DRAFT--Oct. 15, 1997
For Conference Distribution Only

INFORMATION TECHNOLOGIES AND INTER-INSTITUTIONAL COLLABORATION: THE CASE OF THE UNIVERSITY OF THE WEST INDIES

by

Christine Marrett
Head and Senior Project Officer
Distance Education Centre
University of the West Indies, Mona Campus
Kingston, JAMAICA

The Twenty-first International Conference on the Unity of the Sciences
Washington, D.C. November 24-30, 1997

Information technologies and inter-institutional collaboration: the case of The University of the West Indies

by Christine Marrett
Head and Senior Project Officer,
University of the West Indies Distance Education Centre, Mona campus,
Jamaica, W.I.

Introduction

The label of the present times as the information age is widely accepted. Driving the information age is the convergence of computer technology and telecommunications. Computers, on-line databases, facsimile, and electronic networks linked by fiber optics or satellite combine to allow for the current trend in globalization to take place and are accelerating its development. In the information age, a primary source of employment and economic activity is the knowledge industry. Many of the developments are taking place within developed countries and developing countries either get left behind, pulled along, or make conscious decisions about adoption, adaptation and development and use of information technology.

This paper examines some of the issues related to communication and information technology presented in the literature, as they pertain to developing countries in general and the English-speaking Caribbean region in particular. It then focuses on the experiences of the University of the West Indies (UWI), Mona campus in Jamaica, in the establishment and use of Internet connectivity. It highlights the need for collaboration at a number of levels, especially in the environment in which the UWI operates.

Methodology

A review of literature on communication and technology and an examination of documents related to the establishment of Internet connectivity on the UWI Mona campus was undertaken. Semiformal interviews were conducted in 1996 with the former Principal, Professor Gerald Lalor, whose initiative it was to establish the service on the campus, as well as with the Director of the UWI's Mona Information Systems Unit (MISU). The questions were derived from a review of the literature covering information technology, especially in developing countries.

Additionally, a sample of users was examined to determine usage patterns of persons who have accounts with the MISU, and a questionnaire was administered to participants in a seminar/workshop about the Internet, conducted at the UWI in March 1996. Attendance at the seminar/workshop was voluntary and participants were charged a small fee, therefore it is assumed that the sample represented persons who had an interest in using the Internet. The questionnaire was administered several months after the seminar/workshop and was intended to determine subsequent usage of the Internet and solicit views on problems and promises of Internet connectivity. It consisted of 18 items, four of which were open-ended. Twenty-seven questionnaires were completed by persons representing 10 departments. I also draw on my own experiences as a member of the UWI community.

The global picture

The information age, characterized by information technology, has great social impact. Drucker[1] identifies the impacts as including the shift from blue collar work and the importance of formal schooling, reflected in the fact that the majority of new high-paying

jobs are to be found in knowledge work such as technicians, professionals, specialists of all kinds, and managers. He develops the discussion of education in the knowledge society, describing education as the mechanism for both mobility and security, allowing one to move between careers and different organizations.

Naisbitt and Auberdene[2] identify human resources as the competitive edge for both companies and countries in the global competition of the information economy, with the quality and innovativeness of people making the difference. They predict that the low economic value of the unskilled and the undereducated in the information society will relegate them to low salaries. Further, they state that the most competitive countries in the new economic order will be those that invest most in education, as is evidenced by the experience of the Pacific rim countries.

Drucker[3] acknowledges that higher productivity is not generated solely by the new technology in knowledge and service work, but will depend on behavioral change. He makes the point that such change works only if it can be based on the existing culture, giving as an example the success of the Western form of Japanese corporations and universities which contain the traditional culture of "mutual obligations and loyalties of a clan society - e.g. in the lifetime commitment of company to employee and employee to company, or in organizing industry in keiretsu, groups of autonomous firms held together as 'vassals' by mutual dependence and mutual loyalty."[4] In contrast, he mentions the failed efforts at reform in India and China, which attempted to change the cultures of their countries.

Another challenge of the knowledge society which Drucker[5] identifies is that of the expansion of literacy to include not only reading, writing and arithmetic but also computer skills and political, social and historical systems. This expanding knowledge base further requires people to learn how to learn.

Issues facing developing countries

On the face of it, information technologies may appear to be neutral, as expressed by Stone[6], who regards them as no more than critical tools with truly neutral characteristics. However, Hall contends that they are not neutral as

> *neutrality implies disengagement and nonparticipation. In contrast, new information technologies shape the social choice mechanisms available to the communities that use them. The tools and machines we develop for thinking and communicating fashion the tasks that we identify and pursue. For example, information and communication technologies make certain social choices desirable and others untenable.*[7]

Use of information resources in developing countries

Slamecka[8] recognizes differences between rich and poor countries in the knowledge society and information age as including the low use of information sources and services in developing countries and the transborder flows of problem-solving data, with economic and political implications. Slamecka contends that the phenomenon is not only due to the usually offered excuses of poor domestic management of information resources, inadequate marketing, or users' lack of purchasing power but also that the

intensity of information use is relative to a given cultural and socioeconomic milieu. Given that the cost of acquiring and maintaining information resources and operating information services is comparatively high for developing countries in contrast to industrialized nations, and given the competing demands on limited resources, getting the developing countries to commit to investing in information may require raising the level of information use in these countries.

