

**Higher Distance/Virtual Education
in
The Anglophone Caribbean**

*(A Report on the Evolution, Present Status and Future Prospects of Higher Virtual Education in the
Anglophone Caribbean)*

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Also my thanks are due to my colleagues throughout the Caribbean who contributed to this study in various ways.

Badri Nath Koul
October 10, 2002

PREAMBLE

Introduction

The International Institute of Higher Education in America and the Caribbean (IESALC), UNESCO, is conducting studies in the different sub-regions of Latin America and the Caribbean on the evolution, present situation and the future prospects of higher distance and virtual education programmes based on the use of new information and communications technologies. In the process, IESALC made a proposal to Prof. Badri Nath Koul to conduct such a study pertaining to the Anglophone Caribbean countries within the framework of the following terms of reference.

Tasks to perform

1. Conduct the study mentioned above covering the following countries:

Antigua & Barbuda, Bahamas (the), Barbados, Dominica, Grenada, Jamaica, Montserrat, St. Kitts & Nevis, St. Vincent & the Grenadines and Trinidad & Tobago, and other countries served by UWIDEC (Distance Education Centre, the University of the West Indies).

2. The study must cover the following topics:

- 2.1 Identify and describe the characteristics of the computer and telecommunications infrastructure existing in the Caribbean countries that can be used for the use of new information and communications technologies for higher distance/virtual education.
- 2.2 Trace the evolution of higher education programmes implemented through the use of new virtual or digital technologies from their beginning to the present.
- 2.3 Identify and describe the characteristics of the existing experiences on the basis of the following variables: 1) starting year of the experience, 2) field of knowledge, speciality or study covered, 3) educational level and/or branch — undergraduate, graduate, continuing education etc., 4) delivery methods used — totally virtual, combined with non-virtual elements involving physical presence of teachers and learners and 5) teaching and learning platforms used, for example: WebCT, Blackboard, etc.
- 2.4 Identify the existing projects (in preparation or in their beginnings) of higher distance education through virtual and digital technologies and describe them according to the same variables as indicated in item 2.3 above.
- 2.5 Determine if there exists a legal framework or norms regulating the organization and functioning of higher virtual education programmes in the countries concerned.
- 2.6 Determine if there exist instruments for quality evaluation and accreditation of higher virtual education programmes in these countries.
- 2.7 On the basis of the information derived from the above items and any additional relevant information 1) identify the trends and problems related to the development of higher virtual education in the Caribbean and its development prospects for the future and 2) formulate proposals and strategies to improve the introduction and use of the new information and communications technologies in higher education for teaching and learning processes and their articulation with the existing modalities of education.

3. Deliver the final report of the study for the approval of IESALC not later than October 30, 2002.
4. Present the final report in a Seminar on Higher Education in the Caribbean to be organized by IESALC (October-November, 2002).

The proposal was made in June 2002 and accepted for implementation in July 2002, when Prof. Badri N. Koul returned to his office from vacation abroad.

Conduct of the study: details

Time frame

Given that the agreement was signed on July 3, 2002, and that the study report was expected by the middle of October, 2002, the study had to be completed in about 100 days allowing for the study of relevant literature, preparation of the survey instruments, collection of data, analysis of the data collected, derivation of conclusions, drafting of the report and finalizing it for submission. In these circumstances it was not possible to allow more than 35 days to the process of serving the questionnaires and the collection of feedback. This imposed some limitations on the size and quality of the data collected.

Literature (study of)

Most of the literature studied pertains to distance and virtual education operations all over the worlds (see references for Section IV). Secondly, it became necessary to take recourse to such literature as helped in preparing the questionnaires and also in filling the gaps found in the feedback received through the questionnaires. The studies used for this purpose are as follows:

- *A Rainbow Technology for a Rainbow People: E-Business Capacity Development for CARICOM Region—Report of a Diagnostic mission June-August 2001.*¹
- *Caribbean policy response to the information age: a review of government information and communications technology policy and services in selected Caribbean countries.*²
- *RedHUCyT (OAS) Hemisphere-wide Inter University Scientific and Technological Information Network.*³
- *The E-readiness of CARICOM Member States.*⁴
- *The State of Virtual Education in the Commonwealth Caribbean: A Preliminary Study.*⁵

Countries surveyed

After the agreement was signed on July 3, 2002, IESALC proposed that Belize, Guyana and Suriname be added to the list of countries, which were proposed for the study initially. With these additions, the number of countries rose to eighteen (18), of which sixteen (16) — Anguilla, Antigua & Barbuda, Bahamas (the), Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos are served by the University of the West Indies. Guyana is served by the University of Guyana and Suriname by the Anton de Kom Universiteit van Suriname. Inclusion of Suriname in the study marks a deviation from the initial

intention of focussing on the Anglophone Caribbean. Accordingly, we have used the word *Caribbean* to mean all the countries involved in the study.

Institutions surveyed

As the study was proposed to focus mainly on higher education, it became necessary to identify the institutions for the required survey. Given the large number of tertiary level institutions in the Caribbean, instead of conducting a new survey to identify the institutions of higher learning for the present study, we took recourse to a survey entitled *Foreign Tertiary Education Providers Functioning in the Anglophone Caribbean—A Report by the Office of the Board for Non-Campus Countries & Distance Education (2001)*⁶, conducted recently at the University of the West Indies, Cave Hill Campus, Barbados. Keeping in view the analysis presented in it, the countries involved in this study and the basic concern of looking into indigenous Caribbean capabilities, needs and projections, the following six universities were identified as the legitimate candidates for the present study:

1. The University of the West Indies
2. The University of Guyana, Guyana
3. The Anton de Kom Universiteit van Suriname, Suriname
4. The North Caribbean University, Jamaica
5. The University of Technology, Jamaica
6. The University of Belize, Belize

Data

Two questionnaires were prepared to collect the data required. Questionnaire 1 (see Appendix 1) pertains to details regarding the existing infrastructure, the available human resources, the policy status, the legal provision and e-environment of the countries concerned. The questionnaire was served to all the eighteen countries listed above, addressing it to at least five destinations (including the Ministries of Education) in each country. Except three countries (Anguilla, Bahamas and Turks & Caicos), all other countries (fifteen in all) sent in their responses, which form the basis of Sections I and II of this report. The responses/data received had a few weaknesses — (i) There was no time to confirm/authenticate all the data received. (ii) All the responses received were not complete in all respects and to fill up the gaps additional literature and studies had to be used (care was taken to use recent literature developed during the past 12-14 months for this purpose). (iii) The data pertains to physical objects and activities, which have been and are being improved upon vigorously. Consequently, the detail that is 100% correct today will be only partly so tomorrow and so on. These limitations notwithstanding, we moved further to derive conclusions from this data, as from our viewpoint the data of the kind we were dealing with was not meant to present an absolutely accurate picture of the domain being surveyed, instead, we thought, it should provide an understanding of what was around and how it was changing, which it does reasonably satisfactorily.

Questionnaire 2 (see Appendix 2) pertains to the Caribbean universities and their distance and virtual courses/programmes. In this case, depending on the flow of responses, the Questionnaires were sent to 2-6 subjects at each of these universities. Section III of this report is based on the feedback received through this questionnaire.

Analysis of the data and conclusions

Both the questionnaires provided for data that did not require any statistical analysis. While the data generated by Questionnaire 2 provided a satisfactory view of the details (see Section III), that generated by Questionnaire 1 provided country specific narratives, which did not present an overall comparative view of individual countries, nor that of the region as a whole. To overcome this difficulty, preliminary statistics was used to translate the data (from Questionnaire 1) into figures, which besides presenting the details more graphically, also helped in making comparisons and in drawing conclusions analytically.

Presentation

This report comprises five sections covering all the topics proposed by IESALC (see above topics 2.1 to 2.7). In order to achieve overall coherence in the presentation and a reasonable balance in the size of sections, the topics dealt with follow a sequence different from the one proposed above. The sequence followed is outlined below:

Section I covers topic 2.1.

Section II covers topic 2.5.

Section III covers topics 2.2, 2.3, 2.4 and 2.6.

Section IV covers a part of topic 2.7 (namely *other information that is considered relevant to the study*).

Section V covers the remaining parts of topic 2.7.

Sections I and II are based on the feedback received through Questionnaire 1 and the two together present a fairly good picture of the levels of e-readiness of the Caribbean countries as well as the region as a whole. Section III details the Caribbean institutions of higher learning under the four topics listed above. These topics were brought together in one section mainly because logically they pertain to a single theme and partly because the data available under each topic was too small to allow them a section each. Section IV is devoted to a part of topic 2.7, which deserved elaborate treatment for it serves as a standard/measure for distance/virtual educations transactions that are in place currently and/or may be planned and implemented in the future in the Caribbean. Section V brings the analyses and conclusions of the first four sections together to make proposals for future action. The five sections together cover almost all the topics proposed for the study, but there are a few deviations that we need to outline here.

It was not possible to formulate **proposals and strategies** to improve the introduction and use of the new information and communications technologies in higher education. Formulation of such proposals is a country specific task. Given the differing levels of e-readiness displayed by the Caribbean countries, we cannot make blanket proposals to cover all the countries. And this is also true of *strategies*, which can neither be proposed nor formulated unless the country specific details are available in a much greater detail and at higher levels of specificity. This in view, the study makes proposals regarding what the various stakeholders (governments, institutions of higher learning, academics, learners, the corporate sector, etc.) may/should do in order to create an environment in which the use of new information and communications technologies becomes possible and attractive in the domain of higher education. Following these proposals, the study presents five models of distance/virtual education, any one of which can be adopted in a particular country/institution depending on her/its e-environment and e-readiness.

EXECUTIVE BREIF

Section I

Caribbean countries are not adequately equipped with the infrastructure and human resources required to materialize higher virtual education satisfactorily at this point in time. The major difficulties are with the levels of computer literacy and the costs of connectivity. There is, however, a concerted effort all around (through initiatives from various regional bodies like CARICOM and OECS and the governments concerned) to change this situation. Institutions of higher education also are in the process of equipping themselves to build the required levels of capacity for offering virtual education.

Section II

Again, these countries are not fully prepared in terms of the policies, the legal provision and the general e-environment required for smooth virtual education operations. The weakest areas are the limited legal provision for the protection of on-line materials, intellectual property rights, etc. and a subdued e-environment, while the strongest areas comprise the deliberate thrust toward policy formulation and mobilization of foreign resources to boost e-readiness in almost all the countries. It is clear that the rate of development is upbeat and that the e-scenario in the Caribbean will be quite favourable for virtual education in the near future.

Section III

Three of the six universities studied in the present exercise do not offer any kind of distance/ virtual education programmes. Of the remaining three, two offer print based distance education programmes, and one has courses on-line for its campus based students. Overall, of the six institutions only two have some courses on-line. The present scenario is best described as the *threshold stage*, as most of them are trying to put the prerequisites together so as to be able to provide virtual education in the near future.

Section IV

The international scenario squarely points to the unprecedented boost the new information and communications technologies have provided to virtual education. In addition it points to the latest developments in which technology provides not only for the delivery of course content, but also for pedagogic/andragogic transactions. This development provides a firm base for future virtual education operations. Also the vast range of technology applications viewed helps in assessing their relative utility for virtual education, and Web based dispensation appears to be the best option to work for.

Section V

This concluding section puts together the current trends in and the problems related with the use of ICT for purposes of virtual education. A consideration thereof leads us to proposals for the various stakeholders that need to be implemented to provide a sound base for higher virtual education. As for immediate action, five models are proposed for differing levels of preparedness, suggesting that even in the prevailing circumstances a beginning could be made and that the institutions that have gone some distance can improve upon their situation as new possibilities are being explored and built currently.

SECTION I — ICT INFRASTRUCTURE AND HUMAN RESOURCES

1.1 Introduction

Given the compelling reality of diverse and far reaching applications of ICT in the affairs of the state, the corporate sector as well as the private affairs of individuals, no state big or small can afford to ignore harnessing its prowess for developmental purposes and so for the education sector. Its effective and efficient application for education, however, depends largely, among other prerequisites, on the physical and the related human resources available in a country. Since virtual education is dependent mainly on ICT applications, it is necessary to assess the ground reality in order to build pragmatic proposals pertaining to the possible products and processes that constitute virtual education in a country/region and also to identify what more is needed to make such proposals work.

1.2 Infrastructure and human resources: country profiles

In order to assess the utility of ICT in the Caribbean educational sector, we must consider the hardware as well as the human resources needed to work it. Additionally, wherever possible we will outline the various types of assistance that educational institutions have been able to procure in recent years. This should give us a fair understanding of the kind and range of infrastructure that is available in each of the constituent countries. Their respective profiles are presented below using the following 13 criteria. These criteria and the corresponding details, except criterion no. 8, have been derived from Questionnaire 1 (see Appendix 1). Details against criterion No. 8 have been derived from documented records.¹

Infrastructure

- 1 Availability of the new electronic services and access to Internet
- 2 The kind of technology that supports connectivity
- 3 ICT market: monopolist or competitive
- 4 Number of ISPs and Internet connections
- 5 Cost of connectivity
- 6 Quality and cost of the electric supply
- 7 Availability of promotional facilities for ICT
- 8 Recent technology enhancements within the education sector

Human resources

- 9 Availability of e-professionals
- 10 Level of computer literacy
- 11 Availability of teaching/training in ICT
- 12 Attitude of the masses and workforce toward ICT applications
- 13 Levels of ICT skills and efficiency among the workforce

Antigua & Barbuda

Infrastructure: Communication services, access centres and networked computers are available and widespread in the country. Dial-up links constitute the main means of connectivity in the country. While the government controls the local network, the international network is under Cable & Wireless monopoly. Internet access is provided by two (2) ISPs at present and the monthly cost of dial-up 56K is nearly US\$40 per month plus charges for the local phone call. Electric supply is said to be reliable. The country has established a free trade zone, which is expected to promote ICT awareness as well as facilities.

In the area of education, some institutions have already received support under the Caribbean University Network (CUNet) project and further assistance is being arranged for various institutions to procure software, equipment and connectivity.

Human resources: The availability of e-professionals in the country is poor and e-literacy among the citizens is low. There are arrangements for ICT teaching through the Technology Institute. The certified training, which it has begun to offer, however, is of the basic level. The attitude of the masses and the workforce to ICT applications is not encouraging and the level of ICT skills among the workforce is low, but they are on a threshold and can be trained in computing skills of higher levels.

Barbados

Infrastructure: The availability of communication services and access centres is fairly good in Barbados and plans are afoot to establish and promote call centres all over the country. There is a fibre optic ring around the country and alternative support is available through undersea cable and satellite. Cable & Wireless/Bartel has total monopoly on telecommunications at present, but work on liberalization is in progress. Using the C & W gateway, there are six ISPs serving the country at present and the number of Internet connections is estimated to be around 30,000. Dial-up 56K links are available at nearly US\$44 per month, leased lines 64K for US\$830, 128K at US\$1520 and T-1 at US\$12,380. Electric supply is quite reliable, but costly. There are no promotional facilities for ICT at present, but they are being planned.

In the educational sector, a major initiative is the EduTech 2000 programme, which is going to feed higher levels of education in the area of ICT. Also, under CUNet, the University of the West Indies, Cave Hill Campus and Barbados Community College have received equipment and funding for facilitating their access to electronic mail and connectivity in general.

Human resources: The availability of e-professionals is satisfactory and the EduTech 2000 initiative is expected to improve the situation in the long-term. Computer literacy is quite satisfactory and is said to be rising fast. Teaching in ICT is on a sound track covering all the levels. UWI, the Community College and the schools teach ICT routinely, but as demand is increasing additional arrangements have to be put in place. The plan to network computerisation at the schools is expected to fully prepare the young for the knowledge era. Also, Barbados Technology Training Centre has recently been established at the Harbour Industrial Park to provide higher levels of skills for software and applications development. The general attitude of the masses and workforce toward ICT applications is positive and ICT skills among the workforce are supposed to be fairly high.

Belize

Infrastructure: The telecom and Internet services, provided by BTL (a private company), are available in urban areas. Dial-up links and leased circuits, which serve the institutions and the corporate sector mainly, form the main means of connectivity throughout the country. Though there is another private company that provides services to the corporate sector in the free trade zone, BTL enjoys monopoly till 2003. Internet dial-up connections are said to be over 6000. Dial-up 56K connections cost US\$20 for 100 hours and these rates are considered expensive. Electric supply is said to be reliable. The free trade zone, mentioned above, is a private enterprise and focuses on Internet games mainly. There are no other promotional facilities available in the country.

Over the years (since 1997) OAS has provided funds for hands-on training workshops and equipment to the then University College of Belize (now absorbed into the University of Belize) and some schools for computing and connectivity through the Ministry of Education projects supported by OAS/CUNet.

Human resources: There is severe shortage of e-professionals in the country, and most of the needed workforce comes from USA. E-literacy among the masses is very low as there is very little training available locally. A few schools and private training centres provide some basic training currently, while the University of Belize has just started degree and sub-degree level courses, but the intake is very low. The masses and the workforce are turning to favour ICT applications, though most government and corporate sector employees are computer literate and their skills and efficiency are said to be good.

British Virgin Islands

Infrastructure: The availability of telecom services and access centres is said to be poor. In addition to the usual dial-up links and leased lines, the country has the advantage of ADSL. Cable & Wireless is the monopoly service provider and also the sole ISP that has pushed the number of Internet connections to over 3000 so far. Dial-up 56K links are available at US\$59 per month, 64K leased circuits at US\$900 and ADSL at US\$99 per month. Electric supply is said to be quite reliable and is available at reasonable costs. At present the country does not support any promotional facilities for ICT, nor is any planned for the immediate future.

H. Lavity Stouff Community College has received funds from various sources and is fully equipped for sophisticated levels of e-teaching/learning. It is certainly the best ICT equipped institution in the Caribbean and has enough capacity to let others use it for a price.

Human resources: E-professionals are not easily available in the country, though the level of computer literacy is said to be adequate. Though teaching/training in ICT is available locally, it is of lower levels only and is totally a public sector enterprise, as the private sector is not involved at any stage whatsoever. The attitude of the masses and the workforce towards ICT applications is said to be positive and the level of ICT skills and efficiency among the workforce is reported to be good and their skills can easily be improved.

Cayman Islands:

Infrastructure: The availability of telecom services is said to be very good. In addition to the usual dial-up links and leased circuits, some fibre optic and satellite links are also being used for purposes of connectivity. Cable & Wireless is the monopoly service provider and also the sole ISP in the country, but its monopoly status is scheduled to end in 2003. The cost of dial-up 56K links is US\$60 for 50 hours plus US\$1.80 per hour thereafter. Leased circuits of 64K are available at US\$875 per month, direct 128K at US\$1,630 and direct 256K at US\$2775. The reliability of the electric supply is said to be very good and its cost reasonable. There is, however, no promotional facility for ICT available in the country at present.

A multi-million dollar ICT programme, *Improving Teaching and Learning in Cayman*, is about to be launched to remodel school education in the country.

Human resources: The availability of e-professionals in the country is said to be good, but the level of computer literacy among the masses is low. Training/teaching in ICT is available locally at the sub-degree level. There is, however, strong private sector support available for an associate degree and A+. Also, MCSE is available through IBM Scholars Programme. The attitude of the masses and the workforce for ICT applications is said to be in the range of 'hesitation' to 'positive'. The level of ICT skills and efficiency among the workforce is said to be good, but most of the workers (about 52%) are non-nationals.

Dominica

Infrastructure: The availability of telecom services is very good. Besides the usual dial-up links, all populated areas are networked with fibre optic lines. Though Cable & Wireless is the monopoly service provider, there is another ISP operating in the country since 1997 and there are about 4000 Internet connections in operation currently. Dial-up 56K links are available at about US\$33. Power is supplied by a private monopoly agency, and its cost and reliability are a concern. There are no promotional facilities available yet, but they are being planned.

