THE POLITICAL ECONOMY OF THE INTERNET IN CUBA

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There are many misconceptions in the United States about the technological and social status of the Internet in Cuba, in part due, perhaps, to the still considerable isolation of the island under the U.S. trade embargo and, consequently, the relative lack of field research on this and other subjects of contemporary interest concerning Cuba. The lack of knowledge about the state of the Internet in Cuba obtains notwithstanding the work there of noted American Cubanologists, since their research has not, for the most part, incorporated the issue. Another consideration, the specialized and technical nature of the subject, may account, more generally, for the dearth of studies on the Internet in Cuba from any source, at least ones that involve economic as well as social and technical analysis: Several of the outstanding ones available have been cited herein.

In order to fill the gap just suggested and to permit the authorial collaboration that produced this study, the authors have: (1) relied on the field research in Cuba over several years by one of the authors (Valdés), whose expertise in the subject is widely recognized, as is his professional involvement with the Internet in both Cuba and the United States; and (2) limited themselves as much as is reasonably possible to an empirical, if largely descriptive, account which avoids politicization of the analysis, while (3) squarely addressing one interpretive and theoretical question, namely the extent to which the Internet may be taken to be an engine for induced political or politico-economic change in Cuba. On this issue (if not on others), the authors agree: The Internet is unlikely to drive political change in Cuba as some proponents of such change might wish, in part because of conditions peculiar to Cuba but, in a larger sense, because such technologically-induced change is unlikely either in the developing or developing worlds, albeit for different reasons. This topic is taken up toward the end of the study in relation to three leading theoretical premises of technologically- and, specifically, Internet-driven change.

BRIEF HISTORICAL CONTEXT AND CONTEMPORARY OVERVIEW OF COMPUTING AND NETWORKING IN CUBA

In 1964, Cuba's Ministry of Industries established a Department of Automation and imported a handful of computers from Poland. Four years later, the University of Havana (with the support of the Political Bureau of the Cuban Communist Party) established a Center for Digital Investigation to develop a domestic computer-manufacturing capability. In 1970, an engineer, Orlando Ramos, designed the CID-201, the first Cuban computer. Between 1973 and 1976, a series of bilateral agreements were signed with the Soviet Union whereby the latter agreed to help Havana develop a computer industry. With Soviet assistance, Cuba built its first personal computer assembly line in 1978. Computing resources grew from 12 mainframe computers and 100 minicomputers in 1976 to 28 Soviet-made mainframe computers, some 200 Cuban-built minicomputers, and 4000 microcomputers as of 1987. The 1980 Cuban Communist Party Congress officially acknowledged the need to develop computerized telecommunications, including the transmission of data and information.

In 1983, a satellite link gave Cuba access to about 50 Soviet computer databases, which were used primari-

ly in connection with economic planning. By contrast, computer networking among Cuban institutions was almost nonexistent until 1988, when a branch of the Cuban Academy of Sciences established the first domestic electronic network, which offered data transmission, electronic mail (e-mail), and access to Cuban databases. As of November 1992, Cuba had 9 computer networks serving more than 1500 users. By the summer of 1994, the total had nearly tripled to 26 networks (including 11 for use by scientists, 8 serving social science research as well as libraries, and 4 educational networks linking universities, high schools, and technical institutes).

As of this writing, Cuba has dozens of public domestic computer networks plus hundreds of "local," "closed," or "private" networks. E-mail is available to thousands of individual users associated in one way or another with institutions that have been assigned e-mail accounts. Examples of Cuban networks include the National Library's Binanet, the National Neurosciences Center's CNC, Oriente University's UOnet, and BioTec, a network devoted to biological and biotechnology information. Three of the networks — CENIAI, CIGBnet, and InfoMed — are particularly important; TinoRed was an important network engaging Youth ("Joven") Clubs which was terminated in 1997 due to a funding crisis tied to its dependence upon overseas sponsors. Networks now playing important roles with regard to e-mail and/or the Internet include:

CENIAI: The Centro Nacional de Intercambio Automatizado de Información (National Center for Automated Exchange of Information) is a network that was started within the Academy of Sciences but now operates under the auspices of the Ministry of Science, Technology, and the Environment and is one of five divisions of the Institute for Scientific and Technological Information. CENIAI, which has more institutional and individual users than any other Cuban computer network (in excess of 5000), serves the academic community, particularly that devoted to the "hard" sciences. It functions as a gateway to other domestic and foreign computer networks and offers access to databases produced by more than 200 domestic research facilities. CENIAI's establish-

ment of a data-transmission satellite link with the Soviet Union in 1983 gave Cuba its first access to on-line databases abroad. It has trained personnel from hundreds of other Cuban institutions in the use of foreign databases and e-mail. As of this writing, CENIAI has 633 institutional subscribers.

As Larry Press indicates in a recent (1998) treatment of Cuba's Internet, in October 1996, with technical assistance from the Organization of American States and the Latin American and Caribbean Networking Forum, "CENIAI established a 64kb/s IP link to Sprint in the U.S., at a cost of $10,000 per month," and in February, 1997 it "took over administration of the .cu domain," providing "connectivity at 64kb/s to 9 networks in Havana." Press adds that the majority of Cuban users access the Internet via e-mail routed through CENIAI, and that CENIAI's Internet services arm does "Web and BBS development, and operates Web, list, news, and gopher servers." Since 1996, traffic "has grown rapidly . . . and it is now saturated," so that CENIAI has planned to upgrade its Sprint link to at least 256kb/s soon, and may need to obtain a link to Italy or other nations as well — international circuits are provided by the Cuban telephone company ETECSA, Empresa de Telecomunicaciones de Cuba, S. A. To lighten the bandwidth load, the CENIAI web server is augmented by a link to (or "mirrored" at) the Scientific Network of Peru.

