The Dominican Republic

Readiness for the Networked World[1]

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Introduction

Introduction to Dominican Networked Readiness

Unsurprisingly, the Networked Readiness of the Dominican Republic in many ways mirrors the country's current state of political and economic development. The Dominican Republic is a country marked by high economic growth over the past decade, a vibrant private sector, and a national propensity toward resourcefulness, creativity and pragmatism, all of which have been tempered and affected by wide income variation, urban-rural discrepancies, extremely polarized political rhetoric, and institutional and bureaucratic dysfunction. Each of these aspects of the Dominican Republic has shaped the country's adoption and use of information and communication technologies (ICTs).

While wealthier and urban segments of the population and leading Dominican companies have shown rapid adoption and active use of new technologies, much of the country still is not reaping the benefits of computers, the Internet or even basic telephony. The government has begun to tackle ICT issues in fits and starts, but is generally perceived to have yet to provide comprehensive or effective leadership in most technological matters. Formal initiatives (either public or private) to extend the Internet and ICT networks to the rural and poor segments of the Dominican Republic are still in relatively incipient stages, and while there is by now a fairly substantial track record of hundreds of individual projects, their success has been mixed. Dominican Networked Readiness is affected and slowed by the larger backdrop of political, economic and institutional challenges in the country. In particular, low incomes, institutional weakness, weak governance structures, and infrastructure deficiencies (especially electricity) all have hampered more widespread benefits from computers and the Internet.

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Our Approach

In the past several decades, ICTs have reshaped the ways in which we communicate, and have realigned the processes through which we carry out economic activity and transactions globally. This is the Networked World, in which electronic means have become essential to the ways that we communicate with our families, the ways that businesses interact, the ways that government communicates with its constituents, and the ways that nations gain and maintain their competitiveness. Much of our work in the Information Technologies Group at the Center for International Development at Harvard University has focused on better understanding Networked Readiness, which we define as "the degree to which a community is prepared to participate in the Networked World."

In the pages that follow, we examine Dominican Networked Readiness, but we focus in particular on one major Readiness area – Network Use – *how* the technologies are being used in the country. Within Network Use, we sought to better understand how ICTs were being deployed in three segments of the Dominican population:

- in schools and communities;
- in businesses; and
- in society overall.

To achieve these goals, we carried out hundreds of interviews, traveled throughout the country, and deployed several quantitative surveys, most notably the Harvard Dominican Information Technology and Education Survey (HDITES) and a business survey in conjunction with the American Chamber of Commerce of the Dominican Republic.

The overall strategy of our work in the Dominican Republic vis-à-vis Networked Readiness has been to complement and augment existing initiatives, in the acknowledgement that there are a number of ongoing efforts relating to overall economic competitiveness and to the more specific examination of the role of information and communication technologies (ICTs) in the Dominican economic development process. Our goal is to fill an important gap of understanding how ICTs are being deployed within the Dominican Republic, in the hopes that better diffusion mechanisms and more coherent programs and projects will result in the country. In the end, it is *how* technology is being used that really matters. An understanding of that use can better inform the creation of policy and productive dialogue.

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This report proceeds in three main sections, followed by supplementary background materials. In Chapter One we examine the experience thus far of planned efforts to introduce ICTs into secondary schools and communities within the Dominican Republic. In Chapter Two we present our findings regarding ICT attitudes and use in Dominican businesses. Chapter Three describes the more general phenomenon of ICT adoption in Dominican society-at-large. In the appendices, we provide background materials relating to the telecommunications sector and overall policy environment, as well as technical addenda related to specific focal areas of the project.

Throughout the report, we focus on our overall goal of teasing out important lessons and strategic recommendations to enhance Dominican Networked Readiness.

Overview

Generally speaking, the Dominican Republic is in a crucial, and perhaps fragile, period in terms of its Networked Readiness. The country is now indelibly committed to the Networked World, and an effort needs to be made to make important changes in order not to lose momentum, waste investments or risk fomenting extreme disillusionment with ICTs. There is sufficient ICT use within the private sector for one to now consider computers, cell phones and the Internet to be essential tools of Dominican business. The government has spent millions of dollars on implementing telecenter and school ICT programs. And e-mail and cell phones have altered the ways that Dominicans communicate with each other both within the country and with the large Diaspora population living in the United States and elsewhere.

What is most notable about Dominican Readiness is the leadership vacuum that currently exists. Throughout our research we found a tangible desire in the population, but especially in the business community, for greater dialogue and a national vision

around ICTs for the country's future. There is real excitement about technology in the country, but a sense of frustration that the government has not been more proactive in elaborating a strategy for how ICTs can improve competitiveness or address the fundamental development challenges that the Dominican Republic faces. While there is a lot of activity in the area of ICTs, as is made clear throughout the report, the overall approach has been fragmented and lacks a feedback loop or coordinating mechanism (formal or informal) that can let the country learn the lessons from existing projects.

There are certain areas in which the government needs to take the lead in implementing a national vision. Obviously in public education and in policy, the government is the *de facto* actor in instituting reform. But in lieu of government leadership in the area of ICTs, there is a clear role for the private sector to be the driver of change. The private sector should take the initiative to carve out a space in public discourse around the importance of ICTs for the future of the country and to create a collaborative, forward-thinking dialogue that explores how the Dominican Republic can better take advantage of the benefits that ICTs offer as a tool for economic development and competitiveness. Just as the Dominican private sector has played a major role in reshaping debate over education (by recognizing the importance of quality education for the economy and taking a more active role in supporting schools) or urban planning (as can be seen in Santiago), this is an opportune time to channel the vibrancy and energy of the private sector to issues of Networked Readiness.

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Mechanisms such as national and local level Working Groups, workshops, brainstorming sessions, and collaborative forums that focus on incorporating the views of a wide range of stakeholders can do much to create the networks of institutions and individuals that are sorely needed in the Dominican Republic around issues of ICTs. If the private sector shows the leadership and the vision that is lacking in the country, it will provide an example that would be difficult for the government to ignore.

The Backdrop of General Issues that Affect Dominican Networked Readiness

The overall diffusion of ICTs in the Dominican Republic is deeply affected by a number of factors that are more general than technology-specific in nature and that are significant in determining the overall business and economic environment. These issues are commonly front-page news in the Dominican Republic, and regularly form a major part of editorial opinions, political debate, and discussion in taxicabs and *colmados* throughout the country. As such, they come as no surprise to any Dominican citizen, nor even to a casual observer of major issues in the country. Any discussion of Networked Readiness, however, must mention these factors at least in passing because of their overwhelming significance in determining Dominican Networked Readiness.

There are a number of major issues that are insidious and difficult challenges for the country overall, but necessary to identify nonetheless to understand in their totality the hurdles that must be overcome to improve Networked Readiness. As follows are brief mentions of major development challenges and their impact on Networked Readiness:

- *Poverty*. Low incomes have an obvious impact on the diffusion of ICTs. Computers and other technologies are expensive, and their prices remain out of reach for much of the population. The views of the poor towards ICTs are conflicting – some who struggle to afford food, clothing or shelter see no relevance of computers in their lives, while others perceive technology as their greatest hope of getting ahead. Whatever the case, there is a financial hurdle to providing ICTs to less affluent people. There are three main solutions to this challenge – either incomes have to rise, the cost of technology has to drastically come down, or technology programs and projects that allow people and organizations to share the cost of technology need to be rolled out. Most likely, all of these factors come into play.

- *Urban-rural differences*. Although rural access has expanded greatly in recent years, ICT use remains a primarily urban phenomenon in the Dominican Republic. This is correlated to the income differential between urban and rural areas, but is also an issue of infrastructure and population density. Cellular, landline and Internet networks are cost effective in areas of higher population density, and rural markets are notoriously unattractive to telecommunications providers everywhere in the world. The development of cheaper satellite and wireless solutions, as well as innovative business and investment models, is making the rural challenge more tenable, but rural areas will continue to lag behind the cities in terms of Networked Readiness. Primarily through education initiatives and the efforts of local entrepreneurs, in many rural areas ICT equipment can be found, but these areas often lag behind urban counterparts in areas such as sophistication of use and electricity supply.