A Ministry of Finance project funded by OAS/CUNet has provided the University Centre (UWI), the Clifton Dupigny Community College and some other institutions with technical assistance, computer hardware and software for enhancing their connectivity.

Human resources: Like most Caribbean states, there is a shortage of e-professionals in Dominica. E-literacy is said to be adequate, as basic training is available locally at the school and Community College levels. To improve this situation, efforts are on through the Government Education Department. Generally, there is strong support for ICT applications as the masses and the workforce are positive about it, but the workforce has lower level ICT skills and, therefore, need upgradation.

Grenada

Infrastructure: The availability of telecom services, supported by a call centre and some more in the offing, is said to be fairly good, but bandwidth is a concern to address. Both dial-up links and leased circuits are in place for connectivity. Cable & Wireless is the monopoly service provider currently, but efforts are on for liberalizing the sector. As of now Cable & Wireless is the only

ISP in operation in the country. Dial-up 56K links (unlimited) are available at US\$48, while 256K leased lines are available at US\$30,000. Currently, more than 50 leased circuits and about 4000 Internet connections are in operation. Electric supply is reliable but said to be very costly. There is no promotional facility available at present, but there are plans to set up an ICT park within a couple of years.

In 2001, education sector attracted an increased budgetary allocation of 22% over the expenditure in 2000 with special emphasis on ICT under the National Employment and Skills Training programme to 'computerise all learning institutions'. The University Centre of the University of the West Indies, Marryshow Community College, the National Science and Technology Centre, and three skills training centres in the country are being interconnected under a project involving the government, ISPs, UWI and CUNet. It entails installation of ICT hardware and software for enhanced connectivity.

Human resources: At present the supply of e-professionals is said to be satisfactory, but there is a concern about the prospect of a rising demand for them. E-literacy is low among the masses, but of late some growth is visible, as steps have been taken to promote training in ICT through various incentives such as tax reduction on computing equipment. In addition to some private institutions, the government has provided a significant thrust in ICT training recently and the general environment is now shaping to favour ICT applications. The workforce has lower level ICT skills, but is ready for training in higher skills and better its efficiency.

Guyana

Infrastructure: The availability of telecom services, together with the support of community access points and call centres, is fairly good in urban areas, but the demand for services is much higher than what is available. Connectivity is available through dial-up links, leased circuits and a satellite link. Telecommunications in the country, however, is a monopoly enterprise with no competition involved. There are five ISPs in operation, but all of them depend on the same gateway. The satellite-based service mentioned above, however, is independent. The number of Internet subscribers is said to be over 3000 at present. Dial-up 56K links are available at about US\$ 16 for 40 hours and unlimited for US\$33.5. Leased lines 56/64K are available at US\$975. Electric supply is reliable but unsafe for equipment because of fluctuations. There are no promotional facilities for ICT in the country, nor any under consideration currently.

An amount of US\$5 million has been secured for the development of education sector and another US\$25 million has been earmarked for the rural electrification programme to support ICT and there is a commitment to add 50,000 telephone lines in the next five years. The University of Guyana set up its first electronic node with funding from OAS for equipment and technical support and more recently funds have been provided to expand its capacity for enhanced connectivity.

Human resources: Availability of e-professionals is in disorder because of limited opportunities in the country, as many skilled persons leave the country looking for work elsewhere. E-literacy among the masses is very low. Because of the initiatives in the private sector, ICT teaching is fair, but those who get trained are attracted to work outside the country. To improve the situation and reverse this trend, regional ICT training centres are being established to provide basic computer literacy at a larger scale. The general environment of indifference to ICT applications

is changing, as businesses and education sectors are being involved actively in developmental activities. Workforce is efficient at lower level ICT skills and can be trained to higher levels of efficiency and skills.

Jamaica

Infrastructure: A very good digital telecom network, supported by many access centres and smaller networks, is fully operational in the country. In addition to dial-up facilities, leased circuits and satellite connectivity, most of the important locations are connected to a fibre optic ring around the island. Cable & Wireless has the monopoly, but liberalization is being effected in phases. There is a large number of ISPs in operation, most of which use the C & W gateway. All put together they provide over 75,000 Internet connections. Dial-up 56K links are available at US\$40 plus per minute phone charges. Leased circuits of 128K are available at US\$1500 and T-1 at US\$8750, which is quite expensive. Electric supply is quite reliable. Jamaica Digiport International is a free trade zone providing network services to USA and has immense promotional impact within the country.

In 1994, OAS/CUNet provided equipment and technical support for the establishment of the Jamaica Network (JAMNet) to connect Jamaica and USA using a 64Kbps satellite link. In the process the University of the West Indies (Mona Campus), the then College of Arts, Science and Technology (now the University of Technology, Jamaica) and many other institutions got interconnected. More recently, to improve its network, UWI was helped with an earth station for satellite communication.

Human resources: Availability of e-professionals is quite good, but the situation is expected to change as e-commerce catches up. E-literacy among the masses, however, is still low. ICT teaching/training is available at the secondary school and university levels. Besides, various private teaching centres/shops and the Caribbean Institute of Technology provide training in various aspects of ICT at different levels of sophistication. There is a high level of local creativity available (especially in the music industry) and the attitude of the masses and the workforce towards ICT applications is positive. The skills and efficiency of the workforce are of a very high level.

Montserrat

Infrastructure: Considering the present conditions in the country, the availability of telecom services, supported by two Internet cafes, is fairly good. Dial-up facilities, leased circuits and T-1 lines provide connectivity in all the habitable areas. Cable & Wireless is the monopoly ICT provider and there is just one ISP in operation supporting some 600 connections currently. Dial-up 56K links are available at about US\$52 per month, leased 64K lines at US\$960 per month, 128K lines at US\$1768 and T-1 lines at US\$16,000. Reliability of the electric supply is said to be good, but there are no promotional facilities for ICT available at present.

Human resources: There is a very severe shortage of e-professionals in the country, as computer literacy among the citizens is very low. Other than some basic ICT teaching introduced at the secondary school level, there is no higher level teaching in ICT available in the country. The attitude of the masses and the workforce toward ICT applications is said to be favourable

generally. The workforce is skilled in lower level computing and can easily be trained in higher skills.

St. Kitts & Nevis

Infrastructure: The availability of telecom services and access centres is fairly good. Besides the usual dial-up links and leased lines, there is a double fibre optic ring around St. Kitts and a link to under water cable. Nevis is connected through microwave links. Cable & Wireless and The Cable are the two competing service providers. Both the providers serve as ISPs and together provide about 4000 Internet connections currently. Dial-up 56K links (unlimited use) are available at US\$30 (no phone charges for The Cable connection). Leased line links (64K), currently serving around 30 subscribers, are available at US\$1,056. Electric supply is said to be quite reliable. Though there is no promotional facility available at present, planning is on to establish an ICT park in Nevis.

The Ministry of Education, Youth and Community Affairs was assisted with computer equipment, software and other hardware by OAS/CUNet to establish an electronic node for dial-up links. The College for Further Education also has received similar support from CUNet. Recently, Nevis Administration, assisted by funding from Taiwan, set up a centre to receive and deliver UWI distance courses in Nevis itself.

Human resources: The availability of e-professionals is fairly good in St. Kitts, but not so good in Nevis. Computer literacy is adequate and is growing significantly. Besides basic training being provided at some private institutions, computer labs have been established at schools also. A tertiary level institute also is providing ICT education. The attitude of the masses and the workforce about ICT applications is not encouraging. The workforce, however, is computer literate and efficient at lower levels and their skills can be up-graded easily.

St. Lucia

Infrastructure: The availability of telecommunications services is good, but the rate at which the demand is rising is a matter of concern. Connectivity is provided through dial-up links, leased circuits and T-1 lines. Cable & Wireless is the monopoly service provider, though the process of liberalisation has already started. Cable & Wireless is the only ISP today, and there are about 5000 Internet connections on at present. Dial-up 56K links (unlimited) are available at about US\$52 plus 30 cents per access, leased 64K lines at US\$960 per month and T-1 at US\$7,200. Electric supply is not entirely reliable and the costs too are high. As for promotional facilities, a private sector initiative is being considered for implementation.

An Education Development Plan is in place. It emphasises technical and vocational education and has a provision for introducing ICT in schools at a cost of \$4 million. Also a revolving National Technology Training Fund has been created to support training for general computer technology, job-specific training and specialised training to meet the demands of growth in ICT sector. Sir Arthur Lewis Community College has received substantial funds from OAS for computer equipment, communications hardware and software for the development of its LAN and extended connectivity. Also the first electronic node at the Institute for Self Improvement, for electronic communication through the COL server at Vancouver in Canada, was supported with equipment and technical assistance from OAS/CUNet.

Human resources: The availability of e-professionals is fair. Computer literacy among the masses is not high, but is said to be growing fast. An extensive private training facility is said to be available and the attitude of the masses and the workforce to ICT applications is positive. There is already a high level of computer literacy in the workforce and they are said to be efficient and trainable for higher levels of skills.

St. Vincent & the Grenadines

Infrastructure: The availability of telecommunication services, supported by a recently established call centre, and other access centres is quite good. Besides the usual dial-up links and leased circuits, St. Vincent is served by a fibre optic link also, while the Grenadines are connected through microwave links. Cable & Wireless has monopoly in providing ICT services and about 3000 Internet connections are said to be in operation today. Dial-up 56K links (unlimited) are available at US\$52 plus 0.4 cents per minute of use, leased 64K lines at US\$1280 per month and T-1 lines at US\$14,000. Electric supply is said to be reliable. There are no promotional facilities available currently, but there is a plan to build an Informatics Park at Diamond.

The Ministries of Education and Planning and the University Centre (UWI) were assisted by OAS/CUNet with equipment and software to improve their access to Internet and also the Ministry of Communications and Works for installing an electronic node for dial-up electronic mail exchange through the COL server at Vancouver in Canada. More recently, schools are being equipped with computers and Internet connections.

Human resources: There is a severe shortage of e-professionals in the country and among the masses e-literacy is very low, as there is hardly any ICT teaching/training available locally in the country. This difficulty is being addressed with assistance from Taiwan and IBM and also a National Institute of Technology is being planned. The attitude of the masses toward ICT applications is favourable and the workforce is positive about ICT applications and can be trained for the required skill levels. At present, however, their ICT skills are generally low.

Suriname

Infrastructure: Availability of telecom services is quite good in the urban areas, but the infrastructure does not cover the whole country. Besides the usual dial-up links and leased circuits, fibre optic and satellite links are also available for connectivity. Telecom is a duopoly enterprise in Suriname and there are three ISPs that use satellite and fibre optic backbone for connectivity. Dial-up 33.6K links (unlimited) are available at US\$12- 17.50 plus US\$0.2 per minute phone charges, 64K leased lines are available at US\$120-175 monthly and 128K lines at US\$325. Electric supply is not reliable and its cost too is an issue. There are no ICT promotional facilities in the country yet.

OAS/CUNet supported the Anton de Kom Universiteit van Suriname with funds and equipment for establishing its first electronic node in early 1990s and since more support has been sought and received for the connectivity of other academic institutions in the country.

Human resources: There is shortage of e-professionals as most of those who get trained leave the country to work elsewhere. E-literacy is estimated to be very low. In view of this situation, basic

teaching in ICT is being introduced in schools, and the university has mounted on-line courses to impart computer skills to its own staff and those working in the related institutions. In the private sector, EDUCONS (Education and Communication Network Suriname) Foundation, established in 1999, is engaged in developing human resources as well as infrastructure to promote ICT in the country. The attitude of the masses and the workforce towards ICT applications is not encouraging. ICT skills among the workforce are low and need improvements for desired levels of efficiency and effectiveness.

Trinidad & Tobago

Infrastructure: The availability of the telecom services and access centres is good, but there are concerns with regard to the available bandwidth. For purposes of connectivity, fibre optic lines as well as satellite links are available in addition to the usual dial-up links and leased circuits. TSTT (with shares from the government and Cable & Wireless) is the monopoly provider today. In addition to TSTT, there are five other ISPs serving around 60,000 Internet connections in the country. Dial-up 56K links (unlimited) are available at US\$50 per month, 64K leased lines at US\$1,666 and T-1 lines at US\$34,666 per month. The reliability of the electric supply is reported to be quite good. There are no promotional facilities available in the country yet, but these are being planned now.

A Distance Learning Secretariat was established in 1998 under the Ministry of Training and Distance Learning to bring benefits of education to the masses at the community level. Subsequently, it was absorbed in a new ministry with a broader mandate. Another initiative of this kind is the National Library and Information System Authority, which coordinates the work of all library and information services in the country. The first electronic node for dial-up links at the University of the West Indies, St. Augustine Campus, was set up with assistance from CUNet. Subsequently, a project was developed with the help of OAS/CUNet to provide higher levels of connectivity to the University of the West Indies, the National Institute of Higher Education and the Ministry of Education. This project, still under implementation, has brought in substantial technical assistance and equipment to the three participating units.

Human resources: E-professionals are easily available in the country. Computer literacy among the masses is moderate and efforts are being made to increase it through extended access to relevant training programmes. ICT teaching and training are available through public as well as private institutions at various levels, including the university levels, and quality wise it is said to be very good. The attitude of the masses and the workforce towards ICT applications is positive and the workforce is said to be skilled and efficient and at levels where they can increase their skills and efficiency easily.

Country/Regional profile

The above details are abstracted in Tables 1.1 and 1.2. Table 1.1 presents the number of Internet connections in relation to the population in a country and also the cost of dial-up links in relation to the GDP per capita.

Table 1.1: Connectivity levels and costs: the country/regional profile

| | Country | Area (Sq Km) | Connectivity | | | Dial-up costs in US\$ | | |
|----|---------------------------------|-----------------|-------------------------------------|-------------------------------------|------------------|-------------------------------------|----------------------------------|---------------------------------|
| | | | Population ² in (000) | Internet connections in (000) | % connections | GDP per capita US\$ ³ | Dial-up monthly costs US\$ | % of GDP/capita per month |
| 1 | Antigua & Barbuda | 442 | 67.4 | | | 7,900 | 40 + | 6.1 |
| 2 | Barbados | 431 | 276.6 | 30.0 | 10.8 | 11,200 | 44 u | 4.7 |
| 3 | Belize | 2,960 | 262.9 | 6.0 | 2.3 | 3,000 | 20 l | 8.0 |
| 4 | British Virgin Islands | 151 | 21.2 | 3.0 | 14.2 | 10,000 | 59 u | 7.1 |
| 5 | Cayman Islands | 264 | 36.2 | --- | --- | 24,500 | 60 l/+ | 2.9 |
| 6 | Dominica | 450 | 70.1 | 4.0 | 5.7 | 3,300 | 33 u | 12.0 |
| 7 | Grenada | 345 | 89.2 | 4.0 | 4.5 | 3,500 | 48 u | 16.4 |
| 8 | Guyana | 214,970 | 698.2 | 3.0 | 0.4 | 2,500 | 34 u | 16.3 |
| 9 | Jamaica | 11,424 | 2,680.0 | 75.0 | 2.8 | 3,300 | 40 u/+ | 14.6 |
| 10 | Montserrat | 103 | 8.4 | 0.6 | 7.1 | 8,330 | 52 | 7.5 |
| 11 | St. Kitts & Nevis | 269 | 38.7 | 4.0 | 10.3 | 6,000 | 30 u | 6.0 |
| 12 | St. Lucia | 616 | 160.1 | 5.0 | 3.1 | 4,100 | 52 u/+ | 15.2 |
| 13 | St. Vincent & the Grenadines | 388 | 116.3 | 3.0 | 2.6 | 2,400 | 52 u/+ | 26.0 |
| 14 | Suriname | 163,820 | 436.4 | --- | --- | 3,500 | 17 u/+ | 5.8 |
| 15 | Trinidad & Tobago | 5,128 | 1,163.7 | 60.0 | 5.2 | 8,000 | 50 u | 7.5 |
| | Overall | | 5,585.4 | 197.6 | 3.5 | 6,769 | 42 | 7.5 |
| 16 | USA | | 280 m | | 44 | 31,500 | 20 u | 0.76 |

[Notes: a) Blank cells indicate non-availability of the relevant data. b) In the last but one column, *l* stands for limited time, *u* for unlimited time and + for additional costs, such as cost for telephone calls, cost for the additional time beyond the scheduled limit, etc. c) 'Overall' denotes totals in the Connectivity Column and means in the Costs Column, while → points to the direction of computation.]

Only three countries, British Virgin Islands, Barbados and St. Kitts & Nevis, show more than 10% of the population connected, while Belize and Guyana show the lowest percentages. Jamaica too shows no better than 2.8%. The regional connectivity is just 3.5%. In comparison with the USA figures of 44% (see ref. 6 in Section IV), even the best of the Caribbean is about three times lower, while the overall Caribbean figure (3.5%) is more than eleven times lower. Clearly, what USA can plan to do and actually choose to do with the help of their level of connectivity, cannot be done in the Caribbean at this stage.

As for costs, Cayman Islands has the lowest rate at about 3% of the GDP per capita per month, St Vincent & the Grenadines has the highest at 26%, while the overall regional rate stands at 7.5%. Even the lowest rate in the Caribbean (2.9%) is about four times costlier than 0.76%, the rate available in USA. Considering the Caribbean as a part of the North American context, connectivity charges beyond 1% of the GDP per capita per month may legitimately be considered expensive (see Table 1.2 — the figures under criterion no. 5). Considering both, *the levels of connectivity* and *the costs* thereof, the very basic pre-requisites of virtual education are non-existent in the Caribbean.

To fully appreciate the above statement, we turn to the details pertaining to infrastructure and the related human resources in Table 1.2 below.

In building Table 1.2, we have assigned two points if a criterion (see subsection 1.2) is met satisfactorily, one point if the process to satisfy it is in progress and no points if the criterion is not satisfied at all. Following the order of the criteria, as listed in subsection 1.2, and abstracting

the details provided under each country, the table presents an analytical view of the present situation. It should be noted that the analysis is based on preliminary statistics. It should, however, indicate the current situation meaningfully.

Table 1.2 presents the overall ICT profile of each country, and thus of the region, in terms of its infrastructure and the related human resources.

Table 1.2: Infrastructure and human resources—the country/regional profile

| | Criteria Countries | Infrastructure | | | | | | | | Human Resources | | | | | Total | Average |
|---------------|-----------------------|----------------|-----------|-----------|-----------|----------|-----------|-------------|-------------|-----------------|----------|-----------|-----------|------------|------------|---------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| 1 | Antigua* | 2 | 1 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 12 | 0.92 |
| 2 | Barbados | 2 | 2 | 1 | 2 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 19 | 1.46 |
| 3 | Belize | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 12 | 0.92 |
| 4 | British V* | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 1 | 2 | 2 | 12 | 0.92 |
| 5 | Cayman* | 2 | 2 | 1 | 0 | 0 | 2 | 0 | 1 | 2 | 0 | 1 | 1 | 2 | 14 | 1.08 |
| 6 | Dominica | 2 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 12 | 0.92 |
| 7 | Grenada | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 1 | 0 | 2 | 1 | 1 | 13 | 1.00 |
| 8 | Guyana | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 1 | 9 | 0.69 |
| 9 | Jamaica | 2 | 2 | 1 | 2 | 0 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 21 | 1.62 |
| 10 | Montserrat | 2 | 2 | 0 | 0 | 0 | 2 | 0 | - | 0 | 0 | 1 | 1 | 1 | 9 | 0.69 |
| 11 | St. Kitts* | 2 | 2 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 15 | 1.15 |
| 12 | St. Lucia | 2 | 2 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 2 | 14 | 1.08 |
| 13 | St. Vincent* | 2 | 2 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 11 | 0.85 |
| 14 | Suriname | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 9 | 0.69 |
| 15 | Trinidad* | 2 | 2 | 1 | 2 | 0 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 21 | 1.62 |
| Totals | | 25 | 26 | 13 | 13 | 0 | 20 | 12 | 21 | 10 | 6 | 19 | 18 | 20 | 203 | |
| Averages | | 1.67 | 1.73 | .87 | .87 | 0 | 1.33 | .80 | 1.40 | .66 | .40 | 1.27 | 1.20 | 1.33 | | 1.04 |
| Sec. Averages | | | | | | | | 1.04 | 1.40 | | | | | .97 | | |

[* An apology, as the full name of the country has not been written to retain the table in tact.]