Slamecka suggests that to increase a society's use of information and problem-solving knowledge will require long-term strategies to modify the problem solvers' attitude to change and to modify education in problem solving. Short term strategies include "1) identifying problem solvers who are most susceptible to the modification of information-related behavior; 2) specifying data, information systems and services that are the most appropriate to these problem solvers; and 3) devising and applying approaches to the modification of their behavior."[9]

Hall[10] provides statistical validation of the imbalance between industrialized and developing countries in their access and use of the new information technologies and points to the potential negative effect of reinforcing center-periphery relationships. Less than 10% of the world's telephone lines are in the Southern Hemisphere. In the late 1980s, 95% of all computers were located in the industrialized world. Developing country access to technology stands in sharp contrast to provisions for students at universities in the USA: 516 MIPS (million instructions per second) per thousand persons in USA. Next is Japan with 139 MIPS per thousand, down to 1 MIPS per thousand in India. At the time of Hall's writing, there were 1094 Gophers in North America, 14 in the South. My own

question is how many of those in the South are established and maintained by organizations/people of the North? As she points out, the threat is that those parts of the globe not participating in the instantaneous communication with those on-line will become remote. The new information technologies then become a potential tool of exclusion from both transnational and local conversations that will affect the future of those excluded.

Information flows

Hamelink[11] is critical of the ambivalent position regarding the development of links among developing countries in Africa, Asia and Latin America, and the difficulties encountered in coping with the remaining links to the former colonial powers. Regarding the introduction of communications technology in these countries, which happens largely through transfer from the developed countries, Hamelink points out that from the 1960s the primary beneficiaries of telephone, educational television, and satellite communications had been foreign manufacturers, foreign bankers and national administrative and military elites. "In most developing countries the pattern was that advanced technology was not primarily introduced to meet the basic needs of the people, but as the support system for the expansion of transnational business"[12]. As such the technology had added to the obstacles for a process of independent and self-reliant development.

Hamelink[13] explores the information disparity between the North (developed) and South (developing) countries. The disparities exist both in the communication hardware and in information flow. Not only are the technologies being designed, developed, and controlled by the leading traders in the USA, Japan and Western Europe, but also, predictably, ownership remains concentrated in the rich countries that represent some 30%

of the world's population. He reports that together all the developing countries own only 4% of the world's computers; 75% percent of the world's 700 million telephone sets are to be found in the nine richest countries; the poor countries possess less than one telephone for every 1,000 people. The imbalance in information flows is reflected in the fact that most information moves among the countries in the North, less between the North and South, and very little amongst the countries of the South. Less than 10% of all telephone, telex and telefax traffic takes place between countries in the South. Further, flows between North and South tend to be one way. Estimates suggest that the flow of news from the North to the South is 100 times more than the flow in the opposite direction. Information movement between the North and South consists of raw data from the South while the North provides ready-made information packages.

If indeed the global trend is to the knowledge society in a global village, then there is the danger of the emergence of global village ghettos of deprivation. Hamelink[14] reports that in the field of scientific and technical information only 3% of the world's research and development takes place in the South and that only 1% of the world's patent grants are held by nationals of the poor countries. In terms of information usage, the South often is at considerable disadvantage when bargaining, often having fewer skilled negotiators and less useful information.

Transnational service providers and government regulation

Developing countries often face the dilemma of having to rely on transnational corporations to provide the communications services that allow them to participate in global developments while trying to define their own national and regional identity. This

situation often pits the capital, technology and human resources of the transnational against that of state authorities of developing countries who

> *often find themselves unable to regulate these companies or even to articulate the technical and policy requirements for the protection of local service users and the wider society. The central problem that emerges from such a situation is how to reconcile the global scope and legitimate profit-generating objectives of the transnational interests on the one hand, with the requirement for regulation and informed national-level planning to fulfill the perceived needs of people at all levels in societies on the global periphery.* [15]

As Dunn[16] points out, the need to engender negotiating and critical assessment skills in the political and technocratic leadership of the private and public sectors of developing countries is all the more crucial when one considers that their choices for technological innovation are often dictated by financial lines of credit and influenced by intensive marketing strategies of manufacturers, which frequently have the backing of the government of an industrialized country.

> *While selective application of the technologies can bring immense benefits to under-developed societies, uncritical use can lead to a worsening of economic and social disparity and capital outflow. Since the imported technologies themselves are not neutral and the process of choosing among them not entirely free, underdeveloped countries are forced to pay a significant social cost in addition to the immediate financial costs reflected in the usage arrangements.*[17]

Issues facing the English-speaking (Commonwealth) Caribbean

The region of particular interest in this paper, the English-speaking Caribbean, is wide in geographical spread, scattered over two thousand miles of ocean, extending from Belize on the Central American mainland, across to Jamaica and the Bahamas Islands, through the chain of islands which delineates the Caribbean Sea from the Atlantic Ocean -- from the British Virgin Islands at the northern tip of the chain, to Barbados in the south east, on to Trinidad and Tobago just off the Venezuelan coast -- and further south to Guyana on the South American continent. The countries are, with a few exceptions, small in geographical size and small in terms of population. The total population for the region is approximately 5.7 million with Jamaica and Trinidad and Tobago being the only two to have populations in excess of one million people. The region therefore faces most of the challenges to development which confront small states: limited resource endowment (including human resources), small domestic markets, reliance on a few primary products, dependence on foreign capital, high and disproportionate expenditure on administration and social and physical infrastructure, and proneness to natural disasters.[18]

Henry[19] describes the region as emerging from colonial, plantation economies, with development strategies in the post World War II period largely involving import substituting industrialization, export of primary commodities and tourism. Further, the small size of the markets in the region sets limits to the growth potential of import-substitution. He goes on to state that the pattern of production in the industrial or manufacturing sector has relied heavily on technology licenses and trade marks of multinational corporations. As a result of these historical developments, the countries of the region have remained more structurally integrated with foreign countries than with one

another. The formation of CARICOM (Caribbean Community and Common Market) in 1973 "to establish and utilize institutions to enhance the economic, social and cultural development of the peoples of the Member States"[20] is one strategy to counter the imbalances and develop regional collaboration among the 15 member countries.