- *Corruption*. The necessity to make "extra" payments to facilitate business transactions, imports/exports and even simple government transactions was a subject that arose in many if not most of our interviews and conversations. The added cost burden and uncertainty makes the deployment of technologies and more cumbersome and slows down the diffusion process. This pervasive issue is one that extends well beyond the scope of this report, and its affect is felt throughout the economy.

- *Electricity*. An obvious feature of ICTs is that they need electricity to function. The problems and challenges in the energy sector in the Dominican Republic are a major impediment to Networked Readiness. Power outages render ICTs useless, and ICT users must shoulder a much greater cost burden to support the backup generators and batteries that are so common throughout the country.

- *High interest rates/lack of capital*. Although the ICT and telecommunications sectors are among the most dynamic in the Dominican Republic, their dynamism is stunted by the high interest rates and general lack of investment capital. The affordability of ICTs by both businesses and consumers is also dampened by this factor.

- *Political extremity*. The political culture of extreme partisanship was another major theme of our conversations and interviews. The "cleaning house" that occurs every four years with the change in government and the resulting lack of policy and programmatic continuity has a direct negative impact on government-sponsored or associated projects. To its credit, the current government did not abandon the ICT projects of the previous administration (such as computer labs, LINCOS and the

Instituto Tecnológico de Las Américas), and has made renewed commitments to sustain them. However, the uncertainty that surrounds the interaction of politics and programs weighs very much on the minds, plans and investments of businesses interested in ICTs.

It was beyond the scope of this investigation to address these above concerns in any great depth, but they are important to point out. Likewise, the Dominican Republic faces grave problems that we did not explore in our research, but which merit further investigation. These include, and are certainly not limited to, the role that ICTs can play in resolving: the growing HIV/AIDS crisis in the country; the ongoing troubles in neighboring Haiti; prostitution; child labor; extreme environmental degradation; and the strategic realignment of specific industrial sectors such as tourism, agriculture and manufacturing.

This report only begins to scratch the surface of what is a rich, exciting area of research in the Dominican Republic. We recommend that further investigation be carried out in exploring more explicit linkages between the serious development challenges in the country and the potential for ICTs to help resolve them.

A Word about Interpreting Our Findings

It is important to keep in mind that because our findings are meant to better understand how ICTs are being used in the Dominican Republic, there is a major omission of nonuse of ICTs – the overall impression of this report may be that ICT use is pervasive throughout the country. This is not the case. Between two and five percent of Dominicans are Internet users, many areas of the country do not even have telephone access, and computers and the Internet do not have a place in most Dominicans' lives. Our research targeted the cutting edge of the ICT user base in the Dominican Republic – ICT-oriented community projects, computer labs in schools, leading businesses and primarily urban areas – and does not pretend to describe how most of the Dominican Republic is *not* using technology. It is our hope, however, that with a better understanding of the issues faced by schools, businesses and other ICT users, some insights will be gained that will aid in the design of future programs and projects that will help to extend Dominican Networked Readiness throughout the country.

Chapter One

Programs to Promote Network Use in Dominican Schools and Communities[2]

Introduction

Without an educated, ICT-savvy populace, no community can fully participate in the Networked World. To foster this resource, information and communication technologies must be incorporated into both the formal and informal learning systems. Lamentably, although the use of ICTs in education is one of the most powerful catalysts to Networked Readiness, it is an opportunity that is often squandered, misunderstood or underestimated.

Schools' and Communities' Access to Information and Communication Technologies. Schools must integrate ICT tools into their learning processes if they are to be part of the Networked World. Programs that give students access to information and communication technologies in the classroom provide an important step to improving Readiness. A school's Readiness in terms of access can be broken down into areas that include the number of computers, physical access to the technology, types of computers, diffusion of the network, access to and organization of electronic content, and quality and speed of connectivity in the school.

Outside the formal school environment, auxiliary programs centered in community centers, telecenters or other locales can help to give people exposure to computers. Similarly, schools themselves can serve as computer resources for an entire community if provisions are made to open the schools to a broader audience.

Enhancing Education with ICTs. While putting ICTs into schools is an important first step to Readiness, the technologies need to be properly harnessed to improve the learning process. Teachers must be trained to use the Internet and computers as tools for the students' benefit; this training is central to Readiness. Curricula must be redesigned to encourage the use of ICTs in the pursuit of problem solving, group learning and research. Students should be taught from the earliest age possible to use information and communication technologies to enhance and improve their learning experiences.

Developing the ICT Workforce. It is essential that there exist opportunities within the community to offer future ICT workers both first-time and continuing training in essential skills such as software programming, hardware engineering and World Wide Web design. These opportunities are fundamental to creating a sustainable ICT industry and support the integration of ICTs into the local economy.

Overview

The Dominican Republic is in a crucial time period in terms of establishing successful, formal efforts to integrate ICTs into learning environments and into community. While a small percentage of the population will have the purchasing power to acquire computers and new technologies through the natural functioning of markets, within schools and most communities throughout the country, a programmatic approach will be needed to provide ICT access, content and effective managerial and financial means to sustain them. This points to an active role by the Dominican government, in conjunction with partner organizations, to roll out effective projects and programs.

Several programs have been put in place in the past several years in the Dominican Republic that focus on extending computer access and content to schools and communities throughout the country. These projects are in keeping with global trends to

build computer laboratories and establish networks of telecenters that attempt to harness ICTs to the needs of local communities.

There exists an excellent opportunity in the Dominican Republic to learn from the existing initiatives, incorporate the lessons of the past several years of experience, and design and redesign a coherent strategy that more effectively addresses community needs with ICTs.

Goals of this Chapter

Recognizing the importance of secondary education within Networked Readiness, and given the effort and resources that have targeted ICTs in Dominican secondary education and society, this component of the Harvard Dominican Initiative focused on the use of ICTs in secondary education and the broader community. Three projects in particular were studied:

- Little Intelligent Communities (LINCOS);
- the Secretariat of Education's (SEE) computer labs (LABs) in secondary schools; and
- Aulas Virtuales para la Enseñanza (AVEs).

Of these three projects, the first two are government initiatives and the third is a public-private partnership. In our research of these projects, we placed emphasis on public secondary schools in rural areas, primarily along the border region with Haiti. A main component of this research was the Harvard Dominican Information Technology and Education Survey (HDITES), in which we surveyed nearly 200 lab managers throughout the country.[3] The findings from this survey, along with both direct observation and data from interviews, were instrumental in developing our recommendations for local stakeholders.

Summary of Findings

Our investigation of the LINCOS, AVE and LAB projects led us to the following major recommendations:

- Unite School & Community Technology Initiatives
- Increase Community Participation
- Integrate Management
- Improve Inter-project Communication and Build on Lessons Learned

Through complementary survey work carried out in conjunction with the Education component of the Dominican Initiative, we have confirmed that higher Network Use in schools is closely correlated to urban areas, wealthier families and those who attend private schools. These three factors are very significant in determining the most advanced user base in the school environment. We also found a high willingness-to-pay for computer training throughout the country that should be kept in kind as both private and public ICT/Education interventions are designed.

Unite Current Initiatives

Over the next five to seven years there should be a total integration of all three telecenter/lab projects, common branding should start to take place, technical support should be provided in a similar fashion and content should be consistent across projects according to what has shown *in practice* to be most effective, as shown in Figure 1. Training incentives should equalize, coordinators should move between projects, and salaries and incentives should normalize. As discussed below, all projects should begin to take on a similar basic framework with local communities adapting each model to what they see as the most appropriate. The recently formed community IT committees can then decide if they want the lab to serve more as an educational resource or a community center and modify the design and goals accordingly.

Proposed and future telecenter-type initiatives should also be merged with existing projects, or at the very least, should incorporate the lessons learned from LINCOS, AVEs and LABs. This recommendation is especially significant in light of recently announced plans by the Inter American Development Bank to finance a new telecenter initiative, and other rumored initiatives that will focus on providing ICT access to under-served communities.