The last column presents the average score of each country against the best possible score of 2. Jamaica and Trinidad & Tobago are the best equipped Caribbean countries each with a point average of 1.62. The second best score is shown by Barbados and then comes St. Kitts & Nevis and so on. The set with the lowest scores comprises Guyana, Suriname and Montserrat. From the columns, the best average score is under criteria 2 and 1 indicating that two criteria namely *the basic technology for connectivity* and *the availability of communication services* are the best subscribed, while the worst are those of *costs*, *computer literacy* and *availability of e-professionals*. And the overall regional point average is 1.04, only about half as good as the possible best.

Criterion 8 (which is not derived from the questionnaire) is taken separately as it refers to a few projects in each case. It only indicates that the relevant preparations within the educational sector have begun and also that the sector as a whole and the institutions of higher learning in particular are still in need of significant assistance to come anywhere near significant planning and practice of virtual education.

Along the rows, *the human resource component* (with an average score of .97) is not as good as *the infrastructure component* (with an average score of 1.04), though neither component reaches the best possible score of 2.

Overall, of the 195 cells in Table 1.2, 67 are occupied by the score '2', 69 by the score '1' and 59 by '0'. This crude analysis indicates that the region as a whole has come only about one third of the way as far as ICT infrastructure and the related human resources are concerned.

The worst aspects in the above profile are

- a) the very high costs of connectivity (criterion no. 5),
- b) the low levels of computer literacy (criterion no.10) and
- c) the poor availability of e-professionals (criterion no. 9).

It is clear that it is not easy to conceive of a single all-purpose educational system that can serve all the countries equally effectively, as the respective operational capabilities of the countries in question differ widely and the very basics (costs and connectivity) constitute bottlenecks at present.

1.3 Concluding remarks

The foregoing details and their abstracts indicate that during the last few years significant efforts have been put in to set up ICT infrastructure in most of the Caribbean countries. This effort has made some contribution to the educational sector as well, as in quite a few institutions support has been provided for equipment and connectivity. Such support, however, only helps in initiating the activities. Individual countries/governments have to commit funds under routine budget heads for maintaining, upgrading and appropriate running of the technology driven operations in the new order of e-era. The encouraging indications are that some countries have started doing that as well. Secondly, at present the cost of connectivity and the bandwidth are the major concerns. Here the silver lining is that these concerns are being addressed vigorously and we should be in a happier situation soon. Another matter for concern is the generally poor availability of e-professionals and the limited local capacity for building this resource. To sum up, the region displays diverse levels of infrastructure and the relevant human resources, a situation that does not favour a mono-model virtual education in the region.

In Section II, we will take a closer look at the other relevant prerequisites, such as the legal provision etc., needed to put e-operations, be they related to commerce, education or whatever, on a sound footing.

SECTION II — POLICY STATUS, LEGAL PROVISION AND E-ENVIRONMENT

2.1 Introduction

assess the existing ICT status in the region, apart from a thorough understanding of the available infrastructure, it is necessary to fully appreciate the strengths and the weaknesses of the relevant regulatory mechanisms that are in place at present. The policy and the legal framework pertaining to ICT in the Caribbean has in recent years been motivated by the benefits promised by its applications. Trading in offshore data services, improvements in public sector reform, accelerating human resource development, effecting cost efficiency in training and production, optimisation of educational resources and the promotion of tourism are some of the sterling applications that have caught the attention of Caribbean governments. These promises notwithstanding, there are impediments that need to be dealt with before a healthy e-environment can be secured and sustained. An enterprise so young as we know ICT/Internet is, there are few models to go by. The process of growth has perforce to be evolutionary. Accordingly, initially

the Caribbean response to the ICT revolution was driven by external forces, mainly the demands of the ICT market in the USA. More recently, however, the exponential boom in the ICT industry and its multiple applications have emphatically highlighted the diverse opportunities it provides. Driven partly by this realization and also compelled by the recent difficulties in domestic economies, though relatively late, the Caribbean countries have come to review and redesign their response collectively as well as individually.

Here, ICT policy means the stated and asserted intentions of a government about ICT and the related decisions that regulate the activities that are planned and implemented to materialize the stated intentions, which, in the Caribbean, got anchored mainly to the concerns of e-commerce/business and not to those of education/training. Educational enterprise, however, does not require separate policies or different legal provisions. Once they are in place, education will function within the set framework. The concern is to have them in place. As this concern and the resources required to address it differ from country to country, policy responses from different countries have followed differing approaches and thrusts not only in articulating them, but also in implementing them. The overall Caribbean situation can best be described by the expression ‘a broad and changing spectrum’.

2.2 Policy status, legal provision and the e-environment: regional thrusts

There are many regional agencies committed to improving the quality of governance and social and commercial life of the Caribbean countries and the region as a whole. They are also investing significantly in the development of e-environment in the region. Though their missions and motivations are not the same, their contribution in the field of ICT is noteworthy. Presented below are a few cases to give an idea of the regional effort being put into this field.

Caribbean Community (CARICOM):

The CARICOM Secretariat has been involved actively in helping its member states in resolving their ICT issues. It advocates an integrated and comprehensive approach to ICT concerns such as security, access, enabling legal framework, regulatory legal provision, related human resource development, financial support required and the generation and exchange of ICT related information. For example, CARICOM studies like ‘*A rainbow technology for a rainbow people: e-business capacity development for the CARICOM: Report of a diagnostic mission*’ and the activities like the CARICOM initiated Antigua Conference (November 2001) on e-government are of immense value for the member states in making them aware of their weaknesses and strengths and also in shaping their policies, plans and strategies to participate in the ICT revolution on a sound footing. All CARICOM efforts are directed towards influencing, in a positive way, the development of ICT infrastructure as well as services in the region.

Organisation of Eastern Caribbean States (OECS):

Within its mandate of bringing about functional cooperation among the member states, OECS is providing support for the development of an efficient and viable ICT sector in the Eastern Caribbean States. Recently, it established the Eastern Caribbean Telecommunications Authority (ECTEL) that has accelerated the process of liberalising the telecom sector in the member states.

It has also helped in preparing a model telecommunications legislation, which was used by some of the member states to get their telecommunications reform bills through. Among other OECS programmes, besides the ECTEL's distance training programme in telecommunications regulations, the one worth mentioning is the loans programme — loans are being taken from the World Bank and other funding agencies to procure telecom services and know-how in order to make the telecommunications a leading sector in these countries.

Economic Commission for Latin America and the Caribbean (ECLAC):

ECLAC's Sub-regional Headquarters for the Caribbean is engaged in research, training and the organisation of various developmental applications. It collects various types of data/facts, such as the macroeconomic and social indicators and details about projects and programmes for Small Island States, and makes them available to the concerned to look for gaps and help them in formulating corrective policies and plans. One of its pioneering contributions is the Caribbean Digital Library. Established in May 2000, it facilitates access to web-based documents on a variety of subjects and issues related to the Caribbean. There is a constant flow of documents coming to this library through a consortium of institutions called the Caribbean Digital Library Consortium. This way it brings the Caribbean countries closer to each other in the ICT domain.

Caribbean Development Bank (CDB):

Among its developmental programmes, the one for ICT includes financial and technical support for the development of ICT in the borrowing member countries, research and training workshops for the development of human resources and formulation of regional strategies and support to the Caribbean Information Action Group.

2.3 Policy status, legal provision and the e-environment: country profiles

Regional efforts notwithstanding, the Caribbean countries display diverse levels of readiness with regard to ICT related policy and legal provision. Focussed efforts to improve e-readiness are a recent phenomenon and there are significant difficulties, which need to be overcome to make ICT an effective tool for education and development. In order to have a clear understanding of the present scenario, presented below are country profiles built around the following fifteen criteria derived from Questionnaire 1 (see Appendix 1).

Policy status

- 1 ICT thrust as a national priority
- 2 Existence of an ICT/e-commerce plan in the country
- 3 Existence of any specific government authority leading the ICT initiative
- 4 Existence of initiatives in relation to e-government and digitisation of private sector
- 5 Existence of partnership between the public and the private sectors for e-readiness

Legal provision

- 6 Existence of a legal framework for e-commerce/transactions
- 7 Existence of any legal support for storage/distribution of networked information
- 8 Existence of a legal/regulatory framework for cyber crimes etc.

- 9 Existence of laws and their application for the protection of intellectual property rights in the ICT domain
- 10 Existence of ICT related laws and their application for consumer/privacy protection

E-environment

- 11 Existence of ICT industry within the country
- 12 Availability of capital for helping e-readiness and applications
- 13 Existence of e-enabled financial systems to support e-transactions
- 14 Climate for foreign participation and investment in e-enterprise in the country
- 15 Level of ICT utilisation/application in the industry and public services

Antigua & Barbuda

Policy status: Though the government is working for it, e-readiness has not been emphasised as a national priority. There is a body namely Information Technology Centre mandated to lead initiatives in ICT and a national ICT/e-commerce plan was put up for approval last year. Though some of the government departments have put up their web-sites and computerization is an ongoing activity, progress regarding the initiatives in e-government is slow and trade related infrastructure and procedures too have yet to be digitised. There is very little, if any, partnership and consultation between the local industry and the government for the promotion of e-readiness.

Legal provision: There is no legal framework available for e-commerce and the related transactions, nor any legal protection available for processing and archiving networked information. Legal and regulatory framework to look into issues like cyber crime, digital signatures, etc. has been planned but not put in place yet. Again, there are no measures in place for consumer or privacy protection in relation to Internet transactions, nor those for protecting intellectual property rights either. The existing laws need updating in order to cover e-domains, but the progress in the process is slow.

E-environment: The status of ICT industry is quite low and there is no e-enabled financial system available to support electronic transactions yet. Locally, there is no capital available for e-business, but foreign investment and participation is encouraged. Overall, generally the use of ICT applications has yet to become visible in the industry as well as the public sector.

Barbados

Policy status: Barbados aims at becoming ‘the world’s smallest developed economy’ through tourism and the financial sector. E-readiness is not a national priority, but is considered important for reforming the public sector, fighting crime, improving the education sector, etc. Policies and strategies for a national ICT/e-commerce plan are being formulated (a Green Paper on Telecommunications Sector Policy was issued in December 2000), within which the information services sub-sector with emphasis on human resource development and reforms in telecommunications, including those for liberalising telecommunications industry, is receiving special attention. While the body leading ICT initiatives is the Ministry of Commerce, there are several initiatives for promoting e-government. For example, Barbados Government Information Service, the Central Emergency Relief Organisation, the Ministry of Agriculture, the Ministry of Labour, Sports and Public Sector Reform and EduTech 2000 (a seven year programme for the

development of education in the long-term) are all linked under GOBINET, and Customs, Inland Revenue, National Insurance, etc. are linked using a SmartStream package. There is no direct partnership or consultation with the industry for the promotion of e-readiness, but the objective is being achieved by means of studies and surveys.

Legal provision: The Electronic Transactions Act, 2001, provides legal support for e-commerce. In addition, the Computer Misuse Bill is planned to provide legal protection for processing and archiving of networked information. It provides for a Certification Authority, which has yet to be established, to address issues pertaining to authorization of digital signatures, etc. Capacity to deal with cyber crimes has yet to be built, while work is underway for consumer and privacy protection to address the country specific transactions, but trans-boarder transactions have yet to come on board. For this, a study called '*Electronic Commerce and the Barbados International Business Sector*' was commissioned to recommend solutions for issues that arise in electronic transactions including those of intellectual property rights.

E-environment: ICT industry is growing as the country is now working for indigenous Internet-based electronic business transactions and is aiming to be a leading location for offshore ICT business. As yet, there is no e-enabled financial system in place, but the banks are preparing for it. Like most Caribbean countries, no venture capital is available for e-business, but a wholesome policy for the participation of and investment by foreign investors in ICT/e-business is in place and fully operational. Operationally, the use of ICT is quite visible, but mostly limited to Internet, while integrated ICT applications have yet to come on board.

Belize

Policy status: Though the importance of ICT is recognized, e-readiness is not a national priority. The government has yet to put a body in place to lead ICT initiatives in the country and so there are no plans or strategies for ICT/e-commerce available at present. Various government departments, however, are working on plans for on-line services, but they need better coordination. Similarly, though now and then meetings are arranged between the government and the industry with a view to promoting e-readiness, the two are not engaged in any planned consultation or partnership currently.

Legal provision: At present there is no legal support for e-transactions, nor is there any legal provision for the protection of processing and archiving networked information. Again, there is no legal or regulatory framework to take care of cyber crimes, activities like authorization of digital signatures, etc. Though the laws pertaining to patents and trademarks and consumer protection are in place, they need to be updated to cover Internet related activities, especially e-transactions and intellectual property rights.

E-environment: There are a few companies that offer ICT services in Belize. Though the country does not provide any e-enabled financial system to support e-transactions, credit cards are used for transactions over the web. As for the availability of venture capital for e-business, it is non-existent. In fact, interest rates being very high, capital is scarce for any venture whatsoever. Foreign participation and investment in ICT business and elsewhere is therefore encouraged by means of a supportive policy and promising business environment, but traditional bureaucracy is a bottleneck. Application of ICT in public affairs, local industry and elsewhere is at a very low key.

British Virgin Islands

Policy status: E-readiness is not a national priority, though its importance is recognised. There is no national ICT/e-commerce plan or strategy in place yet, but work is on to develop one. Interestingly, the government has assigned the task of ICT initiatives to an educational institution namely H. Lavity Stoutt Community College. Computerization within the government departments and ICT applications for public dealings have yet to come on board, but planning for the purpose has started. The private sector has yet to start any initiatives in this direction, as there is no consultation or participation between them and the government on the issues pertaining to e-readiness.

Legal provision: The Electronic Transactions Act 2001 provides a legal framework for e-commerce, but it does not address the issue of e-learning. There is no legal provision for the protection of storage and distribution of networked information or materials. Though there is no legal provision to address issues like cyber crimes or authorization of digital signatures, there are provisions within the Criminal Code 1997 and the Electronic Transactions Act 2001, which deal with these issues adequately. There are no measures in place for privacy and consumer protection, nor any for the protection of intellectual property rights in the domain of ICT.

E-environment: There is no local ICT industry in British Virgin Islands, nor is there any kind of support capital available to promote it. Again, there is no e-enabled financial system available at present, nor has any special effort been made for attracting foreign participation or investment in the promotion of e-readiness in the country. The use of ICT applications is appreciably visible in every walk of life.

Cayman Islands

Policy status: E-readiness is a national priority in Cayman Islands. There is no ICT plan in existence but one is being prepared currently. There is an ICT Authority in place with the mandate for initiating and implementing ICT activities in the country. The level of progress with computerization within the government departments and its applications for dealings with the public are said to be fair to good. In the private sector, 25% of the infrastructure and procedures are said to be digitised. Consultations between the government and the private sector are well on way and are being managed by E-Business Advisory Board.

Legal provision: The legal framework to support e-commerce or e-learning is provided by Electronic Transactions Law 2000. The same law together with Computer Misuse Law 2000 provides legal protection for the storage and distribution of networked material and the two together provide ample provision to look into issues like cyber crimes etc. There is no legal framework in place for the protection of intellectual property rights, nor any specifically for consumer and privacy protection. The latter, however, is partly covered by Information and Communications Technology Law 2002 and partly by Electronic Transactions Law 2000.

E-environment: Local ICT industry is in existence in Cayman Islands and venture capital also is available to support innovations and new applications of ICT. Also, e-enabled transactions, such

as those using a payment gateway, local on-line banking and local debit/credit cards are commonplace in the country. There is no stated policy for the participation of and investment by foreign investors in ICT and the related activities, but there are no restrictions on such ventures. Use of ICT as well as its applications is on a fairly sound footing in the country.

Dominica

Policy status: For Dominica e-readiness is important but not a national priority. At present there is no national ICT/e-commerce plan or strategy in place, but efforts are on to fill this gap. The Ministry of Communication, supported by an inter-ministerial coordinating committee, is charged with the task of initiating ICT activities. Various government departments are being computerised and corresponding LANs also are being established, but appropriate coordination is a concern. Another weakness in the process lies in the absence of any effort in digitising the trade infrastructure and the related procedures. At present there is no partnership between the government and the industry for the promotion of e-readiness, but consultations are improving.

Legal provision: At present there is no legal provision available to support e-commerce, nor is there any legal protection available for processing and storage of networked information. Similarly, there is no legal framework to look into issues like cyber crime etc. Though laws pertaining to patents and trademarks exist, they need to be updated to accommodate ICT issues and the same way consumer and privacy protection provision too has to be updated to address ICT related matters.

E-environment: There are only a few ICT companies in operation and this situation remains static as there is no e-enabled financial system in place to support e-transactions. Other difficulties in this case are first a lack of venture capital for e-business and secondly the very high interest rates. Though the policy provision for supporting foreign participation and investment in ICT business does not exist, such participation/investment is encouraged through a climate made favourable by efficient bureaucracy. Overall, the use of ICT applications is not widespread yet.

Grenada

Policy status: Grenada is aiming at a 'knowledge-based economy with equity', thus e-readiness is a national priority. To achieve this objective, a national ICT/e-commerce plan has already been drafted and Prime Minister's Office is leading the ICT initiative at present, subsequently to be taken over by the Information and Communication Technology Council. There are steps afoot leading to the establishment of a WAN to be used for e-government and an on-line Labour Market Information System too is in the offing. Police Department has been computerised and work is on in many other departments including the Department of Immigration. In addition, extensive consultations are on with the industry for the promotion of e-readiness in the country.

Legal provision: There is no legal support available for e-commerce yet, nor is there any legal protection available for processing and storage of networked information. The national policy document, however, is to provide for such support and protection. There is no legal framework available to look into issues like cyber crime etc., nor are there any measures in place for consumer and privacy protection in relation to ICT matters. Though laws pertaining to

intellectual property rights are in place, they need to be updated to accommodate ICT related issues.

E-environment: At present the ICT industry is small, but it is growing steadily. Among some minor facilities, merchant accounts for credit card transactions are in place. Immediate boost in the industry is not possible, as venture/support capital for e-business is not available and the interest rates are prohibitively high. To overcome this situation, a policy, which includes ICT sector as well, with monetary incentives for attracting foreign participation and investment, has been put in place and the trade environment generally is said to be good. ICT applications are fairly common in the industry and are making their way into other activities of the society.

Guyana

Policy status: The 2000 national budget did not show e-readiness as a national priority. A year later, however, a policy shift brought ICT to the forefront through a policy paper, which aims at converting Guyana into ‘a knowledge based society’. There is no separate ICT/e-commerce plan available yet, but it forms a part of the draft policy and is being discussed. Also, there is a recommendation for the establishment of an Information Technology Authority to lead ICT initiative in the country. In line with this shift, there is a strong move for e-government, and there are many web-sites being maintained by the government currently. Though there is no organised consultation with the industry for the promotion of e-readiness, a committee for ICT is in place with membership from the private sector, and the needed consultations are in progress.

Legal provision: There is no legal framework available for e-transaction yet, nor any legal protection for processing and storage of networked information. Similarly, there is no legal framework available to look into issues like cyber crime etc. Recently, however, the government has moved to put the required legal and regulatory framework in place with the help of funding from Inter-American Development Bank. As for consumer and privacy protection and also that of intellectual property rights, there are laws in place but they have yet to be extended to Internet and ICT operations.

E-environment: There are some ICT companies in operation but their influence is not what it could be. For trade, there is no e-enabled financial system available in the country, nor is the use of credit cards a common practice. Under the new policy-thrusts, foreign investment and participation is encouraged through incentives to overcome the lack of venture/support capital for e-business. The use of ICT applications has no visibility, mainly because most traditional businesses do not use ICT in their operations and the education sector has just begun to use them.