The cultural dimension

Drucker's[21] contention that behavioral changes required by the knowledge society need to be grounded in existing culture presents a peculiar type of challenge for Caribbean society, which does not exhibit the degree of homogeneity of the Japanese, for example, and is very open to influences of North America. In many respects the people of the Caribbean are still trying to define our own culture. Dunn points to the ready availability on television in the Caribbean of information concerning events in distant locations while information on our own rural areas or in neighboring Caribbean countries is more difficult to come by. Yet while he recognizes the difficulty he also acknowledges the potential.

> *The Commonwealth Caribbean region in common with most under-developed territories of the world, is on the receiving end of much of this technological innovation, designed mainly to meet the requirements of the industrialised north. But, some of these technologies, global by their very nature and their social impact, can offer important opportunities to address productivity, developmental and communications needs of our people. Technological applications in the delivery of such services as health care, in the provision of distance education and the availability of interactive self-teaching facilities can enhance the quality of life in our societies. The re-generation of traditional agriculture through*

advances in bio-technology, improved customer services in the banking and the financial sector, the creation of new and more productive means of employment, and the possibility of systems-reform in the administration of both the governmental and non-governmental (NGO) sectors are also among the potential or actual benefits of the on-going techno-scientific revolution. At the same time, other aspects of the technologies can place our region at a disadvantage, particularly when, as recipients, we become uncritical hosts or fail to ensure our own independent understanding of the social and policy implications of these innovations.[22]

Human resources and education

Henry[23] develops the theme that in today's world of knowledge-intensive industries and global markets, the competitiveness of Commonwealth Caribbean countries, with the limited material resource base in most cases, will depend a great deal on the quality of their human resources. He expresses concern that the amount of investment in human resources in the region is however not great enough to guarantee the level and extent of work force requirements across the economic system to quickly absorb and appropriately apply scientific, technological, marketing and other kinds of information from outside the region.

He posits that technical change in the Caribbean countries consists mostly of adaptation of imported technology and that the capacity for adaptation is determined by prior investment in what he terms certain indivisibilities in information receivers and information channels. The imperative is that small countries that depend on the

international market to survive have no choice but to keep themselves up-to-date on the broad range of scientific and technological developments that could impact their competitiveness in the future. He contends that "[t]he quality of the information available, including that which they themselves generate, and their responsiveness to the available information, will be critical determinants of their trade competitiveness"[24]. The information infrastructure in respect of the human resource base, information sensitivity or social intelligence formation, and information channels or hardware therefore assumes importance. The capacity to utilize information is a function of the quality of the human resources, that in turn is related to educational attainment in the labor force.

Peart[25] identifies part of the problem in the inadequate educational provision in the region, even where the technology is provided, as the considerable gap that exists between current efforts to computerize schools and the ability and readiness of our people to properly utilize the technology. He states that "schools as they are currently configured (within four walls and overcrowded space) and kept by most teachers (in dictated "drill and practice" routines) will not be able to effectively deliver quality education in this new age of interactivity"[26]. He points out that in Jamaica only 3% or 27 of 858 graduating from teachers' colleges in 1996 received training in the use of this technology in schools.

Further compounding the problem of inadequate preparation of teachers for the information age is the fact that in countries such as Jamaica, due largely to budget cuts resulting in low salaries and poor working conditions, teaching as a profession is losing its status. Consequently several teachers have left the classroom, presumably to earn higher wages in some other field of endeavor and few school leavers are opting for teaching as a

career choice, as evidenced by the static or declining enrollment rates in teacher training institutions. The Economic and Social Survey of 1993 throguh 1996[27] report a decline or only marginal increase in the teaching force at the various educational levels. One suspects that many take teaching posts until they find another more lucrative form of employment. The question of the quality of teaching or competence therefore arises, which can have far-reaching negative effects on the preparation of the society to take active part in the information age and knowledge society.

Access

Concern for possible exacerbation of inequalities seem to hold some basis in the Caribbean. In a review of telephone penetration rates in the region, Dunn[28] identifies lines per hundred population in 1994 ranging from a low in Guyana of 4.0 to a high of 30.6 in Barbados, averaging 15.0, compared with a 1991 penetration rate of 96.5 in the United States of America. The penetration rates of the Caribbean are better than the average for poor countries as a whole -- less than one telephone for every 1,000 people -- as reported by Hamelink[29]. However, when one considers that telephone connectivity is a major tool in order to be able to take advantage of many of the new information technologies, there is cause for concern. Add to this the fact that the majority of the lines available are in the urban centers, the rural/urban inequalities sharpen.

Since 1994, the penetration rate has increased in some of the countries. For example, in Jamaica Pickersgill[30] in 1996 reports a rate moving towards 13 telephones per 100 individuals. There has also been an increase in the availability of international computer network services in the region, growing from practically none in 1994 to at least

one in most of the countries of the region, mainly provided by the international telecommunications providers.

Telecommunications providers in the Caribbean.

Although the region is small in population, it accounts for a large volume of international telephone traffic between the region and North America/Europe. Dunn[31] attributes this to tourism -- a major economic activity in the region -- and the large expatriate Caribbean population living mainly in the USA, Canada, and Britain. He cites US Federal Communications Commission (FCC) figures which indicate that the USA to Jamaica route was one of the most heavily used, with a higher volume of calls than from the USA to Australia, India and Nigeria respectively. The region is therefore an important market for US telecommunication operators, with potential for the development of non-voice services.

However it is the British-based Cable and Wireless (C&W) which has been the major operator in the region for over 125 years. Dunn[32] describes its history in the region as beginning as a service of the British government to its colonies. In the sixties and seventies, as the countries of the region obtained independence, there were majority take-overs of foreign-owned telecommunications systems by government and/or local private sector acquisition. The local ownership was feasible so long as the technology and the body of knowledge associated with it remained stable and manageable. However, the dramatic changes in the 1980s global market conditions, technological applications, and the shift from state-led to market driven development policies, combined to allow C&W to reemerge as the major shareholder in the region, with exclusive licenses in 15 Caribbean

territories. It has been able to justify its monopoly position on the basis of arguments of small market size and the so-called geographical complexity of the region. Other companies (such as some based in the USA) have been unable to penetrate the market because of C&W's monopoly licenses or its technological hegemony.