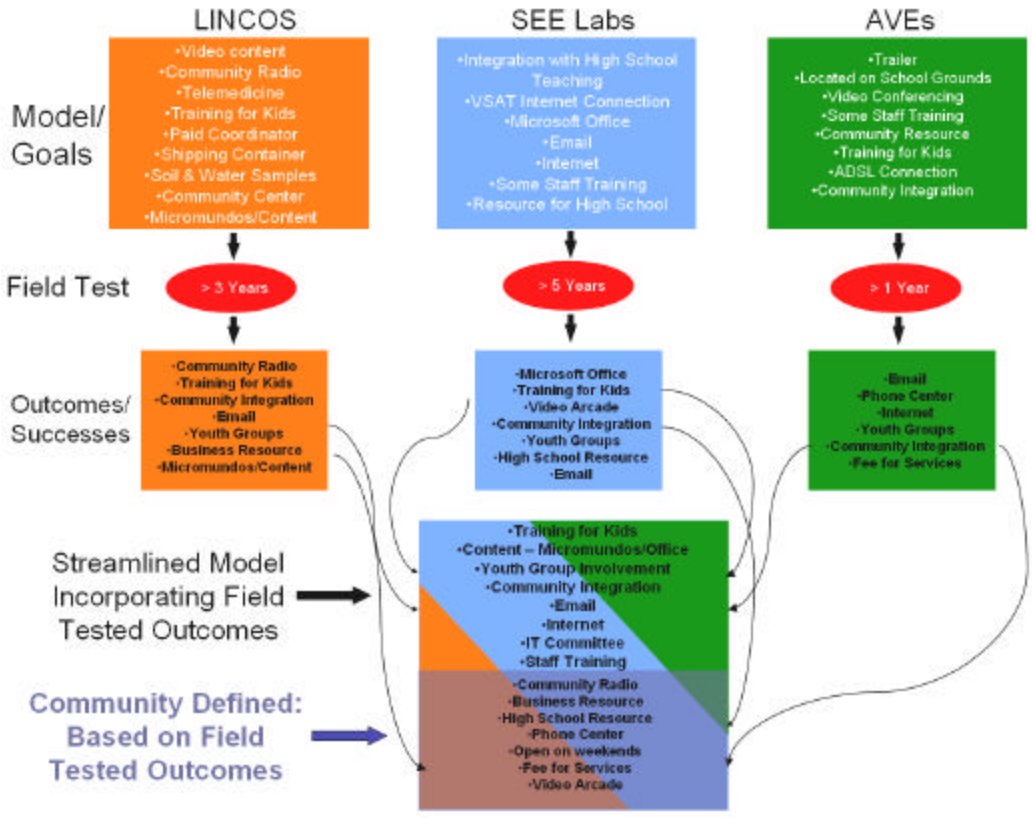


Figure 1: Possible Framework for Unification of Initiatives

Increase Community Participation

These recommendations stem from one of our primary findings – that these projects'

stated missions often did not correspond with their *results*. When looking at *outcomes*, the projects are not drastically different in terms of their successes and failures. Each project faced a broadly similar set of challenges and issues that was instrumental in shaping the overall impact. While many factors have played a role (i.e. infrastructure, finances, management structure, training…) we found that community preferences, expectations and input play a large role in determining the projects' outcomes, regardless of their stated objectives. Across the board, there were not adequate provisions made in these projects to adapt each ICT deployment to community needs and preferences. Taking this into account, planners should adapt the characteristics of the *successes* of each of the three models and merge them into a scaled-down framework upon which future telecenters[4] should be based (See Figure 1). This will allow sponsoring agencies to streamline their resources into what has proven to be effective. Then, this basic framework can be built upon based on *local community preferences*. This will allow the labs to reflect a "local flavor" that will help generate and sustain local interest while allowing communities to build upon a basic infrastructure to better correspond with their local needs.

Figure 2: Community discusses a telecenter project in La Descubierta.

Given that community preferences dictate the success of projects, it is important that the communities are actively involved from the beginning of project planning. This is essential not only to ensure that the development objectives of the project correspond with local needs, but more pragmatically, to better allow ICT facilities to function on even a basic level. While the long-term goal of making a significant improvement in the country's learning environment through technology is still farther down the road, the short-term goal of establishing a network of open and functioning telecenters is within reach. However, this is only possible through capturing and directing the interests of local communities. This can be helped through social marketing initiatives, participatory community meetings, partnerships with civil society groups, and formation and utilization of youth groups.

There are already some signs that this approach may be emerging. Recent steps forward in this process include the formation of local IT committees, engaging teachers and community members in "Technology Dialogues," and the creation of the National Committee for the Information Society.[5] These are all positive steps, but thorough and regular follow-up will be needed for their impact to be realized. More significantly, an even greater challenge for the Dominican Republic is that increased local participation will require *de facto* decentralization. For this to be effective, communities will expect to be empowered to make local decisions and the central administrative body will need to defer to these local priorities. This is not a small task given the traditionally centralized political management structure in the Dominican Republic. However, if successful, this

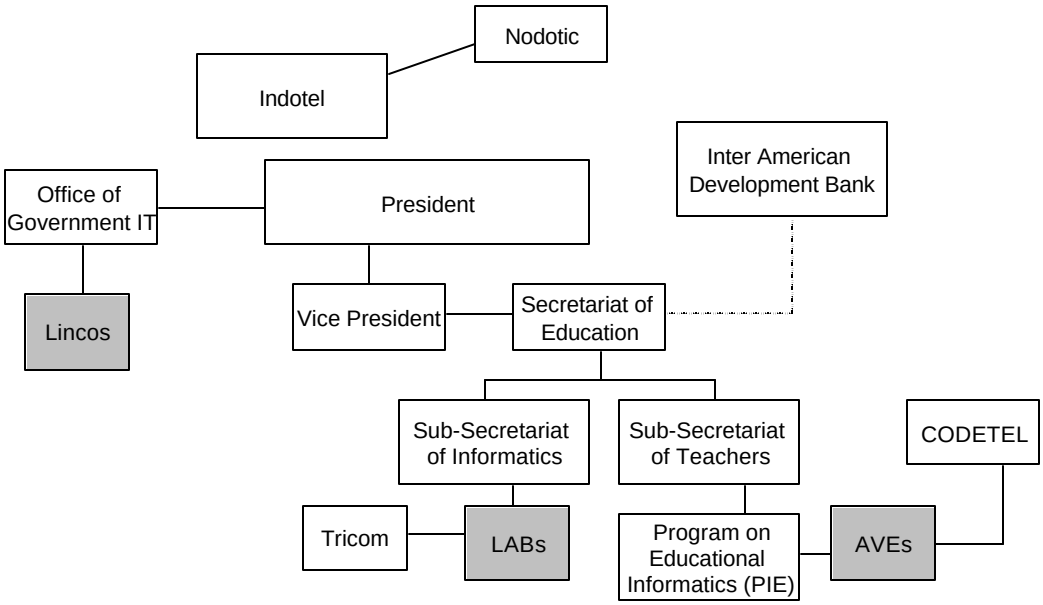
process may serve not only to get the labs up and running, but as a model for future decentralization efforts in other areas as well.

Integrate Management

Over the course of the next two or three years, in order to begin moving toward the total integration of the projects, the management of the current telecenter initiatives should be united and any new initiatives should fall under the same jurisdiction. Given the limited capacity of the Secretariat of Education, planners should consider placing this management outside of the umbrella of the SEE.[6] Although a merging of this type will be very challenging both politically and operationally, it is the best strategy for long-term efficacy of all three models and is critical to coordinate efforts across projects.

In addition to consolidating the management structure, current service contracts with the private sector should be reevaluated and where appropriate, renegotiated to eventually incorporate all three programs. Given the complexity of this issue, it is recommended that a feasibility study be conducted on the various options for this type of outsourcing. Although difficult from a management perspective, over the long-term, the benefits of this restructuring will be significant in terms of cost, operational effectiveness and maximized benefit to the communities.

Figure 3: Fragmented Management of Telecenter Projects



Improve Inter-project Communication and Build on Lessons Learned

Since the Dominican Republic has taken an ambitious jump to provide access to technology for its population, the country has a considerable track record of projects from which lessons can be drawn in order to better design new projects and tailor

management and implementation processes based on successes and failures to-date. Among the AVE, LABs, and LINCOS, there are over 400 telecenter "experiments" with several years of field testing in diverse communities throughout the country. However, as a result of the fragmented nature of these initiatives (see Figure 3), there is poor or nonexistent communication amongst them. This is hindering the development of institutional knowledge and slowing progress. Once an integrated management structure is formed and a mechanism for recording "lessons learned from the field" is established, the Dominican Republic will be able to better draw upon past experience and design a national ICT model that is well-tailored to local needs with a proven track record of success.