Red David: Red David, whose name is a reference to the story of David and Goliath, is a group of Cuban nongovernmental organizations (NGOs) that for a time used the TinoRed network. Because Red David had a relatively democratic and participatory subculture that was not shared by TinoRed's administrators, relations between Red David and TinoRed were sometimes tense.

InfoMed: Created in 1992, InfoMed, the network of the Ministry of Public Health's National System of Health Information, is now used extensively by the Cuban medical community. (Since early 1996, it has had in excess of 500 fee-paying user accounts, some 80 percent of which are institutional accounts shared by more than one individual.) As described by the ministry, its goals are to facilitate the exchange of

electronic information in the field of medicine, biomedicine, and general health and to facilitate linkages among professionals, academicians, researchers, public health workers and others in Cuba and abroad. Despite significant limitations, InfoMed's e-mail service was a vast improvement over the previous situation of reliance on surface mail for domestic and international communications alike.

InfoMed is connected to all of the major Cuban domestic networks. It not only offers domestic and international e-mail, providing connectivity for other organizations, but it also hosts moderated and unmoderated discussion groups and makes a variety of research data files available for remote retrieval. Users can request bibliographic and reference materials kept at InfoMed on CD-ROMs or in databases elsewhere. InfoMed distributes health news from Cuba and abroad, the tables of contents of foreign medical periodicals, and other information. Its staff members also provide hardware and software technical support to member institutions. With assistance from the United Nations Development Program, InfoMed has established nodes (server computers) in 13 of Cuba's 14 provincial medical schools. InfoMed has also received help from the Pan American Health Organization and the World Health Organization toward these ends.

CIGBnet: This is the network of the Centro de Ingeniería Genética y Biotecnología (Center for Genetic Engineering and Biotechnology) research facility in Havana. Established in 1991, CIGBnet serves more than 1000 users at 4 major Cuban genetic engineering and biotechnology centers (two in Havana, one in Camagüey, and a fourth in Sancti Spíritus). In addition, its staff members engage in software research and development, some of which may prove useful to other developing countries. The network also supports the Heber Biotech firm, which markets CIGB bioengineered and pharmaceutical products in more than eighty nations.

Commercial Networks: One example is Cubanet, which as of December 1994 served 28 joint-venture and tourism-oriented enterprises, offering them access to other commercial services around the world (at prices unaffordable to most Cubans). (This network is completely distinct from the Miami-based World Wide Web site CubaNet.) Another example is Coral Container Lines — an enterprise involved in the shipping of containers to and from Cuba which operates a 55-terminal private/local network (with about 35 to 40 users per day), offering international e-mail services via connections to CENIAI and CIGBnet. Cuban banks serving domestic and international commerce have developed secure messaging and office transaction processing software packages, and bank automation has witnessed substantial increases in automation and internal networking, though not yet much external connectivity.

The tourist sector has its own network administered by the Electronics for Tourism Group (Grupo de Electrónica para el Turismo), which serves all tourist chains in the country. The Islazul tourism chain, for example, is linking over 40 of its hotels to the Internet. A complex of twenty schools of hotel operation and tourism across Cuba is networked by e-mail. In Camagüey, this network includes a limited city network that channels electronic mail among a number of institutional users, including the school of tourism, the University of Camagüey, the medical school's Infomed site, a sugar central service center, and a fledgling software company.

In general, there is much more e-mail connectivity across Cuba than internet connections and access, but the island's commercial presence on the Internet is impressive, as to number of sites and their graphic quality and sophistication, particularly in tourism; for example, Cubanacán rents automobiles over the Internet, the Gran Caribe hotel chain offers reservations via the Internet, and Artex offers a website for compact discs of Cuban music. One aim of the Cuban government is to involve erstwhile Cuban entrepreneurs as well as established state enterprises in international electronic commerce, by both encouraging interest in it as a novelty and rendering its use a more or less routine part of the projection of commerce. One way in which that familiarization with networking is occurring is through existing electronic networks and sites (see Table 1).

Table 1. **Partial List of Networks and Major Internet Sites in Cuba**

- CENIAI
- Infomed
- CEDISAP (Centro para el Desarrollo Informático para la Salud Pública)
- BioRed (Havana)
- BioTec (Centro de Información y Consultoría para la Biotecnología y la Industria Médico-Farmacéutica)
- Red de Unidad de Análisis y Tendencias en Salud (Havana)
- Compañia Telemática Internacional SA, Gerencia DHL-Havana
- Instituto de Cibernética, Matemática y Física (Havana)
- Joven Club de Computación
- Movimiento de los Joven Club de Computación:
- Red de la Academia de Ciencias de Cuba (REDACC) (Havana)
- Red Biblioteca Nacional de Cuba (Havana)
- Red de Centro de Ingeniería Genética y Biotecnología (Havana, Sancti Spíritus)
- Red del Centro de Neurociencias de Cuba (Havana)
- Red del Centro Provincial de Información de Ciencias Médicas (Camagüey, Guantánamo, Sancti Spíritus)
- Red de Electromedicina Provincial (Holguín)
- Estación Terrena de Holguín (MINCOMS)
- Red de la FIDICT de Cienfuegos (PERLA)
- Red de Granma (Bayamo)
- Red de Ciego de Avila (FICA)
- Red de la Provincia de Guantánamo
- Red del Polo Científico de Sancti Spíritus (Yayabo)
- Red del Instituto de Ciencias Básicas y Preclínicas (Havana)
- Red del Instituto Superior Politécnico "José Antonio Echevarría" (Havana, Santiago de Cuba)
- Red del Ministerio de la Industria Alimenticia (Havana)
- Red Universitaria de Información Científica y Tecnológica (RedUniv)
- Red Universidad Central de Las Villas
- Red Universidad de Cienfuegos (UDEC)
- Red Universidad de la Habana (COMUH)
- World Ordering Network Service (Grupo Cubanacán, Havana)
- Red de Turismo