It is ironical that in an era of the reemergence of the competition of the market place as a global phenomenon, C&W maintains this monopoly position in the region. The size and influence of the company in the Caribbean make it more difficult yet more imperative for small countries to monitor and regulate it for the protection of the public interest. Dunn writes that in the Caribbean

> *it is not competition but monopoly power, a weak state apparatus and the influence of multilateral lending agencies which have contributed to reducing the importance of government's regulatory role and restricted the power of the marketplace. Far from requiring less regulation, an environment dominated by a private monopoly operator requires organized systems and institutions for regulation.*[33]

Areas requiring regulation and monitoring he identifies include tariff levels, distribution of network resources, technical standards, allocation of returns from state investment, protection of corporation from arbitrary government action and profitability protection. According to Dunn, these activities require institutional strengthening of the legislative and judicial regulatory bodies, as well as the administrative organization and financial capacity to operate the system.

The University of the West Indies

The University of the West Indies is a regional institution serving 14 English-speaking Caribbean countries. There are three campuses located in Trinidad, Barbados and Jamaica. The other countries are served by University centers. There is also the University Center, headed by the Vice-chancellor, which overseas all University-wide activities. There are four faculties at the Mona campus in Jamaica: Arts and Education; Medical Sciences; Pure and Applied Sciences; and Social Sciences. At the St. Augustine campus in Trinidad the five faculties are: Engineering; Agriculture and Natural Sciences; Humanities and Education; Medical Sciences; and Social Sciences. At the Cave Hill campus in Barbados the faculties are: Law; Humanities; Science and Technology; and Social Sciences. Medical studies on that campus fall under the School of Clinical Medicine and Research.

The Mona campus in Jamaica achieved Internet connectivity in 1994, but its genesis can probably be traced back to the UWI's first extensive use of telecommunications in the late 1970s. These early endeavors led first to the establishment of the UWI Distance Teaching Enterprise (UWIDITE) in 1982. Serving the countries which support the UWI, it operated an audiographic teleconferencing network, used for interactive distance teaching and other types of teleconferences. Since August 1996, UWIDITE has been incorporated into the UWI Distance Education Center (UWIDEC). UWIDEC's developmental plans include the establishment of a computer conferencing system on the network and world wide web access to be used for electronic mail, file transfer, and distance teaching.

In 1982, then Pro-Vice-Chancellor of the UWI, Professor Gerald Lalor, saw advantages of satellite-based telecommunications applications for less developed countries (LDCs): "Communications and information are no less important to the LDCs than to the developed world. Here is one new technology which is transforming society in which there need be no time lag in its full application."[34].

As it happens, Lalor's hope for "no time lag" was to be thwarted on several occasions, as will be shown and explored in the case study.

UWI's first attempts at Internet connectivity began in 1991 under an initiative of the Organization of American States (OAS), referred to as CUNet.

CUNet project

The OAS in 1991 approved an initiative entitled "Hemisphere-wide Inter-university Scientific and Technological Information Network" (RedHUCyT). The aim of the initiative is to establish an electronic network for the exchange of scientific and technological information among the universities in its 35 member states in the Americas and the Caribbean. A sub-project of RedHUCyT is the formation of an electronic network linking Caribbean universities.[35] The UWI was invited to attend the First Caribbean Academic and Scientific Network workshop/seminar in Puerto Rico in September 1991, where CUNet was formally launched. This workshop was organized by the OAS, the Corporation for the Academic, Scientific and Research Network of Puerto Rico (CRACIN), and the University of Puerto Rico (UPR), and was attended by institutions from 13 largely English-speaking member states of the OAS.[36]

An outcome of this initiative was the provision of equipment to allow dial-up electronic mail access from Jamaica to the Internet through Puerto Rico using UUCP (Unix to Unix Copy Protocol) networks. This meant that messages from and for persons in Jamaica were sent and received only at particular times of the day when contact was established with Puerto Rico. Nodes were established at the UWI Mona campus, and the University of Technology (UTech), which was then known as the College of Arts, Science and Technology (CAST). A third node had been initially proposed for the Scientific Research Council (SRC) but this did not materialize until three years later, mainly due to the lack of expertise at the Council. Through these networks the academic community at these institutions gained access to a vast amount of information.[37]

Super computer and the computerization of the Mona campus

In 1991 another development was taking place at the UWI which was to prove important to the establishment of full Internet connectivity on the Mona campus. The government of Jamaica had been offered the provision of a super computer with tremendous high speed processing power through funding provided by the US Exim Bank at a low rate of interest and including maintenance for seven years. The Jamaican Government thought that the investment (some five million US dollars) would best serve educational purposes and offered it to the UWI. With the super computer, the Mona campus was to begin its first efforts to computerize the campus. The basic FDDI (Fiber Distributed Data Interface) campus-wide backbone was included with the provision of the super computer at no extra cost at the request of the UWI. The acquisition of the super computer was completed in November 1992 and the installation of the FDDI backbone

began in January 1993 and still continues to widen the coverage of the campus computer network in stages as the funds become available.

The offer of the super computer to the UWI coincided with negotiations for a loan from an international funding agency for the development of science and technology at the University, including infrastructure and equipment (FDDI and computers) for the computerization of each of the three campuses. It entailed the establishment of local area networks (LANS) and the linking of the Faculty of Medical Sciences at Mona, located on the adjoining compound of the University Hospital of the West Indies. However, due to bureaucratic entanglements and delays, although the loan agreement was signed in April 1992, the project only reached the stage of inviting tenders for the equipment to be provided in August 1996. These delays have caused much frustration on the part of those users who were to benefit under the project, especially as other areas on the campus have progressed in gaining Internet connectivity under other initiatives.