Jamaica

Policy status: E-readiness is a national priority in Jamaica and a national ICT plan is in existence. In addition another one for e-commerce is being finalized. The Ministry of Industry, Commerce and Technology is leading the ICT initiative, while arrangements are being made to have a devoted implementing agency put in place. There are multiple activities in progress to promote e-government, such as computerization of departments like Inland Revenue, Accounts, etc. The activities, however, need better coordination. Likewise, efforts are on for consultations

and building partnerships between the government and the industry to promote e-readiness, but they are not properly regulated.

Legal provision: At present there is no legal support for e-transactions, nor is there any legal protection available for processing and storage of networked information, but initiatives to put appropriate legal framework for these areas of operation in place are in the offing. Again, issues like cyber crime etc. have yet to be brought under a proper and specific legal provision. The existing provision for consumer and privacy protection has yet to be extended to Internet operations, while the legal framework for the protection of intellectual property rights is quite advanced, mainly because of the pressures from the entertainment industry.

E-environment: ICT industry is fairly developed. There is no e-enabled financial system to support e-transactions, but work is on for creating one. Like most of the Caribbean countries, venture/support capital for e-business is not available readily. This problem is being addressed by a well conceived policy, including incentives, for the participation of and investment by foreign investors in the ICT business. The use of ICT in the industry as well as other walks of life is quite appreciable and its growth is steady.

Montserrat

Policy status: Though there is no national ICT/e-commerce plan or strategy in place at present, e-readiness is a national priority. Initiatives in relation to ICT are led by the Development Unit and the Government Information Systems, but no activities have yet been initiated in relation to e-government and the involvement of society in it. Equally slow is the process of consultations and partnering with the private sector to promote and improve e-readiness. Being a British territory, Montserrat has not joined the OECS initiative on telecom reforms, nor the other regional efforts to improve her e-readiness.

Legal provision: There is no legal provision available to support e-commerce, nor any legal protection for processing and storing networked information. Similarly, there is nothing in place to look into issues pertaining to cyber crime etc. Consumer and privacy protection legislation as well as that for trademarks and copyright protection are in place, but neither of them covers the ICT issues. They need to be updated.

E-environment: There is no ICT industry in the country. E-enabled financial systems to support e-transactions in the country also do not exist, nor is venture/support capital available to promote e-business. To overcome these difficulties, participation of and investment by foreign investors is encouraged in various ways. The level of ICT use in general is low and it is not appreciably visible in the private sector either.

St. Kitts & Nevis

Policy status: E-readiness for e-business has been declared a priority, though there is no ICT/e-commerce plan or strategy in place yet, nor any official agency established to lead ICT initiatives in the country. Except for some steps taken for computerisation and establishment of LANs in some departments of the government, there is not much to see by way of e-government. Further,

there is no consultation, nor any partnership between the government and the industry for the promotion of e-readiness.

Legal provision: There is no legal support for e-commerce or e-transactions, nor is there any legal protection available for processing and storage of networked information. Similarly, there is no legal or regulatory framework to look into the issues like cyber crime etc., nor are there any measures in place for consumer and privacy protection in relation to Internet operations. As for the protection of intellectual property rights, relevant legislation is in place, but it needs updating to cover ICT activities.

E-environment: There are some ICT services, such as Internet gaming, available in St. Kitts & Nevis, but the operations are limited. At present there is no e-enabled financial system in place to support e-transactions and the other difficulty pertains to the lack of venture capital for e-business, though small and short term loans are available for small operations. This problem is sought to be overcome by a favourable business climate created by a policy provision for the participation of and investment by foreign investors in the ICT enterprise. Most businesses use Internet for e-mail and have access to web-sites, and there is a good spread of Internet users in the county.

St. Lucia

Policy status: Though e-readiness is not a national priority as yet, a draft for a national ICT/e-commerce plan and strategy has been considered, as the government intends to transform the country ‘into an island of creativity’ by means of ICT applications. It seems that there is no official body in place to lead initiatives in relation to ICT activities, but the Government Information Service has been strengthened and charged with the responsibility of maintaining the web-site of the government. Also, a government WAN is in position, and its use is increasing progressively to facilitate wider public participation in national development. In St. Lucia it is possible to visit the public sector virtually and download government documents to learn about the activities of the government. To increase the levels of consultation and participation between the government and the private sector, an Office of Private Sector Relations has been created within the Office of the Prime Minister.

Legal provision: There is no legal support available for e-commerce transactions yet, but a draft Criminal Code is being discussed and it addresses the issues like computer fraud, misuse of data and its fraudulent distribution. On a broader scale, however, there is no legal framework available to look into issues like cyber crime etc. Regulations for consumer and privacy protection in relation to ICT applications and innovations are being planned. As for the intellectual property rights, though trademarks and patents regulations are in position, they need updating.

E-environment: There are a few good ICT companies in operation and the government has introduced FINMAN, a Standardised Integrated Government Financial Information System, which is bound to promote e-transactions throughout the country. The difficulty on account of the non-availability of venture/support capital is being addressed through a business climate supported by a policy provision that encourages the participation of and investment by foreign investors in the country. For this a new television station has been established to provide, among

other things, public education regarding the public sector and its programmes for the promotion of investments. ICT, in terms of Internet and web-sites, is being used extensively in most of the established enterprises and the public sector.

St. Vincent & the Grenadines

Policy status: E-readiness is a priority as per the official statements and steps are afoot for telecommunications reform. A national ICT/e-commerce policy has been put in place through a Telecommunications Bill last year. It is based on the model legislation for the OECS states prepared by the Eastern Caribbean Telecommunications Authority. The Ministry of Telecommunications, Science, Technology and Industry has been established to lead the ICT initiatives in the country. Significant steps have been taken to facilitate e-government. A WAN is in place linking Ministries of Finance, Health, and Works, but the field of operations is limited. Also, initiatives have been launched for consultation and participation between the government and the industry for the promotion of e-readiness.

Legal provision: A National Telecommunications Regulatory Commission was established last year to provide a legal framework for e-transactions, the required legal provision for the protection of processing and storage of networked data and a legal framework to look into issues pertaining to cyber crimes etc. As for consumer and privacy protection in the case of ICT domain and the issues of intellectual property rights, work is on to update the existing laws to cover all the ICT matters adequately.

E-environment: ICT industry in the country has just begun to emerge, but there is no e-enabled financial system available to support e-transactions yet. Like most other Caribbean countries, venture/support capital for e-business is not available in St. Vincent & the Grenadines, but a very attractive investment environment introduced recently has not only boosted consultations between the government and the industry, but also the participation of and investment by foreign investors in the ICT enterprise. The use of ICT, though limited to Internet and PC applications, is increasing progressively in the public as well as the private sector.

Suriname

Policy status: E-readiness is not a national priority in Suriname, nor is there a national ICT/e-commerce plan or strategy in existence currently. The country has yet to set up a body/agency to lead ICT initiatives, as e-government is not on the national agenda. Though ICT is in use in the government departments, its use is limited as the public cannot access services electronically. There is no consultation, nor any significant participation between the government and the industry for the promotion of e-readiness in the country.

Legal provision: There is no legal framework for e-commerce in the country, nor any for the protection of processing and storage of networked information. Similarly, there is no legal provision to look into issues like cyber crime etc. For consumer and privacy protection, in relation to ICT matters, there are no measures in place currently. The position is no different in the case of intellectual property rights, as the country continues to depend on old laws for trademarks and copyrights. All these need to be updated.

E-environment: The country has no local ITC industry, nor any e-enabled financial system available to support e-transactions. The situation is aggravated by the absence of venture/support capital for e-business. Though loans are available from banks, the interest rates are very high. To overcome this difficulty, participation of and investments by foreign investors is encouraged through a new investment policy, which includes the concerns of ICT as well. Over 60% of the industry is computerised and ICT applications in the public sector are said to be visible prominently.

Trinidad & Tobago

Policy status: E-readiness is a national priority in Trinidad & Tobago. Also, a national ICT/e-commerce plan as well as the related strategy has been formulated and is being implemented. To expedite all-round implementation, an independent directorate for e-commerce has been established and is functional. Also, there is a separate directorate for e-government and many plans to link government departments and to promote public participation are in place and being implemented. To promote e-readiness in the country, there is extensive consultation between the government and the industry.

Legal provision: A legal framework is being made available for e-transactions and to protect the processing and storage of networked data. The Computer Misuse Act 2000, and Electronic Transfer of Funds Crime Act 2000, are in operation. Electronic Transactions Bill, Electronic Evidence Bill and also a regulatory authority are being considered currently. These instruments are expected to take care of issues like cyber crime etc. Though the existing consumer and privacy protection provision has yet to be extended to Internet operations, the provision for the protection of intellectual property rights is updated and in operation.

E-environment: In Trinidad & Tobago, ICT industry is strong and growing steadily. There is one e-enabled financial operation run by Nova Scotia Bank, which provides a payment gateway for electronic transactions over the Internet. To promote innovations and experimentation a venture capital corporation is in place, but there is not much of a success to be seen here. To further e-readiness in the country, participation of and investment by foreign investors is encouraged extensively and aggressively. The use of ICT in the public sector is not as extensive as it is in the industry, where its use is markedly visible.

Country/Regional profile

To summarise the above details, we assign two points if a criterion (see subsection 2.3) is satisfied fully, one point if the process to satisfy it has been started and no points if the criterion is not satisfied at all. Following the order of criteria, as listed in subsection 2.3, and abstracting the details provided above, the following table presents an analytical view of the present Caribbean situation. It should be noted that the analysis is based on preliminary statistics.

Table 2.1: Policy Status , legal provision and e-environment – the county/regional profile

| Criteria Country | Policy status | | | | | Legal provision | | | | | E-environment | | | | | Totals | Averages |
|------------------------------|---------------|------------|-------------|-------------|-------------|-----------------|------------|------------|------------|------------|---------------|------------|------------|-------------|-------------|------------|------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | |
| Antigua & Barbuda | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 0.47 |
| Barbados | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 0 | 1 | 2 | 1 | 19 | 1.27 |
| Belize | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 6 | 0.40 |
| British Virgin IIs | 0 | 1 | 2 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 10 | 0.67 |
| Cayman Islands | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 1 | 2 | 2 | 2 | 1 | 2 | 25 | 1.67 |
| Dominica | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 8 | 0.53 |
| Grenada | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 15 | 1.00 |
| Guyana | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 10 | 0.67 |
| Jamaica | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 1 | 2 | 18 | 1.20 |
| Montserrat | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 0.33 |
| St. Kitts & Nevis | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 8 | 0.53 |
| St Lucia | 0 | 2 | 1 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 2 | 2 | 2 | 17 | 1.13 |
| St. Vincent & the Grenadines | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 17 | 1.13 |
| Suriname | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 5 | 0.33 |
| Trinidad & Tobago | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 0 | 2 | 2 | 1 | 2 | 2 | 25 | 1.67 |
| Totals | 18 | 15 | 22 | 18 | 14 | 10 | 9 | 9 | 6 | 4 | 17 | 4 | 9 | 22 | 18 | 195 | |
| <i>Averages</i> | <i>1.20</i> | <i>1.0</i> | <i>1.47</i> | <i>1.20</i> | <i>.93</i> | <i>.67</i> | <i>.60</i> | <i>.60</i> | <i>.40</i> | <i>.27</i> | <i>1.13</i> | <i>.27</i> | <i>.60</i> | <i>1.47</i> | <i>1.20</i> | | |
| <i>Sec. Ave.</i> | | | | | 1.16 | | | | | .50 | | | | | .93 | | .86 |

The last column presents the average score of each country against the best possible score of 2. It is clear that in terms of legal preparedness, Cayman Islands and Trinidad & Tobago are the best e-ready Caribbean countries with 1.67 average points each. The second best is Barbados and so on. And the disparity too is obvious as the lowest score is as low as 0.33 in the case of Montserrat and Suriname. Under criteria nos. 3 and 14, we have the best average score of 1.47, indicating a) that generally the Caribbean governments have recognised the *need for establishing specific units to initiate steps for promoting ICT/e-readiness* and positive action has been, or is being taken in this direction, and b) that *promotion of the participation of and investments by foreign bodies in a country's ICT enterprise/e-business* too has attracted their attention.

Along the rows, *the policy component* (with an average of 1.16 points) is more advanced than *the e-environment component* (with an average score of .93 points), which in turn is better than *the legal provision* (with an average score of .50 points). None of the three components, however, reaches the best score of 2. Also, we may look for each country's situation under each of the components — for example, Trinidad & Tobago has done as best she could in policy formulation, while most countries are far behind in making the required legal provision so badly required for improving their e-readiness. It is instructive to note that of the 225 cells in the above table, 94 are occupied by '0', 67 by '1' and only 64 by '2'. The overall average of 0.86 points (this may be seen as the regional average) against the best possible score of 2, indicates that we have a long way to go. Around only five years ago, one may guess, all these averages would have been no more than or just close to '0'. Obviously, changes are taking place, but much more

has to be put in place before the full potential of ICT can be harnessed for developmental purposes, whether in the field of commerce or education.

2.4 Concluding remarks

The foregoing details and the analysis thereof indicate that over the past couple of years, national as well as regional efforts for the creation of a satisfactory and sustainable e-environment in the Caribbean have brought significant rewards and the process of development is dynamic. Summing up the details from Tables 1.2 and 2.1, given below is Table 2.2, which outlines the overall e-readiness profile of the Anglophone Caribbean.

Table 2.2: E-readiness: Caribbean Profile

| Points awarded | Infra-structure 120 (Max.score) | Human resources 75(Max.score) | Policy status 75(Max.score) | Legal provision 75(Max.score) | E-environment 75 (Max.score) | Total 420(Max.score) |
|----------------------------|---|---|---------------------------------------|---|--|--------------------------------|
| 0 (for no activity) | 36 30.0% | 23 30.7% | 18 24.0% | 46 61.3% | 30 40.0% | 153 36.4% |
| 1 (for activity started) | 38 31.7 | 31 41.3% | 27 36.0% | 20 26.7% | 20 26.7% | 136 32.4% |
| Aggregate | 74 61.7% | 54 72.0% | 45 60.0% | 66 88.0% | 50 66.7% | 289 68.8% |
| 2 (for activity completed) | 46 38.3% | 21 28.0% | 30 40.0% | 09 12.0% | 25 33.3% | 131 31.2% |

Collating the scores against each criterion in the five areas surveyed, we notice that only 31.2% of the task has been completed so far, 36.4% has yet to be taken up, while 32.4% is in the process of completion.

It is clear that much more needs to be done. Present thrusts are motivated by issues of economy, governance and e-commerce, but their outcome is equally relevant to virtual education. Development in the field, on whatever grounds, is therefore welcome.

We will take a closer look at the higher education scenario in Section III of this work, as we conclude this section with the following remarks.

- a) The Caribbean has a long way to go to claim to have a reasonably satisfactory and sustainable e-environment, but the rate of progress is quite encouraging.
- b) The most disturbing reality, from the viewpoint of regional collaboration in educational enterprise, is that the range of disparity (in relation to e-readiness) among the countries is very wide.
- c) Any proposals and strategies for virtual education in the region should be based on a thoughtful/careful consideration of the existing fragile e-environment.

SECTION III — CARIBBEAN HIGHER VIRTUAL EDUCATION TODAY

3.1 Introduction

The focus of this section is on the Caribbean institutions of higher education and their progress with virtual education operations. The institutions identified for the study (see Preamble) are:

- 1 The University of the West Indies. (1948--)
- 2 The University of Guyana, Turkeyen, Guyana. (1963--)
- 3 The Anton de Kom Universiteit van Suriname, Paramaribo, Suriname. (1968/1983--)
- 4 The University of Technology, Jamaica. (1995--)
- 5 The Northern Caribbean University, Mandeville, Manchester, Jamaica. (1999--)
- 6 The University of Belize, Belize City/Belmopan, Belize. (2000--)

So far the term *virtual education* has been used with a loose meaning, but now it is necessary to define it clearly in order to avoid any ambiguities that may otherwise emerge in the following details and discussion. We are familiar with the term *distance education* (DE), which implies a physical separation between the teacher/institution and the taught/learner, while the mediation is effected through specially designed course materials, tutoring, some media support and assessment of learner achievement. *Open education*, on the other hand, points to a philosophy operated in terms of educational policies that allow open entry to higher education, recognition to a variety of experiential learning, easy transfer of credits, flexibility in scheduling and the choice of entry/exit points. More recently, *on-line learning* and *e-learning* have emerged to connote the application of computer support to educational transactions over Web/Internet. The term *virtual education* emerged alongside the last two terms, but has assumed a broader meaning including ICT enhanced distance education, ICT enabled implementation of open education policies and ICT supported distributed transactions in terms of both the sources of content and the venues of learning. And this meaning is still evolving (see subsection 4.3). Today, however, virtual education mainly denotes ICT applications in the delivery of what is already available.

3.2 Caribbean higher education institutions and *Distance Education*

The University of the West Indies (UWI)

The distance education provision at the University of the West Indies has its genesis in the *challenge scheme*, which was introduced in 1977. Students who registered under this scheme were allowed to sit for Level I degree examinations of the Faculty of Social Sciences without attending any classes or receiving any pedagogic support from the university. In 1981, the Caribbean Regional Communication Study was funded by USAID to study the possibilities of using two-way audio teleconferencing at UWI to extend its reach to non-campus countries. The study resulted in a three year grant from USAID in 1982 to equip and manage five teleconference rooms at five sites (Barbados, Dominica, Jamaica, St. Lucia and Trinidad & Tobago) to offer courses in social sciences, teacher training, health and agriculture, and the operation came to be called the University of the West Indies Distance Teaching Experiment (UWIDITE). Besides USAID, it was supported by funding from the European Development Fund, John Hopkins Programme for International Education in Reproductive Health and the

Governments of Dominica and St. Lucia. This is the first time that ICT was used at UWI to extend its reach within the Caribbean. The typical course package comprised (a) audio teleconferences in place of classroom lectures, (b) face-to-face tutorials provided locally, (c) some printed course materials and (d) occasional visits of the faculty members to the teleconference centres. As the project came to its end in 1985, UWI assumed the responsibility for continuing the activities under the same acronym, replacing the word 'experiment' by 'enterprise'. With some aid coming from the Dutch Government in 1985/6, the print component of the package was enhanced. As the developments continued, by 1992/3 the number of sites connected to the UWIDITE network had risen to fourteen including eleven non-campus countries.

In 1992, a study¹ commissioned by the Commonwealth of Learning, Vancouver, provided a justification and also guidelines for UWI to incorporate distance education operations as an integral component within its thrust for expansion and enhanced services. As a follow up, the university decided to become a dual mode institution. This decision had other moorings as well-- in its Development Plan 1990-2000, the university had set itself the task of delivering full programmes at different levels through both the distance as well as the face-to-face mode, partly because the non-campus countries had been demanding greater responsiveness to their needs from the university. A Board for Distance Education was set up in 1993 and funds allocated for the period 1993-96. The responsibilities of the Board namely the planning and delivery of programmes and the activities of UWIDITE could not reach the desired levels of coordination resulting in yet another development — the establishment of the Board for Non-Campus Countries and Distance Education in 1996. While it replaced the earlier Board, UWIDITE was replaced by UWIDEC, the University of the West Indies Distance Education Centre, mandated to work directly under the new Board.