THE MECHANICS AND POLITICS OF OPENING A GLOBAL CONNECTION

In 1988 and 1989, North American academics talked with Cuban Communist Party officials as well as Cuban and American computer specialists about the possibility of opening electronic data-transmission links with Cuba. In 1990, the Canadian and U.S. affiliates of the Association for Progressive Communications (APC), an international computer network serving NGOs and citizen-activists pro "social justice, environmental sustainability and related issues," explored the possibility of an APC e-mail routing mechanism for Cuba. Legal advice was sought in the United States because the Institute for Global Communications (the U.S. APC affiliate) was concerned that its effort would be hampered if the U.S. government were to declare it illegal.

In April 1991, the office of the "ideological secretary" of the Central Committee of the Cuban Communist Party, then under the direction of Carlos Aldana, approved the establishment of an e-mail connection between Cuba and Canada. It was understood that the Cuban side could not afford to pay for the daily telephone calls to Canada. This decision was a major step toward Cuban participation in the Internet. A key reason for the success of the negotiations was that security and ideological issues did not surface. Neither the Cubans nor the Americans involved attempted to bring pressure to bear over who should or should not be allowed access to the e-mail connection. In short, no attempt was made to frame the issue of external connectivity in the context of political conflict between the United States and Cuba. Both parties were ready at that point in time to promote Cuba's connectivity to the internet and world wide web.

With help from the Canadian and U.S. affiliates of the APC, the anticipated e-mail link was finally established in January 1992. Every night at about 11 p.m. EST (unless there were technical or financial difficulties), a long-distance call was made in Toronto by Web Networks (the Canadian APC affiliate) to CENIAI in Havana. For about ten minutes, each side sent e-mail messages accumulated during the preceding twenty-four hours. In this way, the Canadians relayed for the Cubans messages to and from the rest of the world. The volume of traffic through this connection sometimes overwhelmed its capacity (also limited by the APC's modest budget).

By early 1996, both the internal Cuban and multilateral debates over networking, as they had taken form around these negotiations, had clearly been settled in favor of greater connectivity for Cuba. The just-described e-mail service had significant limitations, however. It offered no means of Internet exploration or interactive communications, and data searches

were difficult. In contrast to the near-instantaneous e-mail enjoyed elsewhere in the world, Cuba's e-mail via Web Networks was subject to delays of up to a day. For Cuba, however, the APC service represented a vast improvement over the previous situation in which a letter into or out of the country could take months to arrive (if it arrived at all). In 1993 and 1994, moreover, Cubans began to make adroit use of e-mail to access a significant part of the Internet's resources by means of commands sent to automated data servers abroad — part of the story of access told at the end of this study.

Around fall 1992, the U.S. government began to take notice of Cuba's new global e-mail capability and to weigh whether this development could be used to gain political leverage over Cuba. In particular, Edward Gonzalez and David Ronfeldt (1992), working under contract for the Office of the Secretary of Defense, wrote a study, *Cuba Adrift in a Postcommunist World*, that advocated "[building] bridges across computer networks" in the hope that "freer information flows" would "foster pluralist tendencies" (pp. 71-77). This handed powerful arguments to those within Cuba's Ministry of the Interior, military counterintelligence, and elsewhere who opposed expanded contact with the United States.

Their position was further strengthened on October 23, 1992, when President Bush signed into law the Cuban Democracy Act. Interpreting the bill's telecommunications section as signaling a program of penetration and subversion, the Cuban government put the brakes on further networking talks. The use of e-mail, particularly domestically, continued to grow, but movement toward other forms of connectivity (especially those involving real-time interaction through the Internet) became much more problematic. Whereas establishment of the APC e-mail link had required only a moderately simple decision by a single party official, the new political climate dictated that the move to a full Internet connection could take place only when the highest authorities in Cuba so decided.

The situation of heightened Cuban government suspicion was further exacerbated in the fall of 1993, when the U.S. Interests Section in the Swiss Embassy in Havana managed to obtain a TinoRed e-mail account which the U.S. cultural attaché used to post publicly on TinoRed materials about the United States and U.S. government policy statements on Cuba. The Cuban government reacted with a swift cutoff of the U.S. Interests Section's e-mail privileges.

In January 1994, a financial crisis surfaced in Canada's Web Networks, which had to find 1000 dollars per month to pay for long-distance calls to Cuba. The problem was temporarily solved by a combination of emergency donations and a drastic reduction in e-mail traffic by the middle of the year.

Meanwhile, the United States media was discovering the Cuba-Canada e-mail connection. The Miami Herald published a long article on the subject in late April 1994, which was soon followed by a number of other articles in Miami-based publications. Not surprisingly, perhaps, several exile groups — and individuals acting on their own — soon began sending anti-Castro messages to any Cuban e-mail accounts they could contact. In one famous instance an anti-Fidel message was sent by e-mail from abajofidel@aol.com to all TinoRed addresses. What the senders did not realize, though, was that the systems operator at TinoRed, anticipating such an event, had created a routine by which such messages would be flagged before being forwarded. As they continued to arrive from America Online, the operator created another routine which erased all mass mailings from that source. Arguably, these sorts of incidents played into the hands of those in the Cuban security services who were opposed to Internet connectivity.