JAMNet

The success of the CUNet project in opening up access to information in the academic community quickly led to the dial-up international link becoming swamped and the traffic based costing of the UUCP link reaching the point of possibly exceeding the cost of a dedicated leased circuit. The OAS and the National Science Foundation (NSF) therefore agreed to finance the establishment of JAMNet, a Jamaican computer network with direct links to the Internet.

The JAMNet project was approved in 1993. Application for the circuits was made to the only telecommunications provider in the country, Telecommunications of Jamaica

(TOJ), a subsidiary of the international conglomerate, Cable and Wireless (C&W), in November 1993 but the lines were only provided in July 1994 and final connection made on August 15, 1994. The delay was largely bureaucratic.

Within Jamaica the computer networks of UTech and UWI (the primary institutions) are interconnected through the UWI's super computer by leased circuits provided by TOJ. The possibility exists of broadening the Jamaican network through the interconnection of other institutions by dial access or leased circuits to any of the primary institutions. It was originally proposed to link JAMNet to the Internet by leased circuits through the NSF's point of access in Homestead, Florida[38]. However, in the interview with the Director of the Mona Information Systems Unit (MISU), Mr. Keith Manison, he explained that this was not politically possible as there was no bilateral agreement to carry data on the fiber optic cable between Jamaica and Florida. Instead the leased circuit goes by satellite to New York and then by land lines provided by the US based carrier, Sprint, to the NSF network in Maryland. This routing according to Mr. Manison, is one of the most expensive Internet connections in the world at US$6,500 per month for a 64,000 bits per second data circuit. The cost of the lease is shared between UTech and UWI after remittances from paying external customers, with UTech paying one third and the UWI meeting the remaining two thirds. An upgrade to a 256,000 bits per second circuit at a cost of US$7,500 was expected to have been installed in May 1997. However, delays are being experienced due largely to the need for infrastructural upgrade, as the TOJ has to replace copper lines to the customer's premisis with fiber optic cable.

Mona Information Systems Unit (MISU)

In 1994 the Mona Information Systems Unit was established to "direct and oversee the implementation and growth of Information Technology and Systems on the Mona campus of UWI"[39]. This includes responsibility for the super computer and the fiber optic backbone network for computerizing the campus. It is also intended to be a resource for all information system users, providing "network design and installation, training, consultancy and system development and programming services."[40] Although functioning as a Unit since the end of 1994, it was not until October 1995 that the MISU was provided with it own location, budget and adequate support staff to perform the required functions.

The MISU is headed by a director who reports to the principal of the campus. The Unit has five functional areas: Administration; Operations Management; Technical Services; User Support Services and System Development. Manison points out that the decentralization of data processing services to the various departments on campus through the computer network "will require a change in both attitude and skills of the users"[41] and may even involve changing existing procedures to make the best use of the computerized services.

In discussion, Manison stated that compared to the staff complement of information systems units at institutions of similar size in other countries, such as Brown University in the USA with some 150 staff, the number of established posts at the MISU (28) is small. With a high number of vacancies (some 50%) largely due to financial

constraints, the Director of the Unit describes the existing staff as competent, enthusiastic but "very stretched".

The users and usage patterns

In an interview with Lalor, he described the initial reaction in the UWI to the introduction of Internet connectivity as being at first skeptical about its value and effect, remarking that the University community tends to be largely conservative. However, now people are requesting electronic mail (e-mail) access. All members of staff and students at UWI and UTECH are eligible to have accounts with JAMNet, managed by the MISU. To date there are no charges for such users. Additionally, a variety of services is provided for a fee to other educational, scientific and non-commercial research users. These services range from electronic mail only by dial in mail agent to full leased line connection to the users network bridge.

The number of accounts established with MISU for Internet connectivity on August 28, 1996, for users on the Mona campus was: Postgraduate Students: 345; Undergraduate Students: 1,422; Academic and Administrative Staff: 657. By comparison, approximate figures for September 1, 1995 were: Postgraduate Students: 110; Undergraduate Students: 650; Academic and Administrative Staff: 270, representing an overall growth rate for the year of some 42%. The total number of JAMNet users is 298. (Numbers provided by MISU).

Usage patterns from the earliest days of Internet connectivity to the present reflect the heavy north-south flow typical in the literature.[42] In March 1993, MISU[43] reported that of 120 active users, 5% of communication took place within the Caribbean area, 60%

to the USA, 30% to the United Kingdom (UK) and Europe, and 5% to the Pacific Region. In 1996, in reply to the question of the countries with which respondents mostly communicated (three expressing desire to communicate if they had access), of the 27 responses, 5 or 19% named countries in the Caribbean, 9 (33%) indicated the UK and Europe, 21 (78%) with the USA, 9 (33%) Canada with another 5 (19%) giving other countries. The low inter-Caribbean usage may in part reflect the limited provision of Internet connectivity in the region. In 1994, when JAMNet was being set up, there were few other providers in the region. Today most of the countries are provided with Internet services, largely by the Cable & Wireless telecommunications carrier, with some private services offered (with interconnection provided through the telecommunications carrier). The trend, however, may also be reflective of poor communication patterns existing within the UWI. The Governance Report summarizes the problem:

> *In such a diverse and dispersed University one would expect that a great deal of attention would be given to communication in its many forms, but in fact a situation has been allowed to develop where very few systematic steps are taken to keep either members of staff or members of the pubic aware of what the University is doing and why...In spite of the enormous advances in IT* [information technology], *the use of modern technology to improve communication between campuses, the Centre, and non-campus countries is minimal".*[44]

As Crook[45] points out, for electronic communication to function in a context where historically there were not patterns of communication, use of the technology has to be planned - at least initially.