UWIDEC, now in existence for the last six years, has a mission statement of its own:

The distance Education Centre of UWI is dedicated to becoming a centre of excellence in itself and a catalyst for excellence in distance education throughout the University, to developing and delivering quality programmes by distance, and in so doing, meeting the higher education learning needs of an ever widening population of students, in order to contribute to the University's mission of unlocking the potential of the peoples of the Region.²

Its physical plant has since been improved in terms of space, replacement of the earlier analogue network by a digital one in 2000, addition of computer labs, additional specialist curriculum staffing and Internet facilities all through the system. Today, it runs a regional audio-graphic digitised network involving 29 university centres, 46 teleconference rooms and 28 computer labs in sixteen countries. Each room is around 800 sq. ft. in area and equipped with 12 push-to-talk and one lock-on microphone for two-way interaction. Also, there are 20 inch monitors, a pair of wall-mounted high performance audio speakers, desktop PCs running graphics and data transfer applications as well as document cameras for image and data capture and transmission. All the teleconference rooms have equal audio-conferencing functionality, which allows full interaction among all the teleconference sites across the network. Each computer lab is typically a 10-workstation setting with interactivity across the entire network. Internet access is available not only to students, but also to the support and administrative staff at all the centres.

There have been changes in the course package too. The instructional design in use today is more rational and learner friendly. Each 3-credit course, a typical semester course, is divided into 100 study hours, of which around 80 hours have to be devoted to self-instructional printed course materials, nearly 12 hours to face-to-face local tutorials and about 8 hours to audio-conferences with the course coordinator. In addition to these three course components, each course is accompanied by relevant readings, a course guide and midterm assignments and/or tests. These components together with the preparation for examinations are to be covered in students' private time. Further, depending on individual courses, their specific requirements, such as case studies in Management or practicum in Education courses, are attended to by allowing adjustments in time allocations, additional tutorials and/or audio-conferences. The delivery of all the distance education courses is fit into the same semester calendar as is followed for the face-to-face courses and most examinations are common to the two streams.

Details regarding the UWI programmes managed through the Distance Education Centre (UWIDEC) are presented below in Table 3.1. Each *programme* is made up of various *courses*, each one of which comprises a package as detailed above. A typical certificate programme comprises 8 courses and an undergraduate programme 30 courses.

Table 3.1: UWIDEC supported Programmes

| Programmes on offer currently | | Programmes in the pipeline | |
|--------------------------------------|--|-----------------------------------|---|
| 1 | Certificate in Education (Literacy) | 1 | Certificate in Gender Studies and Development |
| 2 | Certificate in Education (Mathematics) | 2 | B. Ed. (Teaching of Geography) |
| 3 | Certificate in Education (Social Sciences) | 3 | B. Ed. (Teaching of History) |
| 4 | Certificate in Education (Educational Management and Supervision) | 4 | B. Ed. (Teaching of English Literature and Linguistics) |
| 5 | Certificate in Adult Education | 5 | B. Ed. (Teaching of Computer Science) |
| 6 | Certificate in Public Administration | 6 | B. Ed. (Teaching of Chemistry) |
| 7 | Certificate in Business Administration | 7 | B. Ed. (Teaching of Mathematics) |
| 8 | B.Sc. Social Sciences (Level I) | 8 | B. Ed. (Teaching of Modern Language—Spanish) |
| 9 | B.Sc. Management Studies | 9 | B. Ed. (Teaching of Modern Language—French) |
| 10 | B.Sc. Agribusiness Management | 10 | B. Ed. (Teaching of Biology) |
| 11 | B.Ed. in Educational Administration | 11 | B. Ed. (Teaching of Physics) |
| 12 | B.A. in French Studies (Level II) | | |
| 13 | Advanced Diploma in Construction Management | | |
| 14 | M.Sc. in Family Medicine | | |
| 15 | M.Sc. in Counselling | | |
| 16 | M.Sc. in Agriculture & Rural Development | | |
| 17 | University Certificates in Tropical Agriculture | | |

(Note: The Certificate in Education Programmes, which have been on offer for years, were put on hold last year, as they are being revised/redesigned.)

University of Guyana (UG)³

The University of Guyana was established in 1963 and shifted to its present site at Turkeyen, about 5 miles from Georgetown, in 1969. It is the only higher education institution in Guyana and has seven faculties —Agriculture, Arts, Education, Health Sciences, Natural Sciences, Social Sciences and Technology. Functioning through two campuses in the two populous regions of the country, one of which includes the capital town as well, it caters to nearly 5000 students, of

whom more than 60% come from the capital town area. There is thus a vast area of the country, which is not served directly by the university. The difficulties inherent in the vastness of a country are compounded in the case of Guyana by its extremely difficult terrain.

To extend its support to adult learners, the then Department of Extramural Studies was upgraded to function as the Institute of Adult and Continuing Education (IACE) in 1976. And to extend its outreach, the institute introduced distance education activities in 1992 with a bridge course namely Pre-University English, the first of its kind by the University of Guyana. In 1996, in keeping with the mandate to turn the university into a dual mode institution, IACE was renamed Institute of Distance and Continuing Education (IDCE). At present it has more than 12 full-time centres/sub-centres across the length and breadth of the country. Its function is to offer bridge courses to students in remote areas to enable them to access university courses subsequently. A related function is to pave way for the university to become a fully dual mode institution in the not so distant future. Currently, IDCE offers six sub-university courses and one undergraduate programme, which are delivered using a course package comprising self-instructional course materials in print, face-to-face local tutorials, and audio teleconferencing. This package design helps IDCE reach about 9 of the country's 10 regions. Besides the bridge courses, IDCE is moving on to offer certificate level courses in collaboration with the various Faculties including the Faculty of Education. More recently, distance education is considered a viable option to cater to the needs of on-campus students on such courses as are overcrowded.

Outside the university, the Ministry of Education provides initial sub-university level teacher training through its institutes using the distance mode of delivery.

At present the Institute of Distance and Continuing Education (UG) offers the following sub-university *courses* using a curriculum design as described above.

Pre-University English,
Pre-university Mathematics,
Supervisory Management,
Basic Nutrition for Changing Society,
Globalisation and Management and
a programme namely Two-year Diploma in Occupational Health and Safety.

The Anton de Kom Universiteit van Suriname (AKUS)⁴

The University of Suriname was established in 1968 and restructured and renamed the Anton de Kom Universiteit van Suriname in 1983. It has three faculties — Medical Sciences, Social Sciences and Technological Sciences. In addition, it has a few centres and institutes, mainly devoted to research in their respective fields.

To extend its outreach, the university established the *Suriname Educational Network* recently. As is implied by the name, the network is expected to serve the educational sector as a whole, even outside the domain of the university. The network comprises a campus-wide local area network, supported by a fibre optic ring, linked with local schools and Internet through a wireless network. This network, however, is not used for distance modality yet.

In terms of distance education activities, the university has minor participation in two courses (i) Agriculture Economics given by the Faculty of Agriculture & Natural Sciences, the University of the West Indies and (ii) Business Economics given by Hogeschool in Holland. Apart from these two instances, it has no formal distance education programme(s) on offer currently.

University of Technology, Jamaica (UTech)⁵

The University of Technology was created in 1995 by upgrading the then College of Arts, Science and Technology (CAST). Specialising in skills-based technical courses, its offers range from certificate to degree level programmes in a variety of technical areas. Being the only technical university in the Anglophone Caribbean, it considers the whole of this area as its legitimate jurisdiction. In view of its mandate, it must work to satisfy the increasing demand for technical education among working adults, address the need for diversification of courses, revenue generation and cost effectiveness of university operations. Besides, it must support the programmes, which it has franchised to various community colleges in Jamaica or are given at various workplaces and university's outreach centres in Jamaica (and now contemplating to go outside Jamaica). For these reasons, the use of distance education methodologies became a natural choice for the university to extend its reach in and beyond Jamaica. Accordingly, they are building appropriate policies and practices to put distance education on a firm footing in the university.

The genesis of distance education operations at UTech, however, is associated with the idea of an Open Learning Centre, first mooted in the CAST's *Third Development Plan 1991-2001* and reinforced in the *Strategic Plans of 1995-98* and *1998-2002*. In 1998 the Academic Board approved the establishment of an Open and Distance Learning Centre, and the infrastructure required for systematic open/distance studies. A computer network to link the campus units was established in the same year in line with the *Information System Plan: 1998-2002*. The latest planning document, the *Strategic Plan: 2000-2004*, projects the establishment of the Centre for Open and Distance Learning at some time in the future. Apart from these policy thrusts, in operational terms, the first experiences in self-learning were provided/gained through the Self Access Centre established by the Communications Division (Department of Liberal Arts) in 1997 to help campus based students overcome their difficulties in the use of standard English. Using print and computer based remedial materials, the students were offered to work on their difficulties in their own time and at their own pace, using tutorial support whenever needed. The Centre was turned into a computer based learning facility in 2001.

At present open distance education activities are being managed by the Open and Distance Learning Systems Management Committee. It operates through three sub-committees, one each for the programmes, the Internet and the Community Colleges. The first of these oversees the planning and development of courses to be given by distance modality, the second looks after on-line learning activities and the related materials preparation and the third one is to build links with the Community Colleges that deliver the UTech courses.

These arrangements notwithstanding, UTech has no programmes which are delivered outside the university using the distance modality as is done by UWI or UG.

Northern Caribbean University (NCU)⁶

The West Indies College, a Seventh Day Adventist institution established in 1919, was upgraded to a university in 1999 and renamed the Northern Caribbean University. It was in the late 1950s that it offered its first Bachelor's programme—a degree in Theology. At present, with its head quarters in Mandeville, Jamaica, it offers a number of vocational, pre-professional and professional programmes at certificate, diploma, degree, masters and doctoral levels to about 3000 students through five departments—Religion; Behavioural Sciences; Biology, Chemistry & Medical Technology; Education and Business & Information Science. The Information Technology Centre, one of the various centres at the university, is mandated to develop IT products itself and support faculties, staff, students and the community in introducing and employing needs related IT products and services so as to improve their functionality and productivity. As of now the university does not have any distance education courses on offer.

The University of Belize (UB)⁷

The youngest of all the Caribbean universities, the University of Belize was established in August 2000 by merging the then independently existing University College of Belize, Belize Technical College, Bliss School of Nursing, Belize Teachers' College and Belize College of Agriculture. It started its operations through six faculties — Agriculture & Natural Resources, Arts & Science, Business, Education, Engineering & Technology and Nursing, Health Sciences & Social Work. In addition, it has established a number of centres and institutes for specialist studies, such as Marine Study, Regional Languages, etc.

At present the university does not offer any distance education programmes, but is seeking help to develop this capacity to extend its reach beyond its campus sites.

3.3 Caribbean higher education institutions and *Virtual Education*

Present experiences and new projects in virtual education

The six universities, profiled in subsection 3.2, were requested to submit details about their present activities and future plans *in relation to their virtual education programmes*. The framework of their submissions was guided by Questionnaire 2 (see appendix 2) comprising the following seven questions:

1. Names of the courses/programmes on offer?
2. Starting year of the courses/programmes?
3. Field of study for each course/programme?
4. Levels of the courses/programmes on offer?
5. Delivery method used?
6. Instructional platform being used?
7. Face-to-face or DE-specific regulations being used?

The overall picture derived from the data received is abstracted in the following table.

Table 3.2: On-line courses/virtual education—present status

| | Name of the University | Present Operations | Future Plans |
|---|--|--|--|
| 1 | The University of the West Indies | On-line courses on offer | To extend the offers and streamline the management |
| 2 | The University of Guyana, Guyana | No on-line courses on offer | To offer on-line courses, subject to the availability of funds |
| 3 | The Anton de Kom Universiteit van Suriname, Suriname | On-line staff development courses on offer | No new plans at present |
| 4 | The University of Technology, Jamaica | On-line courses on offer for campus purposes | To extend the offers and support to off-campus sites |
| 5 | The Northern Caribbean University, Jamaica | No on-line courses on offer | No plans for such courses at present |
| 6 | The University of Belize, Belize | No on-line courses on offer | No plans for such courses at present |

The above details limit our further discussion to institutions listed at nos. 1, 2, 3 and 4.

The University of the West Indies (UWI)

In addition to the UWIDEC digital audio network described in subsection 3.2, the University of the West Indies has a Computer Centre each at all the three campus sites at Cave Hill/Barbados, Mona/Jamaica and St. Augustine/Trinidad. These centres look after the student administration systems, financial management systems, connectivity of the faculties and administration units and computerised library systems of the respective campuses and also provide help to faculties in putting their programmes/courses on-line. Governed by the regulations meant for face-to-face students, there are two programmes currently available on-line as outlined below.

Table 3.3: UWI Programmes — virtual modality

| | Name of the Programme | Year | Field of study | Level | Method | Platform |
|---|----------------------------------|-------------|-----------------------|----------------|---------------|-----------------|
| 1 | M. Ed. | 1999 | Education | Graduate | Mixed | Virtual U |
| 2 | Diploma in Hospitality & Tourism | 2001 | Tourism | Sub-university | Virtual | WebCT |

These full programmes apart, there are course materials pertaining to a number of courses available on-line. At present these materials function as supplements to what is done in the classroom and/or the lab at campus sites as well as some Tertiary Level Institutes in the region. Table 3.4 presents the relevant details.

In addition to the courses listed in Table 3.4, there are portions (i.e. some parts of course materials, assignments, past question papers, details about entrance and/or course requirements, etc.) of various other courses also on the Web, but they are for campus based students and/or for general promotional purposes.

Table 3.4: UWI courses available on the Web⁸

| | Name of the course | Field of study | Level | Method | Platform | Year |
|----|---|-----------------------|----------|--------|---------------------------------|---|
| 1 | Computer Programming I | Computer Science | Degree | Mixed | FrontPage | Beginning in 1997, these courses have been mounted at various stages between 1997 and 2002. |
| 2 | Computer Programming II | " | " | " | " | |
| 3 | Intro. to Web Technologies | " | " | " | " | |
| 4 | Information Structures | " | " | " | " | |
| 5 | Systems Programming | " | " | " | " | |
| 6 | Object-oriented Programming | " | " | " | " | |
| 7 | Computer Communications and Networks | " | " | " | " | |
| 8 | Artificial Intelligence | " | " | " | " | |
| 9 | Programming Languages | " | " | " | " | |
| 10 | Web-based Applications | " | " | " | " | |
| 11 | Optics, Thermodynamics and Modern Physics | Physics & Electronics | " | " | " | |
| 12 | Electricity and Magnetism | " | " | " | " | |
| 13 | Digital Electronics | " | " | " | " | |
| 14 | Neural Networks | " | " | " | " | |
| 15 | Microprocessors I | " | " | " | " | |
| 16 | Discrete Device Electronics | " | " | " | " | |
| 17 | Microprocessors II | " | " | " | " | |
| 18 | Microcomputers & Control | " | " | " | " | |
| 19 | Digital Communications | " | " | " | " | |
| 20 | Research Project | " | " | " | " | |
| 21 | Biodiversity I—The Plant Kingdom | Biological Sciences | " | " | Netscape Composer and FrontPage | 1997 |
| 22 | Crop Ecology | " | " | " | FrontPage + Adobe Photoshop | 1997 |
| 23 | Biodiversity I (2000) | " | " | " | " | 1998 |
| 24 | Community Ecology | " | " | " | " | 2000 |
| 25 | Introductory Genetics | " | " | " | " | 1999 |
| 26 | Genetics I | " | " | " | " | 1998 |
| 27 | Fisheries Biology | " | Graduate | " | WebCT | 2001 |

While various university units may continue putting up courses on the Web (as illustrated above), the future plans of UWIDEC include upgradation of technology and remodelling of instructional design and course package for on-line course offerings. To this end there are two projects under implementation currently and a third one is being negotiated. The first of these, supported by OAS/IACD funding, provides for equipment and training for incorporating Just-In-Time technology enhancement into UWIDEC courseware. In effect it will allow the existing course package to be enriched by the addition of CDs simulating tutorials, presenting lectures, etc. The second, supported by UNESCO-Japanese Funds in Trust, involves equipment and training for duplicating materials and building collaboration among the five participating Caribbean universities (Guyana, Quisqueya, Suriname, Utech and UWI). And the last one pertains to VSAT technology with the following objectives in view:

- Duplex audio conferencing among all the UWI sites
- Duplex video conferencing among the three UWI campus sites
- Video broadcast from any of the UWI campus sites to the remaining UWI sites
- IP data traffic among all the UWI sites
- Ability to participate in video conferences with external institutions
- Dedicated bandwidth access to the Internet

While work is on to materialize these developments, UWIDEC operated courses, over 80 in number, are being put on-line currently. The stipulation for the academic year 2002-03 is outlined below:

Table 3.5: UWIDEC operated courses on-line — 2002-03 stipulation

| | Name of the course | Year | Field of study | Level | Method | Platform |
|---|--------------------------------|-------------|-----------------------|--------------|---------------|-----------------|
| 1 | English for Academic Purposes | 2002 | Languages | Degree | Mixed | WebCT |
| 2 | Introduction to Marketing | 2002 | Management Studies | Degree | " | WebCT |
| 3 | Caribbean Business Environment | 2002 | " " | Degree | " | WebCT |
| 4 | Introduction to Sociology | 2002 | Social Sciences | Degree | " | WebCT |
| 5 | Industrial Sociology I | 2002 | " " | Degree | " | WebCT |

Table3.6: UWI Programmes – being developed currently

| | Name of the programme | Year | Field of study | Level | Method | Platform |
|---|--|-------------|-----------------------|------------------|---------------|-----------------|
| 1 | Arts and Cultural Administration | 2003/04 | Arts and Culture | Masters | | N/A |
| 2 | Telecom Policy & Regulations | " | Telecommunications | Masters | | N/A |
| 3 | Marketing and Agribusiness | " | Agriculture | Masters | | WebCT |
| 4 | Concepts and Tools for Natural Resource Management | " | Environmental Studies | Graduate Diploma | | WebCT |

The University of Guyana (UG)⁹

For initiating virtual education operations, the university finds itself handicapped on account of both the infrastructure and human resources. In order to move on to ICT supported distance education, it needs the following support:

- Hardware and software for web-based course delivery.
- Web-based course materials for delivery in such remote areas where the required infrastructure is available.
- Multimedia facilities for (a) delivering lectures/course content at various sites simultaneously and (b) reducing pressure on the existing overcrowded classes.
- Training in the development of web-based courseware.
- Training in the management and maintenance of web-sites and web-based courses.

Plans for the future are detailed in Table 3.7, but they are subject to the availability of funds for which requests have already been put up.

Table 3.7: Future plans of IDCE (UG)

| | Name of the Programme | Year | Field of Study | Level | Method | Platform |
|---|---|-------------|-----------------------|------------------------|---------------|-------------------|
| 1 | Training Programmes for Community Leaders | 2003 | NA | Continuing Education | Mixed | WebCT* Or..... |
| 2 | Bridging Programmes | " | NA | " | " | " |
| 3 | University Level Programmes | " | NA | Cert., Dip. and Degree | " | " |

[* WebCT is a thought of choice. It could be some other platform]

The Anton de Kom Universiteit van Suriname (AKUS)¹⁰

At present the university has various materials, manuals and short courses available on-line. These materials, however, belong to a class of their own, as they are designed to prepare the university staff, and also the campus based students, for digital operations envisaged to come on board subsequently. A sample set is presented below to provide a feel of what they are like.

Special Edition using Perl for Web Programming
 Sams Teach Yourself C++ in 21 Days
 Red Hat Linux Installation Guide
 Linux Network Administrators' Guide
 Linux Programmers' Guide

Because of the prevailing high costs of connectivity, the university does not plan to offer any certificate, diploma or degree level courses on-line, nor does it think of extending its operations beyond its campus and associates at this stage. Instead it plans (i) to put more materials of the kind illustrated above on their servers only for their Suriname Educational Network, (ii) to improve the functionality of the material already available on-line (i.e. pedagogic support for designers, improved levels of interactivity and larger and improved pools of exercises, etc.) and (iii) to extend its reach to the schools in Suriname.

Once the costs of connectivity are manageable, the university staff (academic as well as non-academic) are reasonably trained, it should be possible for AKUS to offer programmes virtually, in the not so distant future.