Political and ideological divisions over the Internet aside, one reason for the Cuban government's lack of enthusiasm for a large, uncontrolled influx of Internet users may be the seriously deficient condition of the country's telephone infrastructure. On June 30, 1994, the Cuban Ministry of Communications issued a resolution intended to centralize all networking-related activities. Many Cuban institutions and users spent the next six months trying to interpret and clarify the implications of this move. The word circulated that it would "take time" before an Internet connection was established, and that this would

not be done by the Ministry of Communications. Whatever the reasons for the Ministry's stance, the practical outcome was that the Cuban government had opted for a combination of (1) a high level of international connectivity selected for commercial and research uses with (2) limited and controlled access domestically.

Even as the idea of connectivity became increasingly politicized, efforts were under way to restore forward movement. Discussions took place in Mexico in 1994 about the possibility of sharing of a communications satellite as a way of giving Cuba a more reliable electronic connection with the outside world. The Pan American Health Organization donated a server computer to Cuba's Ministry of Public Health for use as a medical Internet node. The United Nations Development Program gave $250,000 to help Cuba get an Internet connection. The Organization of American States, which was involved in the development of a Latin American science and technology network, also expressed interest in helping, but the United States vetoed the idea at the OAS. The Internet Society (an international voluntary-membership professional organization that is the Internet's nearest approximation to a managing authority) was eager to provide as much help as the United States would allow. In United States foreign policy circles, some favored the development of networking in Cuba because this might expose the island to ideas that could encourage political change; however, this position had not yet found coherent articulation.

During this time, important developments were taking place with regard to Cuba's decrepit telephone system (much of whose equipment was installed in the 1930s and 1940s). On June 13, 1994, at a ceremony attended by both Cuban and Mexican political leaders, the Mexican telecommunications company Grupo Domos signed an agreement with the Cuban Ministry of Communications to modernize the telephone network through a joint venture with the Cuban government. (As remarked later in this study, however, this venture would fail in short order for lack of capital.) In July 1994, the U.S. Treasury Department decided that the transfer of data or information to Cuba by any U.S. carrier could take place,

as long as there was no transfer of money. In October, the U.S. Federal Communications Commission approved agreements between the Cuban telephone enterprise and U.S. telephone companies to offer direct telephone service between the two countries; such service became available on November 25, 1994.

The debate within Cuba about the Internet intensified in the months following January 12, 1995, when InterNIC (a cooperative U.S.-based project that handles the registration of networks joining the Internet) granted CENIAI a Class B Internet address (in effect giving Cuba permission to join the Internet). Numerous forces were involved. The Cuban military was concerned that hostile foreign governments could use the Internet to threaten national security. The Ministry of the Interior saw the global network as a potential conduit of anti-regime political and ideological propaganda. On the other hand, the Ministry of Communications and the various "mixed" enterprises (i.e., joint ventures between the Cuban state and foreign private capital) involved with telecommunications saw Internet connectivity as a means of increasing their revenues.

The Ministry of Communications argued that any political or military risks could be minimized by charging high prices for access — a fiscal means of controlling access while increasing connectivity. This, again, seemed to be emerging as the *de facto* Cuban government position on Internet access and connectivity. Others, for instance many social sciences and humanities research institutions, viewed the Internet as a means of access to a vast global pool of information and an alternative to periodicals that they could no longer afford. Some observers consider this intellectual sector (which avidly seeks overseas collaboration) to be the largest potential single market for Internet services.

In addition to the battle over the Internet's implications for Cuba, there were also struggles over who would control the Cuban system and what its physical structure should be. It took more than a year to resolve these conflicts. In the United States, as noted earlier, some in government and elsewhere favored the development of networking in Cuba because this

might encourage political change. But some Cuban-American leaders opposed it because of its potential economic benefit to the Cuban government. These critics also pointed out that the basic tools of network access (telephones, computers, modems) were largely unavailable to Castro's political opponents in Cuba or the majority of Cuban homes in general. In October 1995, the Clinton administration tried to assuage this concern by various means, including a $500,000 grant to Freedom House, in part to be used to purchase computers for the anti-Castro opposition.

Correspondingly, it had occurred to Cuban government officials that they could also play the game of using the Internet to spread ideas. Jesús Martínez, the head of CENIAI, argued in a September 1995 interview with the Cuban news agency Prensa Latina that "the Internet allows us to establish relations [and] make public to the world the reality of Cuba." Prensa Latina returned to this point in 1996, stating that "Cuba, with full access to Internet information services, expects to be an active supplier of information and not just a passive recipient." One step in this direction was the establishment in January 1996 of an official Cuban site (Cubaweb) on the World Wide Web. The site includes sections on news, art and culture, science and technology, medicine, business and trade, consular and tourist information, and an e-mail directory. Because of the limited capacity of Cuba's telephone system, the site is located on computer facilities in Canada.

As suggested earlier, by early 1996 the policy debate in Cuba over networking had clearly been settled in favor of greater connectivity. One signal came in mid-January, with the appearance of an official statement in the country's media that "Cuba expects to join the Internet in a few months and is working intensively on measures to regulate the service in Cuba." On March 23, at the Fifth Plenum of the Central Committee of the Cuban Communist Party, Carlos Lage (secretary of the Executive Committee of the Council of Ministers) offered a review of the country's economic situation, in the course of which he emphasized the growing importance of computer-based communications, pointing out that "one telex

can cost twelve dollars [whereas] the same message [costs] seventy-five cents in the form of a fax and three cents via the Internet."