As shown in Table 1, the responses to the questionnaire would seem to support this, as when asked if use was made of the Internet to communicate with colleagues within the UWI on the Mona campus, 6 (22%) of the 27 respondents indicated not at all (one stating that people with whom s/he would want to communicate did not have access and another that often persons with whom s/he tried to communicate by Internet did not respond), 15 (56%) infrequently, with only 3 (11%) claiming to use the Internet to communicate frequently with colleagues on the campus. Of these three, 2 indicated that they communicated frequently with one person in particular. Three persons who did not have access felt that they would use it frequently for on-campus communication if they had it.

Table 1: Communication patterns using Internet (N=27)

Frequency of communication	On Mona campus	With other campuses	Non-UWI, within Caribbean	Outside of the Caribbean
Not at all	6	14	14	1
Infrequent	15	6	4	6
Frequent	3	4	4	14
No access/non-response	3	3	5	6

In terms of communication with the other campuses, 14 (52%) indicated that they did not use the Internet to communicate with the other campuses, 6 (22%) infrequently and only 4 (15%) indicating frequent use. Of the 3 respondents who did not have access, two indicated that they would probably use it infrequently for this purpose as they did not

normally have much communication with the other campuses, while 1 felt frequent use would be made.

For communication within the Caribbean outside of the UWI, 14 (52%) did not use the Internet for this purpose, 4 (15%) infrequently and the same amount (15%) frequently. The three who did not have access felt that such use would probably be infrequent. One respondent did not complete this section and another indicated that it depended on need.

By comparison, for communication outside of the Caribbean, only 1 respondent (4%) indicated that the Internet was not used for communication with countries outside the Caribbean, 6 (22%) indicated infrequent use, while 14 (52%) indicated frequent use. Of the three who did not have access, 1 felt that frequent such use would be made, another indicated possible infrequent use, while the third indicated that s/he did not now have such a network but possibilities for development of one existed. Two persons did not complete this section and another indicated that it depended on need.

When one considers that one reason for the establishment of CUNet was to increase communication between the universities in the Caribbean, the question of its success has to arise. We are again reminded that the information technology will not necessarily lead to communication where such patterns did not previously exist. According to the MISU Director, communication within the region has not been drastically impacted as it is not a cultural habit for us to be talking with our Caribbean neighbors. The information technology only reinforces and strengthens existing communication patterns.

In the interview with Lalor, in response to whether he perceived any danger in heavy north-south flow he commented that the important thing was to train people to use knowledge, no matter the origin. Within the region, he felt, there was not enough knowledge based on quality although there was enough to build on. Morin-Labatut[46] supports the view of developing within Third World societies in transition ways of usefully integrating externally generated knowledge and know-how, without destroying the host cultures. Henry maintains that the countries of the Commonwealth Caribbean, which are small in terms of their human resource base, in their budgets and capacity for research and development activity, are unlikely to make great contributions on the scientific and technological frontiers except in a very limited number of areas. He recommends:

> *For the most part therefore,... these countries will need to be heavily dependent, more on their capacity to understand and, where necessary, apply, technological and scientific know-how developed elsewhere, than on their own generation of new ideas. Large countries, including Japan, have had to depend on the received wisdom of others and there is no shame if the Commonwealth Caribbean countries have to do likewise for their very survival. Indeed, there is a high level of creativity involved in learning from others.*[47]

In 1996, in response to whether any effort was being made at a systems level to facilitate communication across departments, the MISU Director indicated that there was no comprehensive, overall plan for the use of the network for communication within the University. Rather, the users, for example, the Bursary and the Registry, each decided on

what they wanted. The MISU Operations Manager and Senior Systems Engineer, Jeremy Whyte, explained that the role of the MISU in encouraging users to look at their functions across departments to identify relationships and overlap in order to use Internet connectivity to share information was an evolving one. The need for easy and coherent data interchange and reports between the University's main information systems *(Banner Finance, PeopleSoft HRMS*, Payroll and Student records) had made this an issue to be addressed and was in 1996 at the stage of systems analysis. The intention was that MISU would make available expertise in the area of systems analysis and coordinate the approaches. However, it was for the users and data owners to indicate at the functional level, the approaches that they would wish taken. At the instigation of the current principal of the Mona campus, Dr. Kenneth Hall, an Information Systems Policy work group has been established since mid 1997 to address these sorts of issues.

Problems and promises

The problem of access was a major cause of limited use cited by respondents to the questionnaire. Lack of or limited access at work, including hardware limitations, was cited by 16 respondents. One in particular commented that "every desk in the bursary has a computer" yet her department had none, although the work of her department (culture) was supposed to have major regional importance within the UWI. Two persons rued the lack of access from their home. For those who accessed through dial up modems, seven found the experience discouraging, referring to the slow speed and frequent bouts of spontaneous disconnection. Seven people indicated that time constraints hindered use of the Internet, with one respondent pointing out that it could take a lot of time to find useful

information. Two persons cited their lack of experience and two expressed the need for a help unit to give assistance, including how to use the computer. One person complained that the server kept going down and one missed the personal contact.

The respondents cited several factors which encouraged them to use the Internet. These were sourcing/exchanging information worldwide (14); speed of communication (10); ease of use (10) - one respondent mentioned that s/he was first introduced to the Internet by a co-worker and then learnt some methods on his/her own; low cost (6); keeping up with developments (4); accessibility (4); convenience (3) - with one person mentioning in particular the asynchronous quality of e-mail; keeping in touch professionally and socially (2); lack of fear about using the technology (1); and one person said that with the Internet connectivity, access to the powerful super-computer was facilitated.