The University of Technology, Jamaica (UTech)

UTech's conceptual framework for on-line education is being implemented through the UTech Virtual Learning (UVL) project which brings together the Faculties, the Multimedia Centre and the Open Distance Learning Centre to develop courses for on-line delivery. To establish a suitable technology base for this purpose, UTech has installed a broadband Campus Area Network (CAN) backbone based on the Asynchronous Transfer Mode (ATM) technology. It provides fibre optic links with 12 LANs on the campus. The network is protected by a firewall and the specific operational areas by a similar dual protection. The whole of integrated campus network is connected to Internet through two WANs, that of the University of the West Indies and that of Cable & Wireless, Jamaica. Campus information can be accessed through an intranet platform from campus-based work/production sites, and from off-campus sites through dial-up access using the T-1 connection to the campus network.

Currently, the services provided are e-mail, access to Web, dial-up access, on-line access to the library, access to teachers, file transfer, departmental/administrative/personnel data processing and transfer, student admissions and registration information processing and storage, chat and multimedia. And the services planned to be added are on-line admission and registration, high speed access to multimedia content, video conferencing, course sharing, access to foreign universities and research centres and distance education on a larger scale.

To achieve these objectives, UTech has standardised IP and Ethernet for the LANs and ATM for the backbone.

As for course development and delivery, UTech's earliest experiences are of stand alone courses (see Table 3.8), which they mounted to train their own staff, academic as well as non-academic, for the ICT supported model of education under their UVL project. One case, however, was that of a Masters' level part programme.

Table 3.8: UTech's earliest on-line courses meant mainly for their own staff

| | Name of Programme | Year | Field of Study | Level | Method | Platform | Regulations |
|---|------------------------------|-------------|-----------------------|--------------|---------------|-----------------|--------------------|
| 1 | Computer Awareness | 1998 | Computer Science | Cont. Edn. | Virtual | HTML + ASP | VE-specific |
| 2 | Streaming Media | " | " " | " | " | " | " |
| 3 | Philosophies in Architecture | 2000 | Architecture | Master's | " | " | " |

Future plans as articulated in 1998/99, projected development of five courses, at least one course each from five faculties, for delivery in September 2000 and the stipulation was to have 30 courses ready for on-line delivery in September 2001. As indicated by the responses to questionnaire 2, however, these projections do not seem to have materialized as only three courses are said to be available on-line for campus based students.

3.4 Quality evaluation and accreditation in virtual education¹¹

Apart from the lack of requisite infrastructure, expensive connectivity, culture based resistance to the use of new technologies and lack of training to use them, a significant factor that has retarded the development of distance as well as virtual education in the developing countries is the notion of standards related to such education. In the developing world, new modes of education are received with suspicion. A word on quality concerns in the context of distance/virtual education is therefore in place here.

Traditionally, in the context of universities established by royal charters or acts passed by parliaments or various types of legislatures, the issues pertaining to accreditation and quality have not attracted any significant scholarly or public debate. It was taken for granted that an institution like a university provided quality education. The criteria that pointed to standards were/are the qualifications and training of the teaching staff, adequate infrastructure including libraries and laboratories, entrance qualifications of students, duration of studies, appropriate syllabuses and assessment schemes and an appropriate curricular design. Distance education institutions (especially the single mode universities) took on these criteria (during the 1970s) and added those of the process of materials preparation (team approach), provision for local tutorials, various levels of counselling together with formative assignments and student support to assess the quality of distance courses. As mega-universities emerged one after the other during the 1970s and the 1980s, the quality concerns in distance education became more focussed and quality came to be assessed in terms of philosophical, systemic and pedagogical/andragogical criteria and programme evaluation within the system using these criteria became a common practice.

In the 1980s and the 1990s, financial stringency in the educational sector and the new ground breaking innovations in communication technologies coupled with the notions of education not only as a birthright in welfare states but also as a major tool for economic growth gave an unprecedented boost to distance education and the notion of virtual education came to the forefront. With these developments, programme evaluation of the type mentioned above got steadily replaced by processes, like those in the industry, of total quality assurance/management.

The process begins with setting the aims and objectives of a programme of study. With the general agreement on aims and objectives, the quality of a programme is assessed in terms of the extent to which those aims and objectives are achieved using the curriculum, pedagogic/andragogic transactions, learning resources, support services, learners' performance and the existence of a quality assurance system as the basic factors contributing to the achievement of those aims and objectives. An aggregate of achievements in relation to all the programmes mounted by a department grade the departmental quality levels and the departmental aggregates put together grade the quality levels of the institution as a whole. At the last, i.e., the institutional level, external evaluation also is conducted to complete the process for purposes of accreditation. This brief outline of what obtains today in distance and virtual education operations points to the fact that the issue at hand is *not whether distance/virtual education is quality and/or standard education*, instead it is *'how to maintain quality/standards in distance/virtual education'*.

In the Caribbean higher education, the issue of quality has not been a matter of concern as the institutions involved are universities and so standards are taken for granted. It is only recently that universities have been attracted to the modern notion of total quality management and relevant provision for quality framework is being put in place. For example, the University of the West Indies created such a provision only in the academic year 2001-2002, and it is expected to take care of DE/VE programmes as well. These provisions, however, need to be broad enough to accommodate the specifics of DE/VE, as the factors, in terms of processes and products, to be evaluated in DE/VE differ from those evaluated in the face-to-face transactions.

As the understanding of these differences improves, relevant processes and mechanisms of quality assessment, maintenance of standards and accreditation norms will come into being to overhaul the present situation in the region, where there is no specific accreditation and/or quality assurance regime available for distance/virtual education.

3.5 Concluding remarks

Of the six universities considered in this section, two (Belize and the North Caribbean) do not have any distance education programmes/courses in their scheme of operations at present. The former, probably because it has just started its operations as a national university and would need some time to feel its way through, while the latter does not seem to have given any serious thought to the desirability of using distance or virtual education methodologies for their purposes.

The University of Guyana offers a few sub-university courses and one that has a semblance of a university level programme, but the methodology used is print based. They have established the

IDCE, but seemingly funding is a bottleneck in the way of introducing any virtual operations. On the other hand, the university in Suriname is preparing its campus in terms of the infrastructure required and the training of its staff and students for ICT supported virtual education. The university, however, has an explicit policy of limiting its operations to the campus, and at best extend them to its associates outside the campus. In this case the cost of connectivity is the bottleneck. These costs are said to be too high to venture a fully fledged virtual education operation. Consequently, they have no distance or virtual education programmes on offer currently, nor do they plan any in the near future.

The University of Technology, Jamaica, is the only university in the Caribbean, which is fully geared for virtual education operations. Infrastructure, planned training of the staff, supportive university legislation and the positive attitude of the management as well as the staff are the factors that provide it a firm base for its growth as a provider of virtual education. At present, however, they have just three courses on-line for campus based students only. They have yet to deliver outside the campus, which they should be able to do in due course of time.

The University of the West Indies has two full programmes and also quite a number of university course materials available on-line, but the latter are supplemental in character and are born of individual academic's/department's interest and initiative. Such initiatives will continue and new courses are expected to be offered on-line in coming years. Through its Distance Education Centre (UWIDEC), the university has a relatively larger distance education operation in place – over 2,600 registrations from 16 Anglophone Caribbean countries. UWIDEC is on its way to introducing virtual operations in conjunction with its print based operations during the academic year 2002-03 and plans to improve upon such offerings progressively in phases.

The overall situation is that only 33% of the surveyed higher education institutions have pro-virtual education initiatives in place, and at the operational level only the beginnings have begun.

SECTION IV—VIRTUAL EDUCATION: CURRENT INTERNATIONAL SCENARIO

4.1 Introduction

In order to properly contextualize virtual education in the Caribbean, it is necessary that the current international scenario is outlined to present a background against which the proposals for action in the Caribbean may be developed and assessed. The single most significant point that needs to be made is that the last word on virtual education is yet to be conceived and that it is *an enterprise in flux*. Beginning with 1969, the phenomenon called distance education is just over three decades old. Of these, the first twenty-five years marked a major shift in the design and delivery of higher education. Distance education courses with didactic support built into printed materials together with media support of various types became an accepted norm and mega-universities were born. They have proved their worth and are flourishing wherever they are — Africa, Asia and Europe. A glimpse of this development is as follows:

Mega-universities (1997 enrolments)¹

| | | |
|---------------------------------------|--------------|---------|
| Anadolu University | Turkey | 578,000 |
| CCRTVU | China | 530,000 |
| Universitas Terbuka | Indonesia | 353,000 |
| IGNOU | India | 242,000 |
| Sukhothai Thammathirat OU | Thailand | 217,000 |
| Korean National OU | Korea | 211,000 |
| National Centre for Distance Learning | France | 185,000 |
| UKOU | England | 157,000 |
| UNISA | South Africa | 130,000 |
| Payame Noor University | Iran | 117,000 |
| National Centre for Distance Learning | Spain | 110,000 |

But the story of virtual education, which has its genesis in distance education, began only around seven years ago in 1995. The last seven years have seen a revolution in communication technologies (*and the transaction called education relies heavily on communication*) that is transforming distance education into virtual education, slowly but certainly. Recent innovations in ICT have provided an extraordinary boost to the philosophy of ‘equality, fraternity and liberty’ and the thrust for globalisation, free trade and open markets is pushing us into what is being called the *information and knowledge era/society*². A statistical glimpse of this era is as follows:

Some facts/figures and projections

1989 — WWW was not there as a public service

1990 — 48 million in Higher Education³

1995 — *Web based courses appeared for the first time*

1999 — *196 million+ people used Internet*⁴

2000 — *e-learning market was \$2.3 billion; in 2003 it is going to be \$18 billion*⁵

2000 — *Internet use at home: Canada 48%, USA 44%, Europe 26%*⁶

2001 — *English was used by 48% of the Internet users, Chinese accounted for just 7%*⁷

2001 — *Growing annually by 33%, DE enrolments were expected to reach 2.23 million*⁸

2001 — *Only 292.8 million or about 5% of world’s population was on-line*⁹

2004 — 640.2 million are expected to be on-line¹⁰

2004 — 600+ million will be in the age group relevant to Higher Education

How are these developments impacting the educational scenario the world over and what is the international reaction?

4.2 Virtual education—beginning 1995

The answer to the above question has multiple manifestations, though in essence it is a single phenomenon—application of ICT to educational transactions. Among the various significant

features of this phenomenon is the speed with which it is transforming the educational ethos as well as practice. Some of the more prominent applications are sampled below.

Help for the distant

- The African Virtual University (AVU),¹¹ established in 1997, was initiated by the Association for the Development of Education in Africa with funding from the World Bank and other international funding agencies. It was envisaged to use ICT to provide quality education in Sub-Saharan Africa and become a degree granting institution using the best multimedia materials available in the world. It established 31 learning centres in 17 countries and also a digital library with about 1000 full-text journals and a catalogue of subject related Web links. Through 2001 it had delivered courses in English and French to about 18,000 students and seminar participants. The subjects taught have been Export Development, Business Administration, Foreign Languages and C++.

Collaboration: university and private/public sector

- Deakin University in Australia in partnership with Ford Motor Company offers technical courses for the employees of the company in the region.¹²
- UK Government is putting in 400 million pounds through the Higher Education Funding Council for England for the creation of an e-university. While 50% of the funding will come from public money, UK universities will also hold shares. Only those who need summer and/or tutorial support will be allowed human contact, which will be charged separately.¹³

Collaboration: culturally diverse universities

- University of British Columbia and Monterrey Institute of Technology, Mexico, started a collaborative project in 1996 to offer a graduate programme in Educational Technology using distributed learning methodology. They have since strengthened this collaboration to include other areas.¹⁴

National solution for a problem of human resources

- In order to overcome the shortage of engineers in France, the Government has decided to create an Internet University in Marseilles. It will offer courses and programmes in Engineering, the material for which will come from the existing institutions in France.¹⁵

Further extension of outreach

- The Indira Gandhi National Open University, India, launched its Virtual Campus Initiative in 2000 with courses in Information Technology. Currently, only 10% of its student population are registered with the virtual campus.¹⁶
- The UKOU established its virtual operation called Open University Worldwide (OUWO) in 1996. By 1999 they registered more than 20,000 students worldwide.¹⁷

Collaborative extension of library resources

- The Fathom programme, launched by the London School of Economics in 2000, is a global on-line library that links resources from the British Library, the Cambridge University Press, the London School of Economics, the Smithsonian and NY Public Library.¹⁸

Pan-world training programmes

- The primary goal of ITU Global Telecommunications University is to provide training to the telecommunications community in developing countries. Its on-line platform is very simple so as to ensure maximum usability. It is a model designed to provide low-cost on-line education.¹⁹

Awards for competencies, experiences and expertise

- Western Governors University (WGU) depends on courses from the participating universities. It offers qualifications based entirely on competencies and pays special attention to those "whose experience and expertise has...outpaced their education".²⁰
- The Regents College in New York, renamed 'Excelsior College' in 2000, grades exams to accredit learning that adult students acquire on their own and banks credits as they work for degrees. It also accredits other types of non-formal learning. It does not support any faculty, but helps students with library support lent to it by John Hopkins University.²¹

Accredited private virtual university

- Mind Extension University was established in 1980 by Glenn Jones, a cable television operator, to facilitate student learning. In late 1990s, he combined Internet and cable television to transform this institution into an independent virtual university called Jones International University. It is the first electronic university in USA that attracted accreditation from North Central Association of Colleges and Schools in 1999.²²

Education as a commercial enterprise

- Hungry Minds is a US company. It has contracted Michigan State University, New York University, Penn State University, Rochester Institute of Technology and University of California (Berkeley as well as Los Angeles Campuses) to provide materials for a common Web portal.²³
- UNext is a U.S. company that has established an e-university known as Cardean. It uses teaching materials from five well-known universities of England and America (London School of Economics, Stanford University, Chicago University, Columbia University and Carnegie Mellon University) and the certification goes under the seal of Cardean, accredited by the state of Illinois in USA.²⁴
- The Apollo Group of companies owns the largest for-profit university, University of Phoenix, in USA. In August 2000 they moved on to their foreign market forging partnerships in China, India, Brazil and Mexico and currently they have students in 25 countries.²⁵
- Universitas 21, a network of 17 universities (Lund University, National University of Singapore, University of Birmingham, University of British Columbia, University of Melbourne, University of Michigan, University of Peking, etc.), is joining hands with Thomson Publishing to establish an e-university to use their e-learning initiatives and experience for commercial purposes.²⁶

Repackaging national resources for wider use

- In USA, the Arizona Board of Regents is planning to establish Arizona Regents University using the distance courses from the University of Arizona, Arizona State University and Northern Arizona University.²⁷
- The Electronic University Consortium of South Dakota uses materials from the six public universities of the state. It registers adult students only and has special arrangements for students with disabilities.²⁸

Corporate universities

- ‘Corporate Universities’, as they have come to be called, are in the main in-house training arrangements at multinationals. For smaller companies, various contractors have come to satisfy similar needs on smaller scales. In most of these cases use is made of video conferencing and Internet.²⁹

4.3 Emerging breakthrough(s): beginning around 2000

While the governments, educationists, funding agencies, businesses and the learner body in general are still grappling with the impact that ICT has already created on educational thought and practice during the last seven years (see subsection 4.2), new initiatives are emerging. *They have profound implications in the sense that for the first time technology and pedagogy/andragogy are merging in a way not known so far. I think that the notion of virtual university is now in the process of getting its firm foundations as the building blocks for the fifth generation³⁰ distance education are being designed, standardized and stored for a market that is eagerly waiting for it.*

Emerging technologies and Internet/Web:

Wireless technology: As indicated by cellular telephony, palm computers and some laptops, it is clear that wireless technology is making its way in a big way. Cheap chips are expected to eliminate the need for hard wires (a major bottleneck) for Internet connectivity.

Micro-power: The use of fuel cells, which convert hydrogen to electricity without any kind of combustion, on a commercial scale will help in generating small amounts of power locally at places of our choice as and when needed.³¹ It is an innovation that is going to solve the problem of erratic power supply at difficult places and is thus a great technical boon for Internet utility.

Speech recognition software: Voice XML helps in coding voice services as easily as HTML writes Web pages. As a consequence, voice substitutes for mouse/keyboard operations and spoken commands for clicks and double clicks are in the making. Besides, speech recognition technology has become reliable and affordable. All this is going to make interaction with computers far easier than it is today and illiterate or less educated people also can use computers like the educated do today.

Machine translation: Such translations are known to be clumsy, but generally they speed up unaided translation by 50% now, and it is expected that they will push it up by 80% soon. This opens up a new way for transforming and translating courses from one language into another.

Emerging pedagogic/andragogic applications

Learning objects and development & management systems: Learning objects³² are discrete items of learning like learning objectives or outcomes, text, images, audio, video, tests, etc. that present a small portion of a topic/theme pertaining to a field of study. Together they are called *educational assets* and are stored in a common database, wherefrom they are accessible and can be put together in different ways for different purposes. In order that they may be reused and re-purposed, they need to have the following features:

‘Granularity’ is the degree of precision with which they can be described and tagged in terms of metadata (as descriptors) such as learning outcomes, various competencies, test items, etc.

‘Scalability’ is the feature that allows them to be customised for individuals or groups with differing needs.

‘Modularity’ allows them to be aggregated into different modules and then deconstructed for reuse or re-purposing.

Modules are built with the help of a *development and management system*, which is required to have interoperability, i.e., the ability to retrieve and transfer educational assets from within the various systems to new delivery environments. This is possible only if the system can operate across differing hardware platforms and software systems. This in turn is made possible at one level by observing platform-independent standards and at another by following IMS Global Learning Consortium’s metadata specifications that present just one standard for institutions, publishers and technology vendors. Use of platform-independent standards by the provider enables learners and/or customers to acquire learning materials using any system whatsoever, i.e., materials could be received through open source delivery platforms like Linux or proprietary systems like WebCT. And the standard metadata specifications not only facilitate interoperability, but also make customisation of learning products and learning pathways possible for varying needs, differing levels of instruction and diverse situations.

There are indications that WWW Consortium’s extensible mark-up language (XML) standard will be the basis for the development of learning object content using IMS standards, as they allow openness and interoperability. Further, it is realized that student registration, management and business systems also must observe these emerging metadata standards.

On-line formative self-tests: On-line Self-Test Centre (OSTC)³³ is a web application that uses a question bank (comprising multiple-choice questions of differing difficulty levels with varying marks depending on their levels of difficulty) to work with and help students through their courses. A test starts with a question of an average difficulty level. Each question that follows is randomly selected from the bank and presented only after the student has answered the previous question. The selection of questions for presentation is done by an adaptive algorithm, which dynamically adjusts the flow of questions with the required levels of difficulty based on the response given to the previous question. The current question number and the total number of questions tackled in the test are displayed with every question. Each question is displayed for a period of its current response time, within which the response must be submitted. Once a response is submitted, the learner is not allowed to revisit the question for any corrections or modifications. Once the test is over, the total weighted score, the number of right and wrong

responses, the number of questions attempted against the total number of questions faced is displayed and then the required feedback is provided with respect to all the questions that were responded wrongly. The correct answers to the questions used in a test are never indicated, but the feedback provided helps the learner in identifying which portions he/she needs to study again or seek help for. Both the parameters, difficulty level and response time are dynamically updated after an item is used 10 times in different tests to reflect its current response history.

The advantages are that it provides for quality self-evaluation, it requires very small time for one to learn how to use these tests, it provides personalized motivation and prompt feedback, it is dependable in terms of security, it can be taken anywhere and anytime and it provides a very high level of flexibility. It functions as a good tutor.

Emerging convergence of universal missions, pedagogy/andragogy and technology

Open source software and low cost hardware: Open source software/computing provides for peer sharing of applications, fine tuned customisation for local applications, avoidance of licensing required for proprietary software and strong possibilities for interoperability through international ICT standardization. Mexico and Brazil have put in place plans to shift to open source software. Kenya is already using it.³⁴ Many more countries, including the advanced ones, are turning to it progressively.