He argued that "in spite of our blockaded circumstances, we are in a relatively good position [to face the challenges of scientific and technological changes], due to the educational and scientific work developed by the Revolution." In April, a new Computer Technology Video Library was opened in Havana, containing more than two thousand videos, many offering instruction on using the Internet. Just a few weeks later (on May 9-11), the Ministry of Science, Technology, and the Environment held its first national Telematics Congress, attended by scientists, technicians, government officials, educators, librarians, and researchers from throughout the country. Most of the panel discussions dealt with Internet services, connectivity, administration, and security.

In June, the Executive Committee of the Cuban Council of Ministers completed action on Decree-Law 209, which regulates the use and development of information networks and Internet services within Cuba. In principle, the decree does not give any single interest or institution the power to dictate what should be done and how. Instead, there is to be a functional division of labor among multiple collaborating institutional players and sectors of authority. This model stands in decided contrast to the 1994 attempt by the Ministry of Communications to centralize control of all facets of networking and telecommunications. The decree designates an Interministerial Commission to regulate access to and management of all Internet information, to supervise the functioning and development of national networks, to monitor technological change and its use, and to supervise security procedures. This commission is made up of five ministries:

1. The Ministry of Science, Technology, and the Environment (CITMA) is to issue licenses and accounts for the distribution of information. CITMA is a central player on the commission because it controls three major entities heavily involved with the Internet: CENIAI, with its long track record in international and domestic network operations; the Information Institute of

Science and Technology (responsible for the technical administration of the information services side of the Internet), whose librarians and researchers provide the scientific and technological community with specialized information; and the Agency for the Development of Information, which is involved with the development and marketing of software and databases.

2. The Ministry of Communications (MINCOM) which is charged with operating the telecommunications hardware and structures used by networks but not with running the networks.

3. The Ministry of the Interior (MININT), for technical security and political monitoring.

4. The Ministry of Justice (MINJUS), responsible for the legal framework of the entire operation, including preparation (if necessary) of new legislation.

5. The Ministry of the Revolutionary Armed Forces (MINFAR) to ensure (through undisclosed means) that the Internet will not weaken the security of the Cuban state.

The Minister of Metallurgy and Electronics Industry presides over the Interministerial Commission, which coordinates the work of its member entities. According to the decree, it is the responsibility of the commission "to assure the coherent behavior of the various central state administrative agencies and guarantee that proper action is taken in the face of possible changes in technologies or other problems that might occur." In addition, the commission is charged with addressing "informatics security, development policies, and the introduction of technologies in the country's socioeconomic processes, while ensuring that all investments made are compatible with Cuba's defense systems."

The decree further stresses "the need for policies and a strategy" on networking that will be consonant with the country's culture, its developmental needs, and the "interests of national defense and security." It also states that it is necessary to ensure that the information that Cuba receives from abroad will be "in accordance with Cuba's ethical principles and not harmful to the country's interests and security." The decree establishes general guidelines for network access and states that "priority will be given to institutions considered the most significant in the country's life and development." Only legally recognized state-sanctioned enterprises and institutions will have access, and individual Internet accounts will not be granted.

Nicolás Garriga, director of the Information Institute of Science and Technology, gives the official rationale, namely that the access limits mandated by the decree will let Cuba acquire some practical experience in Internet operations without having too many users at the outset: "It is senseless to authorize or connect a given number of networks or computers, and then have different kinds of problems. This does not mean we will exclude any sector [of Cuban society] … We have identified approximately ten sectors that should be connected [to the Internet] in the first phase." Each of these primary sectors (e.g., the medical sector) could contain hundreds of users.

As already suggested, the state of the country's telephone infrastructure does not permit large-scale access to the Internet in any event. That infrastructure is seriously deficient even in Havana and in still worse condition outside of it. In Cuba, modems work fairly well at a speed of 1200 baud (fast enough for e-mail and text transmissions), but the country's exceedingly old and noisy copper telephone lines are unable to handle the 14,400 to 28,800 baud modem speeds needed for efficient access to the Web. As noted earlier, plans are under way to modernize the telephone system, but these have been delayed. One way around the overloaded telephone system has been via special channels available to the Ministry of Tourism and the Ministry of Science, Technology and the Environment. This infrastructure provides the backbone linking the provinces of Pinar del Río, Matanzas, Habana, Villa Clara, Ciego de Avila, and Camagüey to the national data-transmission network. Even the special channels, however, lack the capacity to serve large numbers of future users or to handle high-speed multimedia transfers at present.

As Press (1998) argues, Cuba's information infrastructure cannot be improved without capital and a

significant turn away from centralized planning (e.g., by the interministerial networking Commission) and from access restrictions arising from the perceived threat of political or cultural subversion by way of the Internet and the World Wide Web. Press (1998) notes that telephone infrastructure presents a formidable obstacle to internet development, connectivity, and access:

> Cuban telecommunication infrastructure lags behind much of the world and the Caribbean region. Cuba has fewer telephone lines as a proportion of population than any large Caribbean nation but Haiti, and is closer to the low-income nations of the world than the lower-middle group in which it falls. . . . Not only is there little infrastructure, what is there is obsolete and in ill repair. The poor condition and slow growth of the telephone system reflects the difficulty of attracting capital . . . [in the case of the failed joint venture with Domos], [d]ue in part to the collapse of the Mexican peso and pressure after the Helms-Burton Bill passed, Domos failed to raise additional capital. This, coupled with poor management, resulted in their being in default on the investment required under their agreement with ETECSA [Empresa de Telecomunicaciones de Cuba], and they lost their equity.