The problem of access is most likely the consequence of the major problem cited by Lalor in the interview conducted with him: that of financing. Even the technical problem of a slow line (64,000 bits per second) could be improved, according to Lalor, if the UWI had the money. The MISU Director agreed with this view and added that bureaucratic delays also were a major hindrance. Although he felt that the technical staff of the Unit was adequate and enthusiastic, with additional finances, the Unit would be able to properly staff a help desk and provide counselors for users, writers of manuals, as well as programmers.

In terms of the importance of telecommunications to the development of the UWI in the five years since 1996, Lalor remarked: "I don't know what is going to happen in the

next five years. The last five have been so slow. We can't develop without it but where will the money come from? The governments say they can't afford what we want." He ended the interview by stating: "Telecommunications and computers will be the driving force in all spheres. Jamaica will do well to develop strengths and commercial strength at every level. If we can't, we will be poor for a long time to come."

Conclusion and recommendations

The information age, fueled by information technologies, is necessitating inter-institutional collaboration at all levels, as highlighted by the experience of the University of the West Indies, located as it is in an environment of small, developing countries.

If the Caribbean is truly to take advantage of the benefits that the information age has to offer, a conscious approach on the regional, national, community and personal level must be taken to the preparation of society as a whole. Without doubt, education and human resource development are fundamental elements. On the regional and national levels, in the preparation of teachers for their profession, strategies need to be found to 1) attract and retain individuals with vision and integrity to the field of education; 2) move education away from rote learning to problem-posing and problem-solving methodologies; 3) equip schools with computers and network connectivity in both the rural and urban areas. In this regard, alliances between the public and private sectors could be developed.

Public education programs need to be devised to develop a greater appreciation in the public at large for the value of information, sources of information, and the manipulation of information. Information is an important aspect of lifelong learning -- an attribute of the knowledge society. Here, more effective use of the broadcast media should

be made, perhaps substituting some of the imported, purely entertainment programming with both imported and locally produced entertaining yet educational programs. At the community level, especially in the poor areas, information professionals need to work with community groups to assist the people in discovering for themselves the value of information and how to access and process the information.

It must be acknowledged that the education process is not a short term solution and may take years for the effects to be felt. Henry[48] recognizes that in the Commonwealth Caribbean non-formal channels of technology acquisition happens through the large number of Caribbean emigrants to North America and Britain. He suggests that institutionalized return migration can contribute to technology information flow, tapping the knowledge and skills of nationals resident abroad by re-attracting their services even on a temporary basis.

While every effort must be made to access and utilize the information available from outside the region, our professionals must aspire to generate, collect, and distribute information about ourselves, for ourselves, as well as for the external market. The information age certainly provides a global market place, and public and private entities need to broaden the perspective of the market beyond the small numbers of the region to the wider universe that is available to us.

The importance of forming regional alliances to share expertise in a variety of undertakings is realized in principle, hence the establishment of bodies such as CARICOM and a large number of other regional associations. However, in practice, much more needs to be done to make the collaboration have even more tangible results. The very

information technologies can assist in strengthening the cooperative efforts. The University of the West Indies, one of only two regional universities in the world, and the West Indies cricket team are two examples of the type of collaboration and team work necessary. Certainly, the UWI must provide much of the original research and information to help balance the flow of information. It must also act as a catalyst in broadening the South-South dialogue, through collaborative efforts with other universities of the South.

Concurrent with the skills needed to adapt, utilize and even develop the information technology software and hardware, the region also needs to be developing a body of expertise required for public and private sector management in the information age and knowledge society. The need for constant update of knowledge and knowledge seeking skills, as well as other skills, such as negotiation has been highlighted.

Dunn points out that in addition to human resource development, the region needs to become culturally

> *secure and comfortable with its own self-worth and heritage and... therefore open to critically relate to new methods of addressing old problems. It is argued here that such a long term process begins with primary and secondary level training in new applications of science and technology and in techniques of marketing and human communication, even as we strengthen early education in the history, arts and culture of the peoples of our regions.*[49]

At the micro-level, inter-institutional collaboration is especially important in small, developing countries, as highlighted with the introduction of Internet connectivity at the UWI Mona campus.

The need to develop communication patterns which better serve the UWI and the region was brought out. While sharing Lalor's view that we learn how to use the knowledge no matter the origin, I believe we must actively work at changing communication patterns established during colonization, that of communicating more with the metropole than with each other. By consciously developing these communication systems we can work at developing local knowledge of good quality. The point is, however, that information technology will not change the pattern. There needs to be some other dynamic established and persons convinced of the validity of such communication.

Small, developing countries face constraints of limited resources and market bases on which to foster competition that forms the basis of the market economy. Governments and monopoly companies often play major roles. The telecommunications industry in the region, on which information technology relies, is one such example. Tri-partide collaboration between government(s),the telecommunication carriers, and the educational sector (in particular, the UWI) is an area in which efforts are being made but need to be strengthened.

The financial constraints are a major concern and creative ways of raising the necessary capital and recurrent finances will have to be found. Alliances with international funding agencies for the provision of infrastructure and technical assistance need to be nurtured and operational systems improved on both the part of the lending and borrowing

institutions to ensure more timely implementation. For recurrent expenses, user charges may be one solution, but caution must be exercised so as not to exclude a major portion of the population from the information age.

At the UWI investigations and negotiations continue to arrive at the most cost beneficial means of providing the information technology services necessary for the twenty first century. One possibility is the provision of direct satellite communication systems for data transfer. Stream-lining the service provision for infromation systems is another area for possible development, bringing together under one roof the MISU, the computer science department, and the electronics unit, as well as large public clusters of computers to increase access.