More urgently, current initiatives should be reevaluated, and if necessary, realigned to ensure they are incorporating the "lessons learned" from partner projects. For example, the current expansion plan (which includes the installation of LABs in primary schools) should be reevaluated to ensure that infrastructure development plans are being done in a way that incorporates the "do's" and "don'ts" from the first round of implementation.

Recommendations for Future Research

Feasibility study of outsourcing technical support

The government should study the cost of contracting all three projects' technical support and connectivity provision out to the private sector through limited, competitive contracts. This cost should then be compared to estimates of providing the same service in-house. Shifting primary technical responsibility to the private sector will help align the cost-saving incentives and help ensure that the hardware is maintained in the most cost-effective way. For example, contracts can be structured so that the provider has the incentive to address the electricity irregularities and provide protection or power backup that will be financially beneficial. Fundamentally, the technical success of these projects should not depend on the government, but rather, on firms with technical expertise that are properly incentivized.

Create "Collaborative Groups" as Conduit for Lessons Learned

The government should include the perspectives of other stakeholders for ICT and education in the Dominican Republic in the central policymaking process. A more effective mechanism for enlisting broader support and input into programmatic planning is necessary to better share views and experiences. While some attempts have already been made to create such a dialogue "virtually" via an online portal or *listserv*, until *listserv* "culture" becomes more widespread in the Dominican Republic, the dialogue should be rooted in face-to-face and in-person encounters. Currently, most online and *listserv* groups are effective for the distribution of virus warnings and greeting cards, but are probably not yet the best venue for productive and serious discussion.

Partnerships should be looked for between the government and the private sector generally and with specific organizations already involved in this area such as the United States Peace Corps, United Nations Development Programme (UNDP), local Non Governmental Organizations (NGOs) such as EDUCA or Funredes, as well as private secondary schools and both public and private universities.

Even if the government does not take the initiative to form such collaborative groups, there is room for entities outside the government to take a leadership role in assembling stakeholders for discussion and action.

Improve Teachers' Familiarity with the Technology

A lack of familiarity with computers on the part of teachers and telecenter administrators remains a major hurdle to more effective project implementation. One effective mechanism to breed more comfort with the technology is to provide teachers/administrators with computers in their homes; however, the price of such equipment remains out of reach for most teachers. Creative financing schemes need to be worked out to allow teachers to finance the purchase of computers for their home. Leasing programs and loans have been tried but with low teacher salaries, credit-worthiness remains an issue. Other projects involving the sale of used computers shipped from the United States have also been implemented but have encountered little support.

Continue to decipher attitudes toward technology

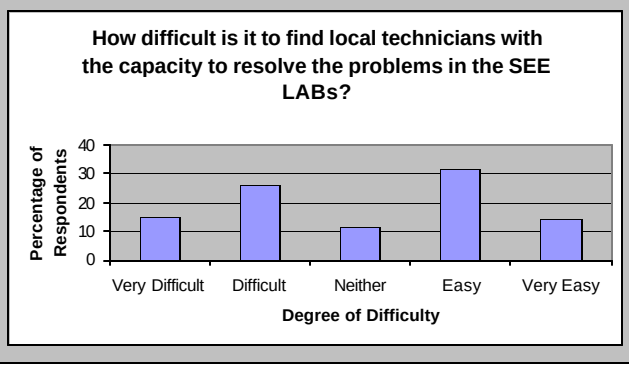
Our findings provide a beginning to the process of better understanding how Dominicans view ICTs, particularly how parents feel about their children receiving computer training. More research is needed to put ICTs into a broader context of educational and other development goals for the country.

The Broader Context: Education in the Dominican Republic

Secondary education in the Dominican Republic has been historically deficient due to limited investment and attitudes that education is not valuable in finding employment. Public education expenditure as a percentage of Gross Domestic Product (GDP) is less than many countries in Latin America including Bolivia and Peru. Adult literacy rate ranks relatively low for countries with comparable GDP at only 83.6 percent in 2000, and the net secondary enrollment ratio still lags behind the region at 53 percent in 1998.[7] Teacher salaries historically have been low and in 2002 teachers earned only RD$3,500 (approximately US$200) per shift per month.[8] In addition to low salary levels, it is not uncommon to find a teacher who has not been paid in months, due to administrative shortcomings within the SEE.

Box 1: Availability of Technical Support

Technical support in the Dominican Republic is generally less of a major challenge than other issues such as training, curricular reform or electricity. Factors such as geographical proximity to the U.S., relatively high overall IT penetration, access to training, and small geographic size of the country have helped basic technical support become available in most areas at a reasonable cost. Fixing a network card, replacing a motherboard, or installing a new power supply, are tasks that are carried out on a regular basis with relative simplicity. Although cost and timeliness vary from location to location and some rural areas off the major thoroughfares remain underserved, overall, availability of technical support is not one of the factors stalling the integration of IT into education.



The Government's Computer Laboratories in Secondary Schools (LABs)

Against the backdrop of the poor performance and broad shortcomings of the Dominican educational system, recent steps taken to integrate ICTs into the educational process are noteworthy. Within the context of the "basics first, computers later versus computers are needed now" debate that continues to take place all over the world, the government of the Dominican Republic made a serious commitment to technology and invested heavily in ICTs in the public education system. At the end of 1996, then President Dr. Leonel Fernández as a part of his administration's vision to use ICTs to enhance the competitiveness of the country pledged to equip every secondary school in the country with a computer lab. Each lab was planned to have 20 networked computers, software and an Internet connection. The installation of the "First Phase" labs began in early 1997. The expressed goals of the project were not simply to provide connectivity and hardware, but rather to provide a "tool to facilitate learning in different areas of the curriculum."[9]

As of August 2002, 343 computer LABS had been installed in secondary schools in the Dominican Republic, covering most high schools in the country. These LABS are in varying stages of operation because in practice, the integration of ICTs into the public secondary schools has moved slower than many hoped. In most cases, use remains limited to basic word processing and e-mail.

Major challenges and issues in the LAB Program

The More Obvious Hurdles

In our interviews with local stakeholders it was not uncommon to find groups who are noticeably disturbed with the way the government handled the computers labs throughout the planning and implementation processes. Many feel that the computer labs are being both under-utilized and mis-utilized – both teachers and students

Box 2: "Se fue la luz" – the Electricity Challenge

In terms of infrastructure, electricity remains the largest single obstacle to use of ICT throughout the country. Grave problems of outages, hardware-damaging surges, and chronically low power may continue to plague the country for many years. Encouragingly, young people in the Dominican Republic show great patience for sitting in front of blank computers screens for hours waiting for the electricity to come back on.

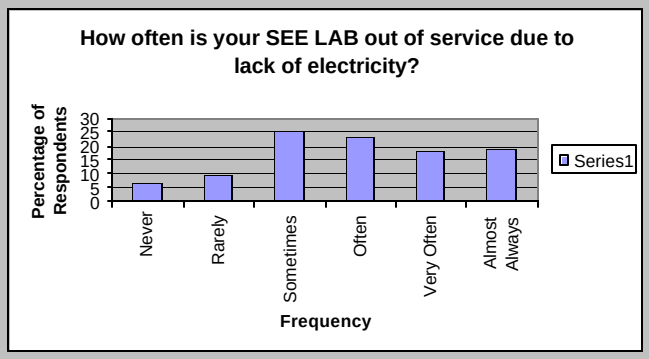


Figure: A young girl fans herself with a mouse pad while waiting for the electricity to return.

pointed out to us that it is common knowledge that computers in the labs are generally not being used for educational purposes.

Figure 4: Some labs remain in boxes after four years due to a lack of connection to the electricity grid.

Critics of the LAB program complain that the rollout was done in a very centralized way with little or no participation on the part of the schools or local communities. More practically, although the original proposal for the program required that each school have "adequate electrical capacity to guarantee the functioning of the equipment,"[10] this mandate was not carried out and the electricity problem was not dealt with before many of the LAB installations. As a result, many LABs were put in secondary schools where electricity was not adequate. In some cases, labs were put in schools that to date, still lack even *a connection* to the electrical grid or any alternative method to generate electricity. The computers in these LABs remain in boxes collecting dust under lock and key exactly as they were placed over four years ago (See Box 1 and Figure 4).