In July 1996, Internet-related equipment (including routers and servers) purchased a few months earlier was installed, and technical training ensued. On July 26, Radio Havana Cuba announced a plan to increase telephone lines from 500,000 to 1 million, with a goal of 20 telephones per one hundred urban inhabitants and 10 per one hundred rural. The installation of digital telephone lines in Havana began in late July. In August, the U.S. State Department began to pressure Grupo Domos, the Mexican company carrying out the telephone modernization, by denying visas to its executives under a provision of the Helms-Burton Act, on the grounds that Grupo Domos was using equipment that had been confiscated from a U.S. firm by the Castro government — thus began the unraveling of the Grupo Domos-ETECSA agreement.

In early August 1996, CENIAI began to offer Internet services on a limited trial basis to a select group of institutional users. The Internet sessions took place (by appointment only) after 4 p.m. on weekdays on four terminals set up in the country's Capitol building. InfoMed and CIGBnet had also been experimenting with the Internet via long-distance telephone hookups to Internet providers in Britain and Canada respectively. In addition, the two institutions (with help from the World Health Organization) have constructed an "intranet" — a local (Cuba-only) version of the Internet. The intranet's users cannot access the real Internet directly, but they can see selected materials previously downloaded from the Internet and made available by the InfoMed staff. CENIAI, InfoMed, and a number of mixed enterprises have recently begun to offer courses (open only to persons approved by their workplaces) on various aspects of the Internet (e.g., e-mail, creating Web pages, search engines). These courses are invariably filled to capacity.

Cuba officially joined the Internet on October 11, 1996, an event which was described by the Ministry of Foreign Affairs in glowing terms:

> Cuba is connected since last Friday to INTERNET, turning into a reality what had been a dream for so long: having access to an international patrimony of knowledge used by some 36 million clients of 160 nations. As a result of the efforts of hundreds of specialists, Cuba will have access from now on to some 34,000 data bases of the most ample spectrum of social, political, economic, scientific and sports information.

THE INTERNET AS A CATALYST FOR POLITICAL CHANGE: ARGUMENTS AND A CRITIQUE

The notion that the Internet inevitably transforms whatever it touches seems to be a part of the new orthodoxy concerning the so-called "new" and/or "global" information economy. Is this likely true to be true for Cuba? Following are some of the arguments that are advanced:

Sovereignty Is Obsolete

Some commentators have asserted that the global pervasiveness of the Internet, which permits information to sweep past borders at electronic speeds, is rendering obsolete the concept of national sovereignty. This view is an oversimplification, however. Governments throughout the world have recognized the

challenge and have begun to take various measures to impose at least some degree of control. France, China, and Germany, for example, each have a regulatory agency. Vietnam and Singapore, among others, each route all Internet traffic through a single gateway. A number of countries have blocked access to certain Internet sites offering material deemed to be pornographic or politically unacceptable.

Cuba has already taken some of these steps. Cuba's Internet policy will be determined by the government's assessment of its and the island's situation: prospects, perils, opportunities and needs, often in the context of Cuba's economic reinsertion by way of foreign investment, joint ventures, and the like — economic dynamics amply explored elsewhere in this conference. Efforts by the United States as a matter of policy to demand a "laissez-faire" approach to internet access on the part of Cuba might only produce counterproductive reaction.

The Internet Will Cause Political Change

Some observers claim that exposure to the outside world via "cyberspace" will create a climate of democratization in Cuba that will lead to the drastic alteration or overthrow of the government. The implicit assumption here is that Cubans have not already acted to bring about such changes because they do not know their own political, social, or economic realities. In reality, while there are instances of political resistance such as independent journalism for which the web has been a venue, such action appears to be *facilitated* more than it is directly *inspired* or *prompted* by the web — witness the impact of CubaNet.

A variant of this thesis is the belief that, aside from whatever specific information may be transmitted into or secreted out of Cuba, the demonstrative power of a structureless internet itself — as a decentralized international "network of networks" with no formal governing hierarchy—could encourage Cubans to reject authoritarianism. But this image of the Internet as a libertarian engine of change is may be obviated if, as appears to be occurring, commercial interests move in, convert the Internet into a vast global marketplace, and impose rules, restrictions, and fees. The process is already underway in much of

Latin America, where networking and web access have been centralized by private capital. Thus, the Internet that Cubans will encounter in coming years may be driven not so much by computing enthusiasm as by commercialism, and characterized by an increase in economic and regulatory constraints as to entry, access, and use.

The fundamental flaw in the "Internet as agent of change" thesis is its mistaken assumption that a given technology must produce a specific political outcome which can be anticipated and manipulated. However, as Daniel Bell (1979) has pointed out, the consequences of technology depend on the social system within which that technology is applied:

> … [The] new revolution in communications makes possible both an intense degree of centralization of power, if the society decides to use it in that way, and large decentralization because of the multiplicity, diversity, and cheapness of the modes of communication. … The effects depend on the context. The new technology, like the old, may induce some cultural and political change, but it may also enable a given system to further refine the political structures that are most acceptable to its culture, which may not be democratic in the Western sense.

A political, social, or economic system cannot be created or re-created by means of a technological invention. Such a system is the product of its country's history, social structure, and political culture. It has a certain inertia (or "path dependence" or "hysteresis") and resists quick or easy manipulation. As Ken Hirschkop wrote in the July-August 1996 issue of *Monthly Review* (New York), "one cannot buy democracy off a shelf, or download it from a Web site."