Information technology and the vast resources and opportunities presented by access to the Internet will require a cultural change in both attitude and skills of the users. The full benefits will not be realized if we continue to simply automate the way we have worked in the past. With the provision of Internet connectivity on the Mona campus, a major developmental opportunity presents itself but to take full advantage of it will require major institutional change.

[1] Drucker, P. (1992). **Managing for the Future**. Oxford: Butterworth-Heineman.

[2] Naisbitt, J. and Auberdene, P. (1990). **Megatrends 2000: Ten new directions for the 1990s**. New York: William Morrow.

[3] Drucker, *op.. cit.*

[4] Drucker, *op. cit.* p. 151

[5] Drucker, *op. cit.*

[6] Stone, M. (1996). **Roundtable on Information Technology and Culture**. Conference on Caribbean Culture, UWI, Mona, Jamaica, March 4-6, 1996.

[7] Hall, B. W. (1994). *Information Technology and Global Learning for Sustainable Development: Promise and problems.* In **Alternatives** Vol. 19 no. 1 1994. pp. 99-132, p. 102.

[8] Slamecka, V. (1982). *The inclination toward information use*. In Sweeny, G. P. (ed.) (1982). **Information and the transformation of society**. North Holland Publishing Company. Institute for Industrial Research and Standards, Amsterdam. pp. 64-70

[9] Slamecka, *op. cit.* p. 67.

[10] Hall, *op. cit.*

[11] Hamelink, C. J. (1995). *Global Communications: Northern control and Southern dependence*. **In Third World Economics** No 123 16-31. October 1995. pp. 14-16

[12] Hamelink, *op. cit.*, p. 14

[13] Hamelink, *op. cit.*

[14] Hamelink, *op. cit.*

[15] Dunn, H. S. (1995) *Policy issues in communications technology use: Challenges and options.* In Dunn, H. (ed.). (1995). **Globalization, communications and Caribbean identity**. New York: St. Martins Press and Kingston: Ian Randle Publishers. pp. 18-19

[16] Dunn, *ibid.*

[17] Dunn, *ibid.*, p. 30

[18] See: UNCTAD (1990). **Problems of island developing countries and proposals for concrete action**. New York: UNCTAD.

[19] Henry, R. M. (1991). *The information imperative in the development of the Commonwealth Caribbean.* In **Information Development** Vol. 7 no. 1, 1991. pp. 32-38

[20] OAS (1995) **Summary Description of the Treaty Establishing the Caribbean Community (CARICOM).** http://www.sice.oas.org/summary/sumcar.htm

[21] Drucker, *op. cit.*

[22] Dunn, H. (ed.). (1995). **Globalization, communications and Caribbean identity**. New York: St. Martins Press and Kingston: Ian Randle Publishers. p. xii

[23] Henry, *op cit.*

[24] Henry, *ibid.*, p. 33

[25] Peart, M. (1996). **Technology and Culture: A case for assessing changes in education in the Caribbean**. Conference on Caribbean Culture, UWI, Mona, Jamaica, March 4-6, 1996.

[26] Peart, *ibid.*, p. 6

[27] Planning Institute of Jamaica. 1993,1994,1995,1996. **Economic and Social Survey, Jamaica.**

[28]Dunn, H. S. (1995) *A one-way street just off the global digital superhighway: Debating monopoly control and policy-making in Caribbean telecommunications.* In Dunn, H. (ed.). (1995). **Globalization, communications and Caribbean identity.** New York: St. Martins Press and Kingston: Ian Randle Publishers.

[29] Hamelink, *op. cit.*

[30] Pickersgill, R. (1996). **National telecommunications policy and regulation in a world of networks: A Caribbean perspective**. Speech given at the CANTO 12th Annual Conference and Trade Exhibition, Montego Bay, Jamaica, June 1996.

[31] Dunn, H. S. (1995) *A one-way street just off the global digital superhighway: Debating monopoly control and policy-making in Caribbean telecommunications.* In Dunn, H. (ed.). (1995). **Globalization,**

communications and Caribbean identity. New York: St. Martins Press and Kingston: Ian Randle Publishers.

[32] Dunn, *op. cit.*

[33] Dunn, *ibid.*, p. 139

[34] Lalor, G.C.(1982).**Caribbean Regional Communications Study Report**. UWI, Kingston, Jamaica. p.5

[35] CUNet (1991) **The Caribbean Academic and Scientific Network, Seminar-Workshop**, San Juan, Puerto Rico, September 9-11, 1991

[36] OAS (No date) **Hemisphere-wide inter-university scientific and technological information network** (RedHUCyt)

[37] JAMNet (No date) **Project to Interconnect Jamaica to the Internet**

[38] JAMNet, *ibid.*

[39] Manison, Keith. 1995. **Mona Information Systems Unit**. Unpublished. p. 1

[40] Manison, *ibid.* p. 1

[41] Manison, *ibid.*, p. 1

[42] See Hall, *op. cit.* and Hamelink, *op. cit.*

[43] MISU (1993). **Electronic Mail at UWI, Mona**. Unpublished.

[44] Report of the Chancellor's Commission on the Governance of UWI (1994). **The UWI: A new structure; The regional University in the 1990s and beyond**. UWI. p. 42

[45] Crook, C. (1988). *Electronic media for communications in an undergraduate teaching department.* In Smith, David (ed). **New Technologies and Professional Communication in Education**. London: National Council for Educational Technology.

[46] Morin-Labatut, G. (1991). *Is there a user in the house? Connecting with the user of information services.* In **Information Development** Vol. 7 no. 1, p 43-48.

[47] Henry, *op.. cit.* p. 33

[48] Henry, *op.. cit.*

[49] Dunn, H. S. (1995) *Policy issues in communications technology use: Challenges and options.* In Dunn, H. (ed.). (1995). **Globalization, communications and Caribbean identity**. New York: St. Martins Press and Kingston: Ian Randle Publishers. p. 38