This free software movement initiated, facilitated and sustained by Linux is being supported by corresponding developments in the hardware area. Simputer³⁵ from India is a low-cost alternative to desktops and hand-computers. It has a 32MB memory and applications like an Internet browser, a modem, e-mail and an MP3 player. It will be made available through a special general public license and will be marketed at a very low price.

Purchasing consortia for technology and distribution of knowledge/information: ICT purchasing consortia of the kind exemplified by the Alliance of Community Colleges (in Midwest USA) for Electronic Sharing (established in 1995)³⁶ make savings and gain access to greater resources and high-level maintenance and support through economies of scale. Another example is that of a global library co-operative OCLC³⁷ (Ohio College Library Centre founded in 1967 now called On-line Computer Library Centre), which has members in 76 countries. It uses World Cat, an on-line collective and shared library catalogue for all OCLC members, to manage and distribute its 40 million records in over 400 languages. Sharing allows its members strategic purchase of new stock and reduces individual cataloguing time, labour and space. It presents a view of what electronic libraries can be and can do.

Free sharing of knowledge products: Michigan State University, funded by the National Science Foundation (USA), is developing an on-line cross-institutional distributed platform for content creation, sharing and delivery. Its focus is on learning objects, which when put together can form different modules and units for different purposes and situations and thus provide economies of scale and customisation. Since the system runs on open source software, any member can post learning objects onto the site and have them improved through peer review. It also includes a learning management system, which helps in integrating the selected objects into modules and units for on-line delivery. Besides, it allows posting information about the courses, academic

activities needed, automated assessment, posting of grades etc. It offers cost savings through the use of non-proprietary objects, course authoring and management tools and provides for continual improvement of materials through open source interface. At this time its membership is free, in exchange a member has to be a research subject.³⁸

A different initiative is coming from MIT. They are putting their materials on-line and making it available freely on non-profit bases. These materials can be adapted for local use. It has already created an Open Courseware site.³⁹

Specimen projects incorporating the latest thinking and its applications:

Canada — POOL⁴⁰ (Portal for On-line Objects in Learning):

They are designing a prototype repository that can be used to store, manage and reuse learning objects. Another repository, which they are designing, is to store broadband multimedia materials. Also they are working on a metadata-tagging standard as a usable model for object identification.

India – SDK⁴¹ (Software Development Kit):

They are developing SDK that aims at building learning objects and also function as a development and management system. Their focus is on basic education and corporate training.

Netherlands – EML⁴² (Educational Modelling Language):

They are developing EML, which aims at increasing interoperability and reusability of educational materials.

USA -- ADLNet: SCORM⁴³ (Advanced Distributed Learning Initiative: Shareable Content Objects Reference Model):

They are creating instructional objects and developing an international community of developers.

USA -- IMS Global Learning Consortium⁴⁴

They are defining specifications for interoperability of applications and services in distributed learning and also working to support adoption of these specifications into products and services.

USA – MERLOT⁴⁵ (Multimedia Educational Resource for Learning and On-line Teaching):

They are building a content repository of digital learning materials, assignments, peer reviews, etc.

USA – SMETE⁴⁶ (Science, Mathematics, Engineering and Technology Education):

They are building a digital library and promoting the teaching of these disciplines.

4.4 Technologies in use today

Sub-section 4.2 presents what actually is happening in the area of educational dispensation today, while subsection 4.3 outlines what the latest developments in relation to the convergence of technology and pedagogy/andragogy are. It is in place here to take a look at the technologies

that are currently in use, their advantages, disadvantages and their utility potential for the future so as to focus on what may suit us most.

Video-conferencing

- This technology is being used mainly in USA and Australia to link multi-campus institutions and corporate training delivered at multiple sites. They use fibre-optic cables or the usual telephone network supported by compression technology to eliminate high bandwidth requirements. Today, video-conferencing is possible through Internet from one workstation to another, but multiple site conferences are not easy because of narrow bandwidth. With bandwidth limitations overcome, it is likely to be taken over by the Web.
- *Advantages:* It saves travel time and cost, accommodation and maintenance costs and duplication of labour by extending a classroom presentation to diverse sites at one and the same time. Teachers do not resist it as they use their normal methods of course delivery.
- *Difficulties:* The difficulties it poses are many: very high installation costs (equipment, modifications in the classroom to make it usable and transmission costs); time and place limitations as it provides for synchronous delivery; participation becomes difficult with large groups of students or participants; it becomes stressful for bad sound and poor image quality if the infrastructure in use is poor.
- *Utility potential:* At present, it may at best be seen as a good *additional* resource, useful for demonstrations and some special presentations.

Satellite broadcasting

- It has been used extensively for over 20 years now: India was one of the earliest users (INSAT Project); today IGNOU's Gyan Darshan functions as India's knowledge network that runs 24 hours a day using one-way video and two-way voice, fax and e-mail links. The Chinese Central Radio and Television University uses it as the main medium of course delivery. The Monterrey Institute of Technology in Mexico uses 4 channels each for 24 hours a day (one-way video and two-way e-mail).⁴⁷ In North America it is used for sparsely populated areas (e.g. the Knowledge Network of British Columbia); for presenting outstanding speakers (e.g. at the National Technological University⁴⁸ for Engineering and Management courses); for extensive reach of programmes from regular broadcasters through direct digital audio broadcasts to the developing countries in Asia and Africa (e.g. WorldSpace in Washington).⁴⁹ AVU receives lectures from selected faculty from all over the world; classes are given in studio classrooms and beamed to learning/receive centres in Africa while interaction is effected through phone or e-mail and on-site moderators.
- *Advantages:* It is good for mass education at low cost for large numbers spread over vast areas; allows common standard of content and delivery and works better for passive models of education.
- *Difficulties:* It demands high capital costs—start-up costs, costs of receive centres, high transmission costs and also high maintenance costs. It requires a high level of expertise, which is not only difficult to find but also adds to costs. It is not easy to make it interactive and is not flexible either.

- *Utility potential:* For general purposes, good printed materials provide a better alternative,⁵⁰ especially if the transponder you need belongs to a foreign country or agency.

Compact disks

- CD-ROMs and DVDs are being used, as in multimedia applications, for large data storage, transfer and transportation.
- *Advantages:* Large quantities of educational material can be digitally coded and catalogued on a single disk that can be used for many purposes/courses in different situations; downloading problems are solved by compression techniques using CDs or DVDs; simulations of complex operations/experiments are possible; virtual labs are possible without the need for space and equipment; expert systems help in decision making and also in making projections; their duplication and delivery costs are very low; it is possible to move easily between Web sites and disks which makes transactions convenient.
- *Difficulties:* Their cost of development is high. They require highly skilled media producers, course developers and imaginative subject experts and the users need high speed PCs to run them.
- *Utility potential:* It is reasonable to use them in place of costly activities or for large-scale operations. It is likely that they become less important when bandwidth increases, yet good quality disks are expected to be available like books in supermarkets and remain in use purposefully.

WWW is the main technology used for e-learning and it relies on Internet.

- *Advantages:* Through the use of browsers and simple language HTML, it provides universal standards and interoperability among different machines and operating systems. It allows us access materials through analogue as well as high-speed digital networks; combining text, graphics and multimedia easily; free and global access to a wide range of learning resources located on the Web; opportunities for international, cross-cultural and collaborative learning; any time, any place and any pace possibilities and synchronous as well as asynchronous interpersonal and inter-group interaction using chat and bulletin boards. In advanced countries, it is a low-cost option (you need a server and a course authoring tool while the network infrastructure and PCs are already there), as development of materials for Web sites and building of such sites does not cost much, Web time is cheap as pricing is done by the size of the pipe not by the time or the distance and narrow band costs are really very low. (This, however, does not apply to most of the developing countries.)
- *Difficulties:* One needs at least a computer, a telephone line and literacy skills to use it; in the case of narrow bandwidth only text and static graphics are accessible; it requires teaching methods to be changed otherwise resources get wasted; both teachers and learners need technical support and the technology itself needs maintenance and Web site building costs and is difficult for traditional passive models of education. At the institutional level too there are difficulties: It is new and demands critical revisiting of teaching practices; it needs investment in equipment and human resources, which most

public institutions are not in a position or willing to make; it needs adequate support and training for teachers which is neither available easily nor provided for under the existing budgeting systems and it requires financial and management systems of a different kind to sustain it in the long-term.

- *Utility potential:* Different promising possibilities are opening which suggest that WWW is the future technology for flexible learning operations. Of course, print will accompany it for a long time to come. Suitable levels of investment, adequate training and restructuring of the didactic transaction constitute the way forward.

4.5 Concluding remarks

The foregoing details point not only to the indisputable fact, that Internet/Web is the future technology for *delivering educational wares*, but also to the scenario in which this technology provides for *educational/training transactions*. The governments, telecom companies, cable TV operators, manufacturers and the businesses concerned, all are promoting this technology like no other has ever been before. We are on the threshold of a major transition and in for a significant revolution.

Public awareness with regard to the details presented in subsections 4.1 through 4.4 is very low; they are not common knowledge universally, let alone a clear perception of their impact. The models of virtual education as detailed in subsection 4.2 are as diverse as the motivations behind their emergence and also the goals they aim at. The single most common feature that they display is *the use of ICT for purposes of transportation or delivering the content of teaching or training to distant locations*. Subsection 4.3, on the other hand, outlines altogether a different feature of ICT — *its use as a tool of pedagogy/andragogy*. It is too early in the day for most of us to comprehend this development, much less be able to assess its impact. What appears to be certain is that as more and more of the developing communities, countries and regions become aware of *the potential of ICT as a means of delivering academic content* and can afford to harness/exploit it in that role, those working on its latter role currently will be using it not only for delivery, but also for purposes more fundamental — making education/training available for the asking and the creation of a truly learning society. This points to the emergence of what may be called ‘pedagogic/andragogic divide’.

The earlier we move on to avoid it, the better. For this a beginning has to be made somewhere, somehow and without any further delay.

SECTION V — TRENDS, PROBLEMS, PROPOSALS AND MODELS

5.1 Introduction

Though the focus of this study in *virtual education*, the Caribbean context necessitated our meandering through various stages of the evolution of DE in the countries concerned and we notice that virtual education is still on its threshold in the Caribbean. The way forward is to look into the current trends and the related problems to arrive at realistic proposals, which on

pragmatic considerations should lead to models of operation that must work and bring about the desired change and development.

5.2 Current trends

Caribbean scenario

The details in Sections I, II and III point to the following trends:

- 1 Governments are seriously trying to put the relevant ICT infrastructure in place, develop and procure the related human resources and also provide for multi level training facilities for a sustainable growth of the sector.
- 2 Equally vigorously, efforts are on for ICT policy formulation and an adequate legal provision and the needed legislation for appropriately regulating ICT applications and smooth e-transactions. Consequently, an e-environment is emerging slowly but steadily throughout the Caribbean and is gradually shaping for a steady growth.
- 3 Governments all over the Caribbean are trying to undo the strangle hold of the monopolies which provide them the telecommunication infrastructure and services currently. Generally, this is done by creating spaces for new providers to promote competition among them and thus bring down the cost of hardware as well as services, which is prohibitive at this stage.
- 4 Governments, the private sector and also the educational sector are looking for and working to procure increased and higher bandwidth to facilitate and boost electronic communication and transactions.
- 5 In spite of hesitations, *higher education institutions* are increasingly trying to introduce technology supported and/or enhanced methods of educational transactions, which may be classified into three types: a) cases which are driven by individuals by virtue of their own motivation and personal interest in the use and application of technology in their day to day transactions (e.g. UWI courses on the Web), b) cases that are supported by project funding provided by various funding agencies (e.g. UWI programmes on-line) and c) cases which operate under an overall institutional policy and thus enjoy pan-institutional support in each and every respect (e.g. UTech courses).
- 6 All the institutions see the need for increasing enrolments with an eye on both the local market and shares from regional and global markets. Generally it is appreciated and agreed that the only way to fulfil this need is to take recourse to distance education supported by technology, i.e. virtual education.
- 7 *Distance students* are increasingly looking for courses that free them from the time and space constraints imposed by synchronous and class-model contact and/or tutorials.

International scenario

Section IV points to the following trends:

- 1 Generally, at every developmental stage, applications of contemporary technology in education have followed those in military and business. Applications of ICT in the educational enterprise follow this rule squarely.

- 2 As new economies are believed to depend significantly on information and knowledge, education is changing its role and shaping progressively as a tool for building strong and reliable economies.
- 3 The major economic powers have successfully used education for creating stable supplies of electricity, diverse human resources and reliable communication networks that maintain and strengthen their economies. This has not only bolstered their belief that higher education has a strong correlation with economic growth but also prompted them to invest more and more in technology enhanced education.
- 4 Both the public and the private sector, driven by the felt need for participating in the new economy and thus take a share from the expanding market, need and look for technology ready human resource wherever possible.
- 5 Already, learning from the advantages being reaped by North America from their deregulated telecommunication systems, many other countries are in the process of deregulating their own markets.
- 6 Driven by the vision of the expanding education market, the corporate sector has come to believe that investment in e-learning has the potential of exponential returns. And new types of institution and collaboration are being established and forged wherever feasible.
- 7 Shrinking educational budgets, increasing student numbers, diverse educational needs and need for retraining the existing work as well as teaching force are the factors that push the institution of education itself more and more toward new ways of transaction that cannot but be technology dependent.
- 8 International bodies like International Telecommunication Union (ITU), various funding agencies and governments are investing in linking schools and setting up tele-centres and also in reforming the related legislation.
- 9 Bandwidth is increasing and governments are looking for it.
- 10 For varied and genuine reasons, the *new learner* also asks for technology mediated instruction and is building bottom-up pressures that cannot be resisted by convention/tradition for long.
- 11 Low cost technologies and open source software are emerging to further boost ICT applications in education for both delivery and pedagogy/andragogy.
- 12 Work on *learning objects* and the related *instructional management systems* is poised to add an altogether new dimension to the notion and practice of virtual education, which has become a reality now (see subsection 4.3).
- 13 *Virtual education* is expanding its meaning, as it goes beyond *delivery* to actual *transactions*.

Educational enterprise: the current trends

The overall reading is that the traditional context of education is changing and with it the learner as well as the institutional response to the new learner. The emerging new context is characterized by the following features:

- 1 International pressures are forcing societies toward globalisation, free trade and open markets.

- 2 In social terms education is now as much an intellectual excursion as a tool for improving the quality of life, meeting peer pressures, managing mobility, matching the changing employment market and surviving in one's struggle for existence.
- 3 In the financial domain, as wants have merged with needs, there is not enough for one to spend on education as education is not the one and only item of expenditure. Yet more and more are looking for it.
- 4 Technology for education is becoming more and more affordable, dependable, available and user-friendly, but most do not possess it.
- 5 Education is primarily seen as a means of improving economy, national as well as personal, and therefore must serve an immediate purpose, must return the value of money spent on it and is preferred as a packaged, ready to use *commodity*.

As the conventional learner is changing, a new learner is emerging on the scene:

- 1 The new learner may be a fresh-to-the-university school leaver or an adult with a job to manage and a family to look after. They are conditioned by their families, financial constraints and work related situations. Education is not their primary task necessarily.
- 2 They need and take courses/degrees later in the day after picking up a job or having a family.
- 3 They prefer taking courses/degrees in a relatively flexible timeframe and over a longer period of time at times and/or with breaks in between for one or the other genuine reason.
- 4 They look for education of a kind that satisfies their immediate needs, as they seek value for the money they spend on it.
- 5 They prefer end-to-end user-friendly service and so pose themselves more like *customers* than the familiar traditional obedient student.

And the corresponding institutional response to these developments is no less unprecedented (see subsection 4.2):

- 1 Sensing the competition in the educational enterprise, some institutions have switched over to *customer-centred* thinking, approach, planning and action.
- 2 Some go for collaborations (union is strength) and enter the market to exploit their collective goodwill/brand name. This is the genesis of educational consortia.
- 3 Some rethink/remodel known tools and services, add innovations to them as boosters and jump into the market with their old wine in new bottles.
- 4 Some go for various combinations of the above three responses as educational institutions are remodelling themselves as commercial enterprises, with the express view that such a change does not necessarily portend devaluation of education as understood traditionally.

This response is overwhelming and far-reaching in its impact. Though still in its infancy, its immense potential for bringing about an educational revolution is unquestionable. As distance education methodologies incorporate the campus-based ones and vice-versa, the convergence of systems and thus the emergence of technology enhanced mixed mode operations are in the offing.

5.3 Problems

Along with promises, ICT is accompanied by problems, which unless addressed squarely will not let us exploit its potential fully. Some of the major problem areas and the related problems are outlined below.

Technology

- 1 ICT infrastructure is uneven and the related expertise differs from country to country and among the institutions and various social groups within the same country. Consequently, greater the dependence on ICT, the greater is the inequity in access to education. The infrastructure related inputs, such as the establishment of tele-centres, etc. to overcome this difficulty, lack uniformity and universality. Consequently, a discriminatory (across socio-economic levels) educational provision is coming into existence.
- 2 Mere existence of and access to ICT infrastructure does not ensure its effective utilization for any social or economic enterprise including education, unless the relevant and enabling policy framework and legislation are in place. We have just started to address this problem.
- 3 Management of ICT needs experts on the one hand and on the other a financial system that provides for its sustained growth. We are handicapped on account of both these factors.
- 4 In most of the countries, the providers of ICT infrastructure and access are strong and well entrenched monopolies. Consequently, access to technology remains costly and limited/discriminatory. In certain cases the costs are prohibitive. Generally, the cost of electronic communication for longer durations of time, as required for educational purposes, is not easily affordable. As a contrast, these costs are going down significantly as well as rapidly in the advanced countries of North America.
- 5 Of the four major technologies available for educational purposes, namely satellite, CD-ROMs, audio/video conferencing and the Internet, which one or which combinations of them best suit an institution or a budget is a question that is answered variously depending on who the respondent is. For example, wherever courses are delivered on-line, the selection of the platform is either tied to the project funding or is a result of ones familiarity or facility with a particular platform. Thoughtful selection with a view to long term economies and purpose-specificity is not the order of the day. A lack of proper appreciation of the issues involved has caused many a project failures in recent years.

Institutions

- 1 Pressure for enhanced services from different constituents of the state and the society is increasing and the institution of education is hard pressed to make adjustments to meet these pressures. Conservatism in educational dispensation, academics' resistance to change, educational trade-unionism and an out-dated mindset make it difficult to effect and manage the much needed change. Caribbean institutions tend to be conservative in their outlook, policies and operations. Consequently, we do not observe any radical changes in institutional missions, nor any in the types of collaboration or educational

activity. In many cases distance students have to plod through the regulations meant and suitable for face-to-face students.

- 2 Faculty and the support staff are geared to working in and for the traditional on-campus course delivery. Switching over to the new system, even if only partially, requires institution wide fundamental changes. To bring about such changes is a difficult task conceptually as well as operationally.
- 3 Academics resist the development and integration of distance courses with on-campus courses/programmes, as making inputs in this area is seen as an 'add-on' to their routine responsibilities. In certain cases, work for distance education is seen as a process that entails clash of interests and is, therefore avoided.
- 4 Lack of training in and aversion to the use of technology at the institutional level are hurdles that need to be crossed in order to benefit from ICT applications.
- 5 ICT supported educational dispensation needs new models of budgeting and deployment of human resources and to attain these is a serious problem too.
- 6 Growth in the number and diversity of provider institutions causes variation in costs and quality of programmes being offered. This points to the need for accreditation bodies and the related procedures in orders to protect the interests of learners, which in turn points to the changing role of the national governments and the regional bodies concerned. This is an issue that involves many institutions across cultures and countries and so is difficult to resolve.