Diffusion of Innovation: Contagion by the Internet

In his classic treatment, Rogers (1983) defines diffusion as "the process by which an innovation is communicated through certain channels over time among members of a social system." As Rai, Ravichandran, and Samaddar (1998) argue, this characterization suggests that a sort of contagion drives the innovation-diffusion process, with the additional assumptions that the underlying social system is unchanging and that early and later adopters is fairly

homogeneous as to their capacity to adopt the given innovation:

> … Consequently, the rate of diffusion is modeled solely as a function of interactions between existing and potential adopters in the social system. Utility theory suggests that users subscribe to a technology only if it provides a net positive utility. The economics literature suggests that for users considering adoption of certain technologies, the potential return they can realize depends on the number of existing users. This relationship is especially strong for computing networks where the value of the network increases with an increase in the number of users it connects. Once there is a critical mass of adopters for such technologies, network externalities can motivate further growth. However, achieving critical mass depends on the utility of the technology for the early users. Thus, the rate of diffusion is determined by the size of the adopter and potential-adopter populations at any given time.

However, the authors conclude that contagion effects do not adequately describe global Internet growth. These factors would be even less serviceable for a country like Cuba, where, for a variety of reasons, most people are not able to make these kinds of utility calculations. External forces, including in Cuba's case governmental decisions restricting access, and attendant uncertainties (such as those tied to the U.S. embargo) play an overwhelming role. Mixed-influence models such as that of Rai, Ravichandran, and Samaddar (1998) assume that diffusion is influenced by external factors *as well as* contagion effects. In Cuba's case, centralized policy restricting access and the conditioning effects of U.S. policy point to the impossibility of crediting diffusion influences on individuals as such with a catalytic role in any movement toward growth in internet adoption.

The economic import of a technological innovation such as the Internet should be measurable in terms of the technology's impact on productivity. There is reason to doubt that computer or networking technologies have exhibited significant productivity improvement effects in most economic contexts, and if information technology has fallen short in the economic sphere, it may be expected to fall short in political ones as well. If anything, it can be argued that this technology is at least as likely to prompt political problems: a case in point is precisely that of equity of access, which is not only a problem in Cuba but also throughout Latin America and elsewhere. In any event, the politico-economic effects of Internet growth are difficult to gauge.

The question remains of how, and on what scale, individuals as such may gain access to electronic mail and Internet accounts on their own initiative (as opposed to government-approved institutional accounts). Reportedly, one (relatively complicated) way to gain surreptitious access is to get a password and configurations from the system operator at a state firm linked to the net, then send messages to selected webmasters abroad asking for attachments of their web pages; one then downloads these attachments from return messages onto a web image browser at work or at home, pulling up whatever one wants. The Cuban government is most assuredly aware of these practices but does not control them at present, presumably because it would be too costly to do so, and because the adverse impact of sub rosa arrangements for access to electronic mail and/or the Internet is, in all likelihood, minimal.

If anything, such efforts are indicative of legendary Cuban ingenuity, of the effort to resolve ("resolver") cotidian difficulties and challenges. One of the authors (Valdés) located a website which indicates that an enterprising Cuban, probably toiling on his own, was able to post on the Web through a U.S. server at no cost. The surmise is that this individual had to learn HTML as well as how to intersperse images on a web page, a task that few specialists have mastered. He was then able to save all of the data attendant to the webpage and send it as a compressed file, no small task since the maximum speed in the case of Cuba is 64,000 bps (modem), requiring therefore considerable time for transmission. He had to find a free webpage site in the United States and ensure that the format he used and that of the server were compatible. Not only did he, in this instance, post on a website that is about 2,000 miles away, but he also presented it as a bilingual posting. Finally, the webpage address itself is not in Cuba but in the U.S. server, and the author at no time reveals his (or per-

haps *her*) identity, in what is a quintessential exercise in private initiative. This kind of scenario is simply not considered by any available account of Internet access in Cuba known to the authors. There follows a more systematic overview of typical ways of gaining access there to both electronic mail and the Internet or Web.

THE REALITIES OF GETTING ACCESS TO THE INTERNET IN CUBA — "RESOLVIENDO EL INTERNET"

It is often assumed that, because of government controls, individual Cubans have no access to the Internet without a grant of official access. It is true that linking up to the Internet there is not easy, or "normal." In the United States or elsewhere in the developed world, one makes a phone call, or gets a diskette in the mail and, within a matter of minutes, is connected. But that is hardly the case in the less developed countries, and, in the present instance, one has to consider the extraordinarily limited resources under which Cubans have to labor, as well as the political conditions that make access exceedingly difficult. Yet, it would be a mistake to assume, in light of these barriers, that there is no (or extremely limited) access to the Internet for Cubans.

Of course, to have access several things have to be present. First, one needs a computer. Second, one needs a phone line and a phone, both of which need to be in working order, and preferably not ones shared with others. Third, one needs a modem. Fourth, one needs a great deal of patience to get access to the few ports of entry to any server. Assuming that those are present, then the question is how one gets an account, and there are, in fact, many ways that one can get connected to e-mail and/or the Internet in Cuba. A summary of several of these follows:

Government provided-access: This is given primarily to state, government, party and administrative institutions. It includes entities connected to government ministries. For example, the Ministry of Health has its own network (the aforementioned Infomed) which offers the service to hospitals, research institutions and entities somehow connected to the Ministry. The same is true for the Ministry of Education,

which covers the entire elementary and secondary school system, libraries and research institutions, or the Ministry of Higher Education, which links every provincial university and institution of higher education. The Ministry of Sugar also has its network, connecting all the sugar mills in the island.

Corporate access: State enterprises, and mixed and foreign enterprises also have their own networks and access, interconnecting the entire island.

Social institution access: This includes religious and non-governmental organizations, including churches or other places of worship, and NGOs (including such international ones as OXFAM and nationally-based ones such as the "Centro Martin Luther King").

Individual access: This is obtained by contracting with a service provider, but one has to pay in cash and often times requires that some government, economic, cultural, political or social institution provide formal support in order for the service provider to make access possible.