The electricity problem has been widely recognized and there are efforts to resolve this issue. The SEE is in the process of installing power inverters and battery backups for all the LABs and it has stated confidence that this will allow regular use of the labs**.** The costs and benefits of this project should be closely monitored as batteries will provide power only for a limited amount of time, and the replacement of batteries will be very expensive, which could become an even greater issue if local communities are expected to pay for them, as is under discussion.

In short, the best way to describe the state of the "First Phase" initiative which begun in 1996, is "Still in Progress." However, although the LABs have suffered some crippling setbacks, 291 out of the current 343 (85 percent) are reported to be functional.[11]

In the larger context, the problems and challenges that exist in the rollout of the secondary school computer labs are typical of the experience of many other countries. It is essential to remember that the Dominican Republic is only at the beginning of a long process of integration that involves educational reform combined with strong managerial, operational, financial and community support. Each of these by itself represents a major undertaking – together, they are a daunting task.

Teacher Selection for the LABs

One of the major operational and managerial hurdles in implementing such an ambitious project was staffing the laboratories with good teachers who also had some technical background.

The SEE faced difficult tradeoffs in formulating their staffing strategy, especially given the scarcity of specialized human capital in the country in 1997. For instance, there were certain long-term financial implications that had to be considered -- the rollout of the labs was a permanent expansion of the educational payroll. Furthermore, given the difficulties of getting rid of personnel once they have been hired and placed on the SEE payroll, officials wanted to be extremely careful to select and hire only the most qualified people. Officials within the SEE first considered offering the LAB positions to the most qualified teachers in each school. However, the most qualified teacher was also often the best teacher in the school and SEE officials did not want transfer the best math and science teachers out of their classrooms into the computer labs, thus losing capability in the other disciplines. In light of the lack of technical skills in the schools, the SEE opted to hire outside of the system. It was decided that LAB managers would be hired who possessed the equivalent of a Bachelor's degree in Systems Engineering or similar area, advanced knowledge of computers, experience in computer education, and a strong interest in teaching and working in the educational system.

> "We have the whole world at our fingertips and we use it to type instant messages to our cousin sitting at the computer next to us."
> - IT youth group member from rural community

Since individuals with these qualifications often did not live in the remote communities where they were needed, some lab managers moved from the cities to rural areas to take the position. This is an interesting instance of "reverse brain-drain." Critics complain that technicians were hired to do the job of a teacher and that while their background helped to maintain the labs technically, they did not have the skill base needed to help teachers integrate ICT into the schools.

Computer Use and Content in the LABs

One of the main issues hindering development in the LABs is the lack of applicable content. In the absence of structured integration into the curriculum by the teachers, many labs are simply "open" for the students to do what they like. Games, chat and surfing the Internet are the most popular activities. However, it is not uncommon to find students experimenting with a paint program, starting a letter in a word processing program or writing an e-mail to a friend. Some LABs are equipped with

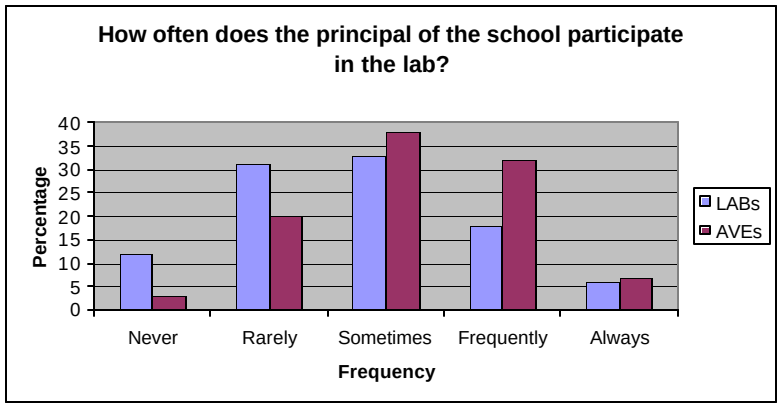
Figure 5: Students at a private training school in the Northeast.

reference CD-ROMs that have piqued some students' interest, but in general, there are major challenges to improving the provision and use of quality content, particularly with respect to the integration of the computers into the educational curriculum.

Local community participation and buy-in

The local support and understanding of school administrators and teachers is essential to maximize the impact and operation of computer laboratories. Yet as a result of the common perception that community participation was not widely sought during the planning and initial implementation of the LABs, current SEE officials are finding it difficult to garner the support of the local community to help with the maintenance and upkeep of the LABs. For instance, as a result of being alienated from the planning and implementation processes, many school principals and teachers have considered the LAB to be a separate entity from the school and therefore outside of their jurisdiction. Many principals do not even have a key to the LABs in their schools. As a result, many of the labs have been underutilized and support from school principals remains very low. As can be seen in Figure 6, of the 91 LABS surveyed, 12 percent of managers stated that the principal of the school *never* participates in the computer lab and 31 percent said that he/she "rarely participates." Only 24 percent characterized the principal's participation as "frequent" or greater. Although this difference could have a variety of causes, it is notable that in the AVE project, a newer public-private sector collaboration (discussed in greater detail below) in which computer labs physically reside *outside* of the school, on school property, school principals have reported to have a much higher participation level in the labs.

Figure 6: Participation of school principal in computer labs



Aulas Virtuales Para la Enseñanza (AVEs) – A Public/Private Partnership[12]

In early 1999 CODETEL, the former state monopoly and largest telecommunications provider in the Dominican Republic, invested US$6.7 Million to launch the AVE project. This includes 90 AVEs in partnership with the Secretariat of Education. The SEE contributes a US$637,200[13] annual cost for the project and is responsible for providing personnel for the labs. Currently, CODETEL is under contract to provide technical support to the AVE program (including gas for the generators, desktop support…), but this responsibility will be turned over to the Secretariat of Education eventually.

The AVEs are housed in self-contained trailer units that sit on the property of elementary schools. There are 92 total throughout the country. The objective is to provide ICT training to teachers, students, and people from the surrounding community. The AVEs are designed to have two managers per unit who work in half-day shifts, one for the morning and one for the afternoon/ evening.

Figure 7: AVE Unit

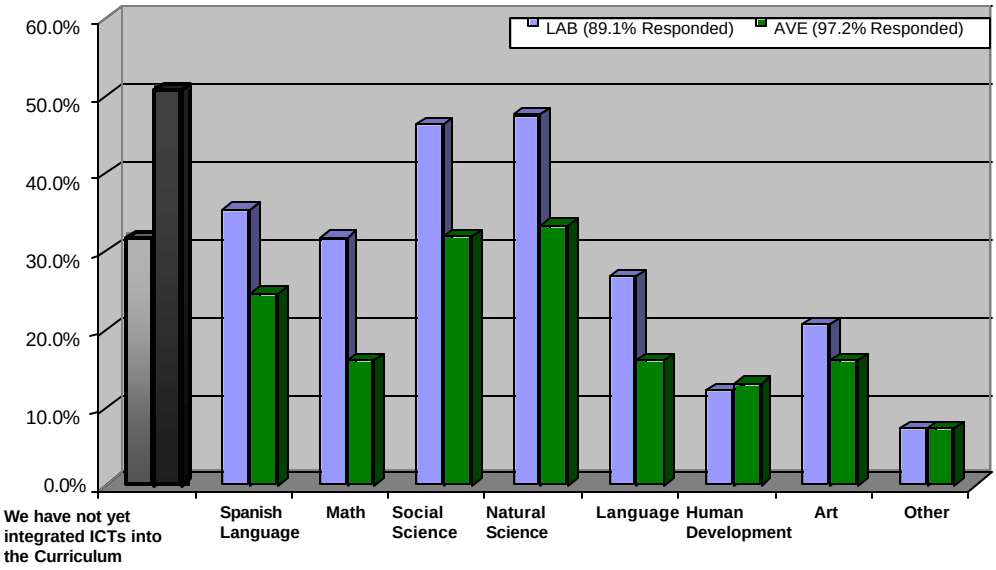
As of August of 2002, 57 of the 90 AVEs (63 percent) were open and functioning, in which 107 managers worked (an average of 1.88 per AVE). In some cases, if there is not yet a manager appointed for a particular session (morning or afternoon), the AVE is closed for that session. While the remaining 33 AVEs (37 percent) wait for the SEE to appoint a manager to staff it, the trailer remains locked and unused.[14]

Although the AVEs are physically installed on school property, participation of teachers in the AVEs is quite low.