Distance/Virtual education

- 1 In developing countries like those in the Caribbean, the effectiveness and quality of distance/virtual education remain a matter of concern for academics as well as the employer/society.
- 2 Within the developed countries, like those in North America, the recent changes in the characteristic features of didactic transaction have been accepted generally and are being incorporated within the educational ethos at all levels. As the changes are significant, the developing countries are faced with the unavoidable problem of reorienting learners, academics, educational administrators and the providers of student support services.
- 3 Demand for greater access to programmes being offered in higher education and for programmes that are relevant to the employment market and labour force is increasing exponentially. A lack of the required national and regional capacity for meeting it opens the possibility of increasing dependency on and unwanted dominance by developed countries and their prestigious institutions.
- 4 From the learners' viewpoint, the issues of affordability and access to electronic communication channels remain major problems that have no immediate solutions.
- 5 The mechanism of local live academic support does not work satisfactorily as such support is not available uniformly across the region.

5.4 Developmental proposals: the basic considerations

Major requirements

To shape virtual education in the Caribbean anywhere near like that in North America (see Section IV), the following needs must be fulfilled as preconditions for positive and sustainable development.

- Governments need to revisit their policies pertaining to educational planning and financing. In addition relevant enabling policies in relation to telecommunications need to be put in place as soon as possible.
- Institutions need to revisit their missions and reorganize their operations keeping in view the varied applications of technology, human resource requirements and market forces and also reorient the existing staff for the purpose.
- Learners and educators need to be reoriented for the emerging technology enhanced didactic transaction. This may require overhauling the existing systems of lower level education as well.
- Provision needs to be made for national, regional and international collaboration and accreditation.
- Cross cultural and multinational curricula need to be worked out and implemented.

Selection of technology

It is worth reiterating the specific strengths of the four major technologies identified in Section IV, with specific reference to virtual education.

Video-conferencing is a cost intensive technology, mainly for synchronous transactions, and therefore of limited application for large-scale virtual transactions. For developing countries, it is at best a good *additional* resource.

Satellite broadcasting also is cost intensive and supports only *passive* synchronous transactions. *Satellite technology*, however, is of immense value for Web/Internet-based education.

Compact disks can be used to pack and transport multimedia courseware easily at a relatively lower costs, but to use them satisfactorily we need superior user-end equipment and superior expertise at the source end.

Web/Internet provides for virtual education at various levels of technological sophistication and promises a range of future possibilities and is *the technology* for virtual education. In considering this technology it is necessary to look into some of its microelements that affect its extension, utility and costs in the long-term.

Software: ICT applications depend as much on software as they do on hardware. In our choice for the former, as in commerce or administration, in education too we generally jump to proprietary products like WebCT, for example. We do so, because they are well advertised, multipurpose and finished products for ready use. These attributes blind us toward their requirement of ongoing licensing, their ever spiralling costs and the related exploitative trade practices. We need to consider the use of software applications based on open source operating

systems like Linux. For example, (a) Open Science Initiative¹ in USA functions as a clearing house for free open source applications developed for research in sciences, (b) Silicon Bazaar in Kenya² develops open source software for small businesses at a cost equal to 7% of the cost of a corresponding Microsoft application. This approach will save institutions from expensive licensing deals and also overcome problems of interoperability confronting collaboration among faculties, institutions and cross-border students. In particular, for course authoring purposes we need to look for items that are available freely for use and experimentation. In worst case scenarios, we may look for proprietary items available at reasonable prices under long-term arrangements.

Hardware: As in the case of software, low cost hardware also is making its way into the market. Computador Popular is an initiative of the Government of Brazil aiming at providing low cost computers (at US\$225 through loans from the government repayable at US\$10 per month) for the masses. There are other initiatives of this kind in the market and some of them from the major companies too. Institutional deals for such low cost items can bring in economies of scale and benefit students all over the region.

Procurement: *Purchase consortia* need to be formed for bulk purchases to ensure economies of scale, cost-effective services and subsequent upgradation of the equipment bought through such mechanisms.

In the process of *technology selection*, however, the foregoing assertions are debatable as specific advantages for specific purposes of each technology over the other can be argued and emphasised. Accordingly, if funds were available, *in an ideal situation*, one would advocate a model that presupposes the availability of all the best components in an integrated complex for their simultaneous use. But we are working in sub-ideal situations, in which choices have to be governed primarily by costs and only secondarily by the considerations of curricula and the transactions they require.

Curricula and transactions

Generally, a pedagogic/andragogic transaction is governed by the related curricular requirements and entails activities pertaining to cognitive, psychomotor and affective domains. Depending upon the subject/discipline concerned, activities pertaining to one or more domains need to be incorporated and emphasised at varying levels of rigour. The bottom line, however, is that most transactions involve (a) acquiring some new information/content, (b) some new concepts and their applications, (c) some new know-how and do-how items and (d) some behavioural as well as attitudinal changes. Of course, some subjects need lab and/or field work additionally.

In the context of higher education, a combination of packaged information/content and interaction with the institution/teacher should cover most of the subjects/disciplines. A provision for self-instructional packaged information supported by additional loose materials and lab/field work, wherever needed, together with live or simulated interaction is thus the minimal necessary curricular design to work with. On-line course delivery may manage most of the information/content transfer (as on-line library support will provide the additional loose materials), but on-line interaction depends on the availability of tutor-time, which certainly is

limited. If it is a small group of say 25 students working on a course on-line, the tutor concerned may not find it difficult to provide the necessary interaction. On the other hand, if the cohort runs into hundreds, there have to be tutor-teams, examiner-teams and/or extended lab/field sessions to manage the overall transaction. It may necessitate employing graduate students as course tutors for undergraduate and sub-university courses as a routine practice. In many cases, however, CDs may be able to provide simulated tutorial and lab/field sessions, passing on still greater responsibilities on to the learner him/herself. All this, it should be noted, assumes a kind of student that takes the onus of teaching/learning on to him/herself.

With the above considerations in view, it should be possible to propose various models of virtual education, which may be adopted depending on the level of funding and the related technology available to an institution or for a programme. Each model will have its own workable curricular design.

5.5 Possible models

There are three major factors to be considered in proposing models for virtual education in the Caribbean. These are technology, pedagogy/andragogy and costs. In view of the current trends and the existing circumstances/problems, it is not possible to make a single all pervading proposal for bringing virtual education to the centre-stage of the Caribbean educational enterprise. There have to be different take-off points for different countries and different institutions. A judicious consideration of the Caribbean situation (see Sections I, II and III) points to five models outlined as follows:

Model I

Print as the master medium of didactic communication and *postal system* as the technology for transporting materials: In this case the study materials have to be in self-instructional format and academic support may be provided locally using live tutors and additionally through postal communication, while the faculty at the institution will take care of the quality concerns. This model suits institutions that have no budgets for computer hardware and software and no personnel to use them. It works very well, but it does not meet our definition of virtual education (see subsection 3.1) — it is distance education. Yet it could be a significant first step on the path to virtual methodology as, even in this model, low level technology may be used to support transportation of materials and part of interaction.

Model II

Stepping into virtual modality, the simplest design may have the following configuration:

The source/institutional end — a courseware database linked to an instructional server (IS), which in turn is linked to the Internet.

The user/student end — a user's device (i.e. a P.C.) connected to the Internet. Such a P.C. may be available at one's home, work place, an institutional receive centre or any other location where access to the Web is possible.

Operations: At the source, the academics/specialists concerned create the course material that is digitised by the academic him/herself or the production staff (if available) and stored in the courseware database, which can hold textual as well as simple graphic material. From the database the material is transferred to IS, loading it in a downloadable format for delivery when accessed by a student from his/her device at the user's end and/or a receive centre. Audio and video inputs are not available in this model. The material available to the student is text and simple graphics such as charts etc. The student must work on the material on his/her own, and for additional help there may be a tutor available locally. Students in a particular locality may form self-help groups for peer interaction and institutional help could be provided through e-mail transactions. The student, at the user's end, can manage with a low cost workstation, while at the source end we need only the courseware database, an instructional server (SI), database management software and a simple (freely available) platform, FrontPage, for example. For the low data transfer stipulated in this model, the network infrastructure required is low cost and the ordinary telephone lines, which are available everywhere, can serve the purpose satisfactorily. Otherwise, the students can receive the material at a centre designated and equipped for the purpose. In case the student wants to have the material in his/her possession, print outs will have to be arranged may be at students' own cost. The term-end examinations will have to be the traditional type — pen and paper sit in examinations.

Basically this model (a) replaces the postal/courier transportation of materials by electronic transfer and (b) provides for electronic interaction with the faculty (with the help of e-mail facility) replacing postal communication. And it meets our definition of virtual education.

Model III

A relatively advanced model incorporates audio and video components and one-way virtual communication. The configuration in this case is more complex than that in the second model.

The source/institutional end — (a) a courseware database linked to an instructional server (IS), which in turn is linked to Internet, (b) a multimedia database linked to a multimedia server (MS), which in turn is linked to Internet.

The user/student end— a user's device (i.e. a P.C.) connected to Internet available at one's home, work place, an institutional receive centre or other locations where access to the Web is available. The workstations in use in this case require higher capacity with facilities for multimedia data decompression.

Operations: At the source/institutional end the textual course material is put into the database and loaded on to the servers as in the second model. In addition, teacher's presentations are recorded, edited, digitised and compressed into multimedia files and stored in an audio/video (multimedia) database linked to the multimedia server. At the receive end, the student needs to access both the textual material from the IS and the audio/video material from the MS through one and the same workstation and have the benefit of one-way (teacher to student) virtual communication. Two-way written communication too is possible with the help of e-mail links. The workstations in use should have better memory and speed in order to process multimedia files. In addition, for smooth and fast transmission of multimedia files the network in use should be at least medium-band standard. Narrow-band lines may be used, but the transmission cannot be smooth. Students can access the materials from a designated centre or their homes/offices.

In this model, the services of a local tutor are not necessary as the multimedia component should replace the tutor satisfactorily. Because of the additional components in the hardware, software as well as the course package, the costs in this case are higher for both the students and the institution concerned.

Model IV

This is more sophisticated than the third model, as it adds a dynamic interactive component to the educational transaction. The additions are in the form of interactive multimedia elements and chat and/or bulletin boards. In this case the configuration is as follows:

The source/institutional end — (a) a courseware database linked to an instructional server (IS), which in turn is linked to Internet, (b) a video camera(s), video/audio editing equipment and digitisation and compression equipment, (c) a multimedia database linked to a multimedia server (MS), which in turn is linked to Internet, and (d) additional support such as video projectors, extra storage devices and software for course navigation, chat/bulletin boards, conference scheduling, control of student activities, data compression/decompression and transmission, two types of data-base management and network management. Accordingly, in this case the communication network has to be a wide-band standard necessarily.

The user/student end — the same as in Model III, but the equipment should comprise sophisticated hardware and software to manage much higher levels and a wider variety of data.

Operations: In addition to what Models II and III can achieve, this model provides for two-way communication using chat/bulletin boards and live video sessions. The teacher can interact with the students synchronously or asynchronously as agreed to and planned and students can access the material and interact with the teachers from their work places, homes and/or a centre designated for the purpose.

In this model, there is no role for the local tutor, the communication is two-way, the teacher can control learner activities when engaged in synchronous interaction or leave them to their own ways if asynchronous interaction is the chosen mode.

Model V

This is the latest one being developed at various places (see subsection 4.3). In this case, the hardware and software requirements at the source/institutional end are much more advanced than and different from those required in Model IV. At the user/student end too the equipment needs to be more sophisticated, as this model would ideally need flawless technology allowing for superior speed, memory and capacity.

In this model the major sophistication lies in both the preparation and the delivery of course materials, which are transformed into *learning objects*,³ appropriately tagged and managed using *development and management systems*, which aggregate them according to specific learner needs, deconstruct them for re-purposing and reuse and help the learner in accessing them through differing platforms by virtue of their interoperability. Much of the interaction needed is managed with the help of various types of on-line interactive components and formative self-

tests (read electronic tutors). It is within this model that virtual education goes beyond a mere system of course delivery, for it incorporates pedagogy/andragogy as a basic feature right from the stage of content selection, through teaching/learning transactions to learner assessment.

Here, we must refer to an initiative taken by the Commonwealth Ministers of Education, who have directed the Commonwealth of Learning (COL), Vancouver, Canada, to prepare a proposal⁴ on “Virtual University for the Small States of the Commonwealth” for their consideration. The proposal is available on the COL Web-site and COL is interested in receiving comments on it before it is submitted for consideration at a Ministers’ meeting early next year. It is for its merits that the COL proposal makes a case for Model V to be the chosen model for the proposed Virtual University for the Small States of the Commonwealth.

Institutions like the University of Technology, Jamaica, which are technology oriented, may benefit by getting in touch with the institutions that are actively involved in building this model (see subsection 4.3). Others may work with them at an exploratory level to see how far they can move along.

5.6 Concluding remarks

The possibility of virtual education is a boon from ICT applications, but these applications and the related hardware, do not make it. This is a significant and obvious fact, but is at times lost in our clamour for technology. There are cases on record showing how institutions go in for extensive and expensive hardware and applications without paying any attention to the concomitant long-term impact in terms of costs on account of the technology chosen, the software needed or chosen for use, the maintenance needed, the training of personnel or the hidden costs such as those born of the obsolescence of equipment.

Indications are that over time all higher education institutions will move for virtual education. It is also clear that the institutions will have to make conscious decisions, workout appropriate plans, remodel their financial and administrative systems and reorient the staff in order to enter this new era educational dispensation. Each one of them will have to identify its own starting point, with a clear understanding of what is available and what needs to be added for what purpose and at what cost. Though any exercise of this kind will differ from institution to institution, one or the other of the models outlined above should help in the process.

In the process of social evolution occasions come for the middle rung operators to feel and appreciate the needs and aspirations of the masses and also mould the leadership to meet and fulfil them. Where do we stand — are we the masses, the leaders or the middle rung operators! Each one of us here has a role to play, as the way forward is to go for mixed mode educational dispensation. The earlier we move on, the better.

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QNR-1

***Readiness for Information & Communication Technology (ICT)
supported Distance Education***

Questionnaire-1

Name of your country:

Name of your Institution/Department:

[Note: We are seeking information about your COUNTRY, not the Department.]

Infrastructure

1. Availability of new electronic communication services and access centres: is it poor/good/very good?
.....
2. What technology supports the connectivity? Satellite/fibre optic lines/leased lines and/or dial-up links
.....
3. Existence of effective competition among communication and information service providers: Are the services provided by a single monopoly enterprise? If 'yes', please name it:..... Or, are there any competitors? If so, please name them.
.....
4. Are there any ISPs? How many? And nearly how many Internet connections are there in the country (any statistics)?
5. What is the cost of dial-up 56 K services per month? Cost of leased circuits of 64K per month? Costs of other levels of services, if available?
6. Reliability of electric supply for e-learning and other operations: is it poor/good/very good?..... Is electricity available at a reasonable cost?... Yes.....No..... Or, is it expensive?.....
7. Does your country support any promotional facilities for ICT? Such as ICT Parks/ Free Trade Zones/etc. If 'yes', please name them.....

Human resources

1. Is the availability of e-professionals for e-transactions (in education, business, etc.) poor, good or very good?
2. What is the level of computer-literacy among the masses in the country? Low/adequate/high/very high.
.....
3. Is teaching/training in ICT available locally in the country?..... If 'yes', at what levels? Basic/Sub-degree/Degree/Graduate..... Is there any support provided by private training agencies/institutions in the development of e-professionals in the country? If 'yes', at what levels?.....
4. What is the attitude of the masses and workforce towards ICT applications? negative/that of hesitation/that of indifference/positive
5. What is the level of ICT skills and efficiency among the workforce? ...very low/ low/ good/ very good.....

National policy

1. Is ICT-readiness a national priority?
2. Is there a national ICT/E-commerce/E-learning policy/plan existing in the country?
.....
3. Is there any government authority/body in-charge of ICT initiatives in the country?
..... If 'yes', please name it
4. What is the level of progress with computerisation within the government departments and its application for transactions/dealings with the public?
5. Have the infrastructure and procedures in the private sector been digitised? If 'yes', to what extent?
.....
6. Is there any consultation or partnership between the private sector and government to improve ICT-readiness in the country?

Legal situation

1. Is there any legal support for e-commerce and/or e-learning available in the country?
2. What kind of, if any, legal protection is available for storage and distribution of networked information?
.....
3. Is there any legal provision available to address issues like cyber crimes, authorization of digital signatures, etc.? If 'yes', what is the level of its effectiveness?
4. Are laws in place for the protection of intellectual property rights for ICT-based products?
.....
5. What measures of consumer and privacy protection, in relation to ICT products/activities, are available in the country?.....

Promotion of e-culture

1. Is there a local ICT industry in existence in the country?
.....
2. If 'yes', is support/venture capital available for them to innovate and grow?
.....
3. What kind of, if any, e-enabled financial system is available in the country to support e-transactions (payment of fees, purchase of books, on-line registration, etc.)?
.....
4. What kind of, if any, favourable climate/policy is in place for the participation of foreign institutions in the provision of ICT supported education?
5. What is the level of ICT use in every day life generally—businesses, educational institutions, government offices, schools, etc.? Not at all/ limited/ appreciably visible / quite common.
.....

QNR-2

Information & Communication Technology (ICT) supported Distance Education Operations and Initiatives

Questionnaire-2

- The name of your **institution** and **country**.....
.....
- Have you any *Information and Communication Technology* (ICT) supported distance education courses and/or programmes on offer **currently**? [*We are asking mainly about Web/Internet-based on-line courses.*] ...yes.....no.....
- If 'yes', please supply the following information:
 - a. *Name(s) of the course(s)/programme(s)* 1).....2).....
.....3).....
.....4)..... 5).....
.....6).....
 - b. *Starting year of the course/programme* ...1).....
.....2)..... 3).....
.....4)..... 5).....
.....6).....
 - c. *Field of study (such as Management, Accounting, Medicine, etc.)*
.....1)..... 2).....
.....3)..... 4).....
.....5)..... 6).....
 - d. *Please state the level at which the programme is on offer (i.e. Certificate, Diploma, Degree, Graduate, Continuing education or any other level and also the number of students at each level).*
.....1)..... 2).....
.....3)..... 4).....
.....5)..... 6).....
 - e. *Delivery method: (totally Web/Internet-based or various combinations of media?)*
.....1)..... 2).....
.....3)..... 4).....
.....5)..... 6).....
 - f. *If totally or partially Web/Internet-based, what instructional platform are you using, for example, WebCT, Learning Space, Blackboard, etc. ?)*.....
.....1)..... 2).....
.....3)..... 4).....
.....5)..... 6).....

g. Please indicate whether your distance education (DE) programmes are governed by your routine statutes/regulations for purposes of registration, examinations, etc. or by DE-specific statutes/regulations?

Routine statutes/regulations.....DE-specific statutes/regulations.....

- What new projects (new courses/programmes) are being planned or prepared currently? If there are any under way, please supply their details according to the following outline:

a. Name(s) of the course(s)/programme(s) 1).....2).....
3).....
 ...4)..... 5).....
 ...6).....

b. Starting year of the course/programme ...1).....
 ...2)..... 3).....
 ...4).....5).....
 ...6).....

c. Field of study (such as Management, Accounting, Medicine, etc.)
 ...1).....2).....
 ...3).....4).....
 ...5).....6).....

d. Please state the level at which the programme will be offered (i.e. Certificate, Diploma, Degree, Graduate, Continuing education, any other level) ...1).....
 ...2).....
 ...3).....4).....
 ...5).....6).....

e. Delivery method: (totally Web/Internet-based or various combinations of media?)
 ...1).....2).....
 ...3).....4).....
 ...5).....6).....

f. If totally or partially Web/Internet-based, what instructional platform will you use, for example, WebCT, Learning Space, Blackboard, etc. ?
 ...1).....2).....3).....
4).....
 ...5).....6).....

- Based on the information available in my files, I have tried to profile your institution. Please look into it (please see page 3 and beyond) for corrections and add to it to make it comprehensive. *In so doing, please note that our focus is only on distance education initiatives and operations(mainly those supported by ICT).*

[Institution specific notes/details, one each for six universities, for the respective respondents to confirm/correct.]