Youth access: This is provided through numerous Youth Clubs.

These procedures give governmentally approved access to literally thousands in Cuba. However, what of those lacking these means? The following options then come into play:

Black market accounts in dollars: These are issued by means of "virtual servers" resident within an approved server either because the system operator(s) allow it, or because they are unaware that the server is stealthily used. The challenge is gaining access to the port of entry.

Surreptitious accounts: In most cases, no money payment is involved. It is simply the case that some of the people running the system set up several extra accounts within the real server, and provide prospective users with such accounts as if they were legal users.

Account sharing: This is a situation where someone has a legal account but allows others to use it. The users' e-mail does not reside within the server that is

used to enter the Internet; rather, the e-mails are kept in a server outside the country — be it Hotmail, Netscapemail, etc.

Distributor account: Here someone has a legitimate account which is used to receive/collect or deliver e-mails to others. Only one person has access but he/she serves as the real distributor of electronic mailings. The person could also send e-mail on behalf of the multiple users. This is not uncommon: In fact, most research centers function of the basis of this principle. All that one has to do is write the mail message and save it on diskette and then give it to the distributor, who not only forwards but also receives e-mails on behalf of these users.

Of course, the situation is somewhat more complicated with the Internet than with electronic mail, although the same principles hold. In the case of the "distributor account," for example, that account holder does the search on behalf of the clients. In this mode, as a rule, there is some money paid by these clients. Of course, it is impossible to know how many users can be found in any of these modes. Obviously, Cubans will spend their limited resources in buying basic needs before they can engage in using e-mail or the Internet. But the use of both is more widespread than often assumed in journalistic or academic treatments. The relatively high educational level of Cuba's population has made it possible and enticing to enter this new domain.

CONCLUSION

The computer networking revolution reached Cuba much earlier than it did many other Caribbean and Latin American countries. Although nearly five years were required for it to move from e-mail to real-time Internet access, this is not an unusually long interval by developing country standards. The e-mail link benefited academics, artists, researchers, and numerous nongovernmental institutions at a time when international contact was becoming increasingly important but financial resources were severely limited. Cuban academics discovered electronic messaging before many of their U.S. counterparts, often as a way of overcoming institutional or economic impediments in such areas as access to academic or scientific research abroad.

As the Internet has moved toward greater commercialization, its potential benefits have become obvious to Cuban authorities. Despite a shortage of capital, as well as concerns about regime security, the government has committed considerable human and financial resources to the development and exploitation of the Internet. Much of this investment has been oriented toward attracting and facilitating foreign investment and promoting Cuban goods and tourism. The Internet, in particular the posting of numerous websites to promote tourism and Cuban products (from cigars to biotechnology) is one more way of "internationalizing the economy following the catastrophic of the end of the Soviet bloc as trading partners," as "Cuba is quickly securing shared business contracts with private firms all over the world …" (Venegas, 1997, p. 1). Moreover,

> The link with the Internet is being developed to foment research, business, and tourism as well as to provide cultural and travel information about the island. Despite the fact that Cuba has made significant changes in the past few years with regard to economic policy, tax laws, employment, and the like, the Communist Party insists that these changes are in line with a socialist agenda. Cuba rejects, wholeheartedly, still under the rubric of an anti-imperialist political stance, the neoliberal reforms taking place in the rest of Latin America, emphasizing that these have only worsened the already devastating disparity between wealth and poverty. The Internet and any other digital communications system that is put into use will be welcome within the parameters of the socialist agenda (Venegas, 1997, p. 1).

In certain ways, Cuba's handling of Internet access will probably resemble the development of its policy on foreign investment. Access to the Internet will initially be limited, selected by commercial, research, and similar criteria, and individual accounts will not be permitted for a considerable time. As its telecommunications infrastructure is modernized and the Internet becomes better known, both the central nodes and their users may be allowed to increase in number. Cuba (like other developing countries) may never become a densely interconnected nation, and internal access will continue to be far outstripped by international connectivity. Given the relatively high

educational level of Cuba's population in general and workforce in particular, as well as widespread enthusiasm about computing and the Internet, however, it is reasonable to anticipate significant growth in the popularity and use of electronic networking. There are already over 20,000 computers in secondary schools, over 100,000 persons have completed computer courses offered by the Youth Computer Clubs, and domestic e-mail is on the rise. These are signs of repressed demand for access to computer networking and to the Internet.

Increased Internet connectivity could be valuable to all concerned. Cuba clearly stands to benefit from sharply increasing connectivity domestically and internationally, and the rest of the world could gain as well from what Cuba has to offer, as with biotechnology, where Cuban advances have been blocked by lack of access to peer review mechanisms, particularly in the U.S., as well as scientific trials carried out in concert with researchers in the U.S. or Europe. Whether such possibilities can be realized will depend on political actors both in and outside of Cuba.

In general terms, the Cuban government has promoted international connectivity, in large part to promote the country's economic reinsertion, while restricting individual access. The U.S. would have international connectivity and domestic access occur on different scales and at a different pace, to promote what it regards as political openings. There are reasons to doubt, however, that either Cuban or American government efforts at political influence will be equal to the complex development of the Internet. Such development is as likely to be tied to the still uncertain prospects for national economic growth as to anything else, all in the context of the equally uncertain prospects for the internationalization of the Cuban economy in the face of the nearly-forty-year-old U.S. trade embargo. Until there can be widespread access to the Internet and to its wealth of information (political and otherwise) by ordinary users or subscribers in Cuba, much of the discussion about the potential sociopolitical impact of the Internet there will remain highly speculative.

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