectivity is another constraint in developing IT infrastructure. Unless a neutral body regulates the available bandwidth meticulously, the problem will persist. More so, increase in teledensity in near future will create additional pressure on the existing bandwidth capacity.

7.3.4 Absence of Any Evaluation System: The government has not so far taken any positive step to carry out an evaluation of the weaknesses in different sectors. Even the concerned authorities do not have a comprehensive, accurate and updated database. So-called survey carried out by Sustainable Development Networking Programme had no specific directive or objective and came out with some irrelevant statistics.

7.3.5 Integration of All Available Tools: Only submarine cable network cannot support and bear the load of entire countries ICT needs.

More so, reaching cable system at the doors of internet users would never be possible and is quite expensive. Therefore, the government has to depend on other tools for the last mile connection. But to identify the most relevant tool at the desired place would need depth of knowledge and thorough evaluation.

7.4 Marketing and Business Environment Constraints:

7.4.1 Lack of Database on IT Professionals: Non-existence of database information on Bangladesh IT professionals is barring us from moving forward and competing with the strong rival countries.

7.4.2 Absence of Quality Assurance: Most of our IT firms do not have quality assurance certificate or ISO certificate, which is the testimony of their ability.

7.4.3 Absence of Funds for Research and Development (R&D): The necessity of R & D practice is unquestionable and undoubtedly essential for any country to develop and keeping it in a continuous development process.

8 Proposed Strategies to Overcome the Barriers

8.1 Bangladesh being at the trail among the countries with e-readiness, adoption of generalized information technology at mass level of implementation is at a low end. Therefore, it is the high time to recognize the exact areas of intervention, put emphasis on specified sectors and formulate strategies for better implementation of ICT in the country. The proposed Strategies may be divided into short term and long-term mission for smooth implementation. A short -term Strategy may be aimed at next one year and the long-term one for five-years.

8.2 Long Term Plan: A well thought out strategic plan within a long time frame may necessitate following actions:

8.2.1 The government must carry out a comprehensive survey scheme and prepare a detail database as soon as possible. The government must have an updated database showing statistics of network use, information infrastructure, hardware-software support, internet access cost etcetera.

8.2.2 The government should appoint an expert or a consultant group to assess the strengths and weaknesses of Bangladesh in the global market and formulate appropriate strategy to overcome the weaknesses. The focus should be on strengthening the software industry.

8.2.3 Extensive effort should be taken to produce skilled manpower on IT. Maximum fund should be allocated for computer education. Specialized university should be established in Bangladesh like Malaysia and other countries. Existing syllabus must be reviewed immediately to address the present day need with subjects on programming, Internet based education, E-business, online banking, E-commerce, WEB and WAP etc.

8.2.4. Cost of Internet based communication should be further reviewed and brought down at a minimum level that brings level playing field for Bangladeshi entrepreneurs at the global arena. The regulatory board must address the perceived demand for minimum 10 years while managing/distributing the bandwidth.

8.2.5. Rapid implementation of IT village project at prospectus countries to be implemented immediately.

9 Conclusion

9.1 The first transatlantic cable was laid in August 1858. Then, the first generation fibre-optic cable was laid in 1988. The latest trend in submarine cable network is the use of Dense Wavelength Division Multiplexing (DWDM. In the mean time, Advanced Research Projects Agency Network (ARPANET) was invented, which is the progenitor of global internet. DSL and cable are the two commonly used fixed line internet technologies. DSL may again be divided into Symmetrical DSL (SDSL), Asymmetric DSL (ADSL) or Single Pair High-Speed DSL (SHDSL). Besides, fibre optic cable are emerging as another preferred technology. Conversely, fixed wireless systems, satellite, WLAN, third generation mobile, free space optic and power line communications are the wireless technologies.

9.2 Bangladesh stepped into the information world in 1964 by introducing an IBM 1620 mainframe computer at the Atomic Energy Centre, Dhaka and the universities. Then in 1996 government decided to allow private companies to act as Internet Service Provider (ISP). Another breakthrough came in 2000, when government deregulates Very Small Aperture Terminal (VSAT) for private sector. Finally, government signed Submarine Cable Network contract with SEA-ME-WE 4 consortium on March 27, 2004. Starting in 1997 the government started gradually reforming its various sectors/organisations to develop proficiency in ICT sector. Among those, forming of Bangladesh Telecom Regulatory Board on 2002 is most significant. Government also formulated the national IT policy and the intellectual property rights in the same year. In 2002, government transformed all the four Institutes of Technologies (BIT) to Science and Technology Universities and put them along with 38 universities and 31 Colleges under National University for offering Undergraduate Degree in IT.

9.3. The existing telecommunication infrastructure is frustrating. The present teledensity is about 0.83 per cent including the mobile sets. The government aimed to raise the figure to 3.3 per cent by 2005. In December 2002 all analog exchanges at 64 District Headquarters were converted to digital. But she has only 3 International Trunk Exchange. GP is utilising the optic fiber network of Bangladesh Railway. Besides, BTTB has laid countrywide fiber optic links in 1986 (50 out of 64 districts). Till date, a total of 83 Bangladeshi software firms have been regularly exporting software and ITES in 26 countries. BTTB is providing both dial-up internet service to telephone users of all 64 districts and 164 Upazillas having digital exchange.

BIBLIOGRAPHY

1 Abu Saeed Khan, SEA-ME-WE4 submarine cable consortium bids open Project to connect Bangladesh with high-speed telecom network by July '05, *The Daily Star Web Edition Vol. 4 Num 105*.

2 Habibur Rahman, A K M, Divisional Engineer, BTTB, *Data and Internet Services: BTTB Scenario*, akmhabib@bttb.net.bd.

3 J. R. Choudhury, Vice Chancellor, BRAC University, *Technology in Bangladesh - Issues, Challenges and Opportunities*, AEDSB Seminar, World Bank Office, Washington DC September 04, 2002.

4 *National ICT Policy (October: 2002)*, Ministry of Science and Information & Communication Technology Government of the People's Republic of Bangladesh.

5 Omar Faruque Khan, Dr Md, ICT Secretary, *ICT - Status, Issues and Future Plans for Bangladesh*.

6 Research, Insight, and Analysis, About SEA-ME-WE 4, *Daily Wireless*, June 13, 2004.

7 Shabbir A Bashir, *Fibre-optic Telecommunication & Better ICT in Bangladesh*, a presentation paper from the internet.

8 Shahidul k.k. Shuvra, Submarine cable deal to be signed, Daily News Monitoring Service *www.bangladesh-web.com*, Friday March 26, 2004.