Figure 8: Location of AVEs throughout the country. Source: http://www.codetel.com.do

This is partly due to the lack of clear guidelines surrounding the hours during which each AVE is meant to be open for use for the general community and when it is to be open for use by the school. Some creative, self-starter AVE managers took it upon themselves to determine what schedule was most beneficial for all and designed and implemented it accordingly, but this appears to be the exception rather than the rule. There is also some misunderstanding about how the AVEs fit into the school environment – there is a mistaken general impression among many teachers that "the AVEs belong to CODETEL."

Figure 9: Some differences between the AVEs and the LABs



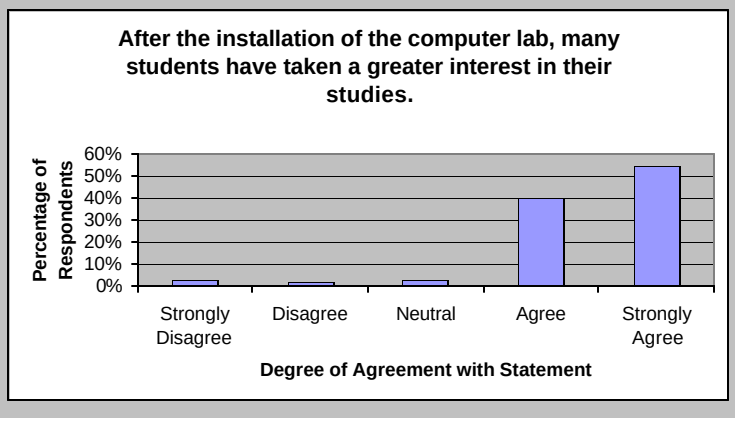
Outside of unclear communication and insufficient teacher and manager training, the main barrier to increased use of the AVEs in schools is simply the small physical size of each AVE unit. Since classes in schools in the Dominican Republic often have 40 or more students, it is not practical for teachers to take a class of 40 to share only 10 computers in a small trailer. Splitting up the class has been very difficult. Furthermore, the AVEs also share a common shortcoming with the larger LAB program: the integration of the computers into the curriculum (see Figure 9).

Overall Network Use by Children in Schools: Some Determining Factors

Our understanding of how ICTs are being used in the Dominican Republic has also benefited by a household survey carried out by our colleagues from Harvard CID who headed the Education component of the Dominican Initiative[15]. In their survey, over 440 households were polled as to their

Box 3: Labs have increased student interest in their studies

In the HDITES, 94 percent of lab managers either agreed or strongly agreed that the arrival of the computer labs has increased students' interest in school. We found similarly high numbers of managers who felt that parents were more interested in their children's education as a result of the Labs.

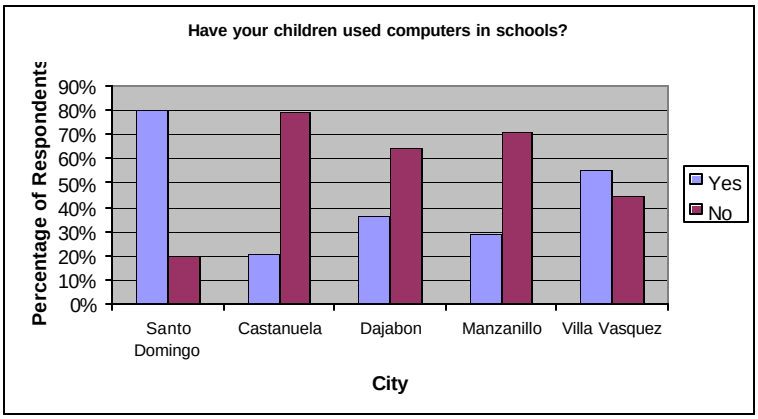


attitudes toward education and schooling – several of their questions dealt specifically with the experience of Dominican children using computers, and with attitudes toward computers in schools.

The findings from the Dominican Household Education Survey (DHES) are supportive of our general conclusions from our other surveys and research on Network Use within this project. Survey results indicate that there are strong determinants in the Dominican Republic of whether children have used computers – these include geography, income and type of school attended. This survey does not capture the nature of computer use by children, but it does give us valuable information about who is using ICTs.

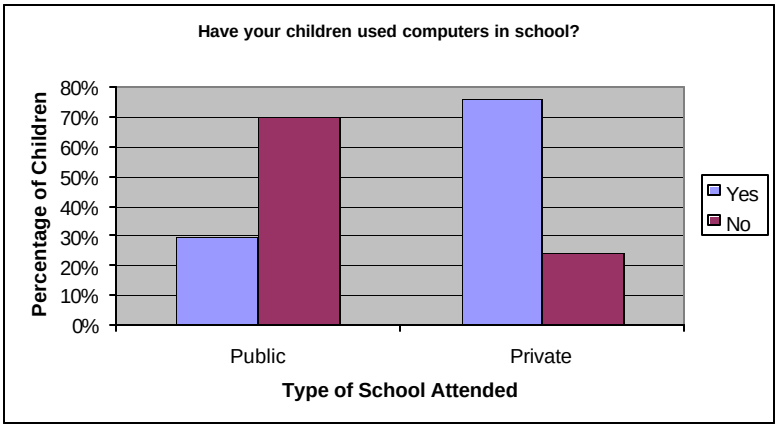
For example, there are marked differences in computer usage by children in schools depending upon where they live, with significant differences between the capital and the rest of the country. As can be seen in Figure 10, children living in Santo Domingo are significantly much more likely to have used computers than children living in other parts of the country.

Figure 10: Usage of computers by children in school by geography



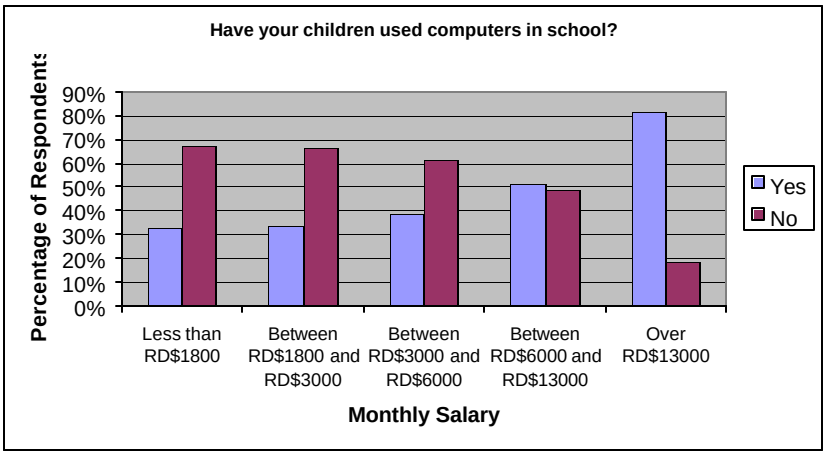
The breakdown of children who have used computers is also dependent upon what kind of school children attend. As can be seen in Figure 11, according to households surveyed, children in private schools are significantly more likely to have used computers than public school children. This can be explained in part by the greater likelihood of finding computers in private primary schools (driven by the absence of computers overall in public primary schools), but our overall findings suggest that there are major discrepancies between private and public school provision of computers.

Figure 11: Usage of computers by children in school by type of



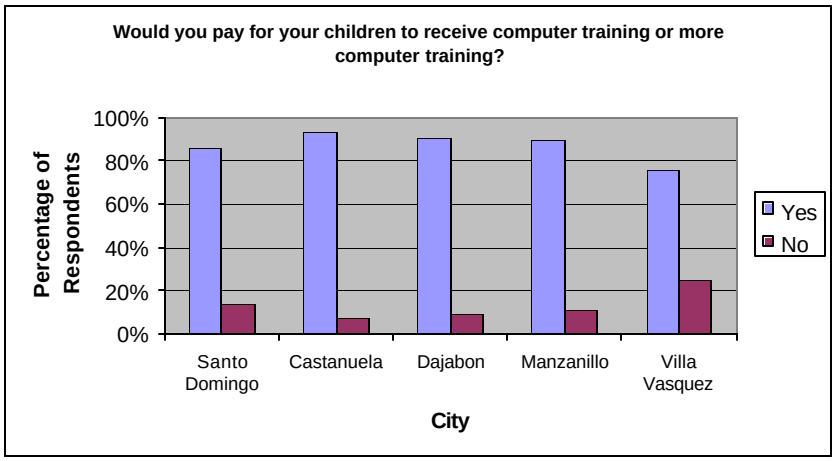
Income also plays an important role in determining whether children have used computers. As illustrated in Figure 12, as monthly household income levels increase, children's computer usage increases also.

Figure 12: Usage of computers by children in school according to income level



In addition to renewed interest in school by students as a result of the computer labs (see Box 3), our research found a stated willingness for parents to pay for computer training. When asked whether they would pay for computer training or additional computer training, heads-of-households whom we interviewed overwhelming showed a willingness-to-pay for further training. This willingness was valid regardless of geography, type of school attended or income. As depicted in Figure 13, in over 70 percent of households surveyed, across all geographic regions, we were told that they would pay for computer training. In Figure 14, it can be seen that no matter whether their children attended public or private schools, similarly high percentages of parents were willing to pay for computer training. Parents and caregivers in the Dominican Republic appear to value computers for their children consistently. Our survey of lab managers also confirmed parental willingness to pay for computer training – in the sample of lab managers in the HDITES, 80 percent either agreed or strongly agreed that parents were "ready"[16] to pay for their children's computer training.

Figure 13: Household willingness-to-pay for computer training by geography



When we analyze how income affects parental willingness-to-pay for computer training, we see a similar trend. As can be seen in Figure 15, at all monthly household income levels[17] among households interviewed there is strong willingness-to-pay for computer training. It should be pointed out, however, that these findings should be taken with a grain of salt. When faced with difficult day-to-day budgetary decisions, parents who are faced with difficulties of paying for basics such as clothing or food may respond differently than in our survey. For example, 31 out of 36 respondents who reported no

monthly income also said that they were willing to pay for computer training. This could be explained by the enthusiasm for technology that exists in the Dominican Republic, but also does not capture true ability to pay, nor does it tease out the realities of making difficult choices.

Figure 14: Willingness to receive computer training and type of school attended

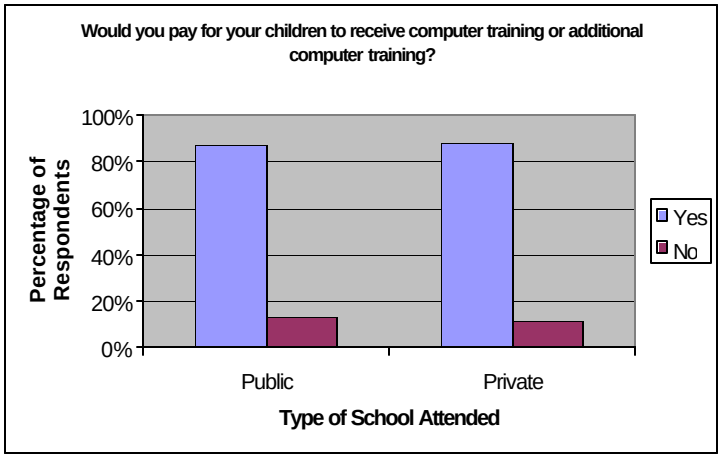
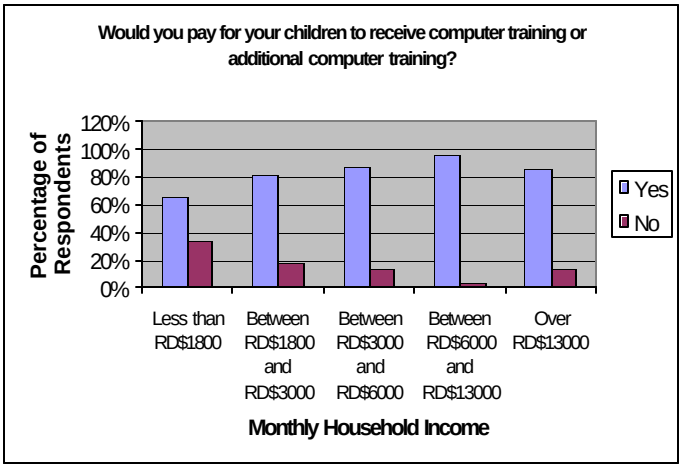
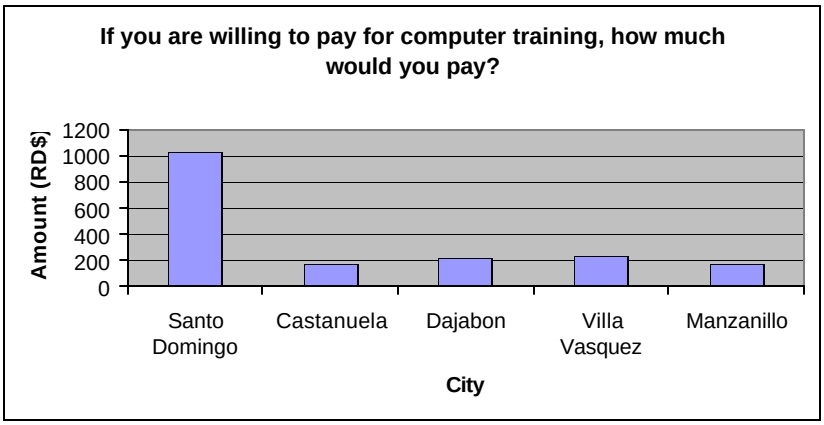


Figure 15: Willingness-to-pay for computer training according to income level



In the DHES we also tried to quantify how much people would be willing to pay for computer training. Although the general willingness-to-pay is broadly even throughout the country, perhaps unsurprisingly, residents of Santo Domingo were willing to pay

Figure 16: How much would you pay for computer training, by city



proportionately more. As can be seen in Figure 16, those in Santo Domingo would pay roughly five times more for computer training than people living elsewhere in the country.

Implications for Program and Policy Design

Targeting the Right Population with Programs and Projects

When these major determinants of computer usage are controlled statistically through regression analysis, it is shown that while income, geography and type of school attended are all influential, income is the most important factor. Higher income levels are strongly correlated with both attending a private school and living in the capital

(residents of Santo Domingo whom we surveyed were more likely to have higher income and to send their children to private schools), but all three factors are important determinants of computer use.

There are important implications from these findings for public policy design and programmatic choices. Children who come from wealthier families, live in the capital or who attend private school are more likely to use computers than their counterparts who live elsewhere in the country, attend public schools and/or are less wealthy. This could suggest that one-size-fits-all projects and programs may not be most appropriate for ICT and Education interventions – more targeted approaches may be warranted, as may greater efforts to reach citizens outside the capital.

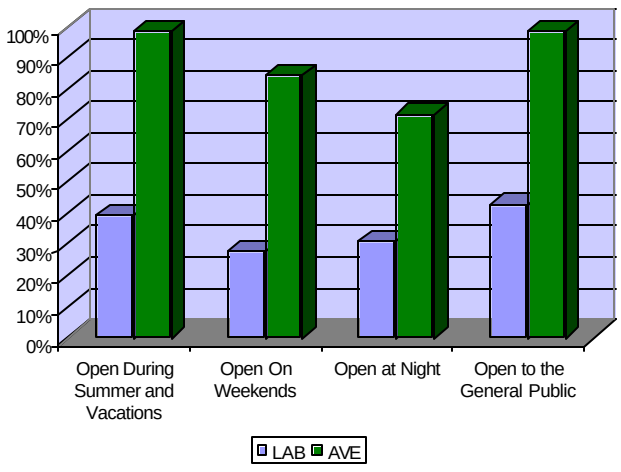
The willingness-to-pay for computer training that exists throughout the country should also be kept in mind by both public and private approaches to ICTs in Education. There may be opportunities for both the government and private entrepreneurs to improve services nationally by tapping into the willingness of families to contribute financially to their children's computer training.

Steps toward Greater Community Involvement

Recognizing that a significant error had been made by not getting communities involved in the initial implementation of the labs, government officials more recently tried to remedy the situation by presenting a new formula for the operation of the labs. In July 2001, the SEE hired a consultant with funding support from the Inter-American Development Bank to direct a Managerial Unit called the Unidad Ejecutora para las TICE en Educación y Desarrollo to lead an analysis of the situation and propose recommendations.

As a part of this consultancy, an ordinance was written for the new vision of the LABS and AVEs. This ordinance was sent to all lab managers as well as the regional and district directors. It stated that "every minute that a lab is closed represents an irreparable loss" and the labs should be opened at night and on weekends. A document sent along with the ordinance outlined the new guidelines that were to be adopted. Among the guidelines were that the use of the labs should be extended to the local community and the daily schedule was to be lengthened to 12 hours.[18]

Figure 17: Lab Operating Hours



One major goal was to encourage communities to take greater advantage of the resources, but the new guidelines also were also designed to pique the interest of the local community in order to open the door for increased local capacity to maintain the labs locally to relieve the administrative burden of the already-strained SEE. It is

believed that by opening the lab to the community, this may also increase the use of the labs by adults, who can then be encouraged to take part in its administration. In our HDITES survey, we found that the AVEs were open much more often to the community than the LABs (See Figure 17).

In addition to encouraging the labs to remain open longer, the ordinance officially allowed the labs to raise funds locally for their maintenance and upkeep. All of this was part of the strategy the SEE had adopted to make sure that the government's investment produced the hoped-for benefits.

"Technology Dialogues" – Social Marketing

The ordinance and first stages of rethinking the overall approach to government-supported computer laboratories are encouraging signs of change. Based on early observations, the response to the ordinance was positive. However, the ordinance alone is unlikely to lead to significant change without operational and planning support from the SEE. Recognizing that a more hands-on approach was needed, the Unidad Ejecutora began to engage the communities in "Technology Dialogues" where a "New Vision" was presented for the use of the labs. The meetings were conducted in a participatory fashion at regional centers throughout the country. Participants in the meetings included the Regional Directors from the SEE, LAB and AVE coordinators, Peace Corps volunteers, as well as interested NGOs or civil society groups from the region.

> "Success [of rural telecenters] depends on the community taking ownership and allowing them to participate in the process of local management."
>
> - LINCOS worker

The "Technology Dialogues" focused on:

1. Regional technical support planning.

2. Development of local *Technology Committees* directed by communities in coordination with regional officials to plan for and manage the labs (details of the structure, members, and management of the committees were up to the community).

3. Increased regional communication flow between projects.

The meetings continued until July 2002, by which time 8 of the 17 regions had been engaged. Given the positive response from the meetings, officials from the SEE expressed interest in having the dialogues continue. However, as of October 2002, no plans have been put in place.[19]

Improving Teacher Training

Although policymakers generally acknowledge the importance of teacher training, much learning is yet to be done in this area. Initially, a five-week training session was offered at the Instituto Tecnológico de las Américas (ITLA) outside Santo Domingo for lab managers. Teachers, however, have largely been left out of formal opportunities to increase their skills. This has resulted both from omission from the process and, where attempts have taken place to incorporate them in training programs, from a disconnect between the logistics of providing training and the realities of both managers' and teachers' everyday lives.

A number of problems have arisen in the approach of bringing LAB managers from all over the country to the capital for centralized training. First, the motivations that lead managers to participate in training programs do not always coincide with increased benefit to the program. Observers point out that many managers are interested mainly in a break from their day-to-day routine, not always in ICT skill building, and classes are not usually made up of those that most want to learn. Additionally, many of the most dedicated managers are hesitant to leave their classrooms and families to go to the capital for training.

The SEE has begun to realign its policies with the realities of the teachers' psychology and day-to-day reality. A program is in the design phase to provide training at times convenient to the teachers in regional training centers closer to home, rather than exclusively in Santo Domingo. Under this revamped plan, teachers are free to take the classes that fit with their schedule at any approved regional training center. To provide an additional incentive, after completing the program, teachers will be eligible to purchase a low cost computer with financing through the government. Since the learning takes place on the teachers' schedule, and the most interested teachers will self-select themselves to participate, it is hoped that this will result in improved acquisition of skills. Furthermore, it is estimated that by moving the training to regional centers, cost savings can be realized versus in the centralized program in Santo Domingo. While this program looks like a very positive step in the right direction, many of the details remain to be clarified.

Computer Purchase Incentives for Teachers

Another way the government is hoping to improve the computer skills of the teachers and then integrate ICT use in the learning process is by helping to facilitate the purchase of computers for teachers' private use. The hope is that given the time constraints of teachers and the difficulty with using the computer during lab hours (along with a natural reticence by teachers of showing their students that they may not know as much as the students do), having a computer at home will allow the teachers to increase their skills on their own time through their own exploration. To help with this, various purchase plans and the sale of both new and used computers at more affordable prices are being tried. Impact of programs like these should be closely monitored.

Scholarships for Online Courses

Another way the SEE is enticing managers[20] to increase their skills is by providing scholarships on a limited basis to interested managers. A total of 428 scholarships have been given through three different programs.[21] Although no study has yet to be

conducted on completion levels of the programs or their effectiveness, in our survey some managers stated they gave up the program because frequent power outages became too disruptive. Others simply told us that they lost interest in the program. At the same time, some managers said that they took full advantage of the opportunity and added that they remain in contact with classmates from other Latin American countries. Overall, 33 percent of LAB managers in our survey had completed an online course.[22]

The Little Intelligent Communities (LINCOS) Project

LINCOS is a collaborative project designed to provide marginalized (primarily rural) communities in the Dominican Republic with access to computers, telephony and other services. Each LINCOS unit is a used shipping container retrofitted with computers, Internet access via satellite, a television and VCR, telephones using Voice Over Internet Protocol (VOIP), community radio transmitter, an electrical generator, soil and water measurement instruments, and a telemedicine unit.

Box 4: LINCOS and the International Community

One of several ironies present in the LINCOS project is that LINCOS may be better known *outside* of the country than inside. Many of the IT and education stakeholders interviewed within the Dominican Republic had either never heard of LINCOS, or had a very limited knowledge of the location of the centers or what services they provided to local communities.

Begun in Costa Rica, with installations in San Marcos and San Joaquín de Cutris, LINCOS was adopted by the Dominican government following discussion between the government of Costa Rica and that of the Dominican Republic. The Dominican government made an initial commitment to purchase and install 15 LINCOS units. Through partnerships with institutions like the Massachusetts Institute of Technology (MIT), University of Rochester Center, the Costa Rica Foundation for Sustainable Development, Hewlett Packard, Microsoft, and LCSI, LINCOS is a well-known name internationally within the field of rural ICT connectivity. The futuristic canopy designed to provide shade for the shipping container is a trademark, eye-catching design that along with the fame of its sponsors has created a buzz in many international conferences.

Box 5: LINCOS wins on content

In a partnership with LCSI the LINCOS units have content for young children to help with literacy in a fun and interactive manner. MicroWorlds software is being used in the LINCOS units and seems to be a favorite among the local kids. LINCOS targets youth aged 9-14.

Pedro practices spelling his name in a LINCOS unit

Impact of LINCOS

While no comprehensive analysis of the impact of LINCOS has yet been conducted, local LINCOS coordinators generally feel that the greatest service that LINCOS provides is access to a telephone.[23] Before the arrival of the LINCOS, residents in some communities had to travel 50 kilometers to make a phone call.

There are numerous anecdotes of the positive impact of LINCOS within different communities. Stories abound of the important social role that local, community Internet radio has had in disseminating news, weather and music to the community within reception range. Communal airing of videos on the VCR and introduction of computers into each community have been considered to be positive developments.

At the same time, there are clear limitations to the LINCOS model, particularly in consideration of the high cost of each unit and the cost-benefit ratio. While an exact cost figure is difficult to ascertain, LINCOS officials and its designers acknowledge that it is an extremely expensive project. When taken together with physical design limitations, unstructured content, and serious deficiencies in drawing in local support and integrating LINCOS into the community (see Box 5), there has been an ongoing need to rethink many LINCOS elements, as well as attempts to redesign the program.

LINCOS Adapts to Change

After consistent complaints by LINCOS communities about the cramped design of LINCOS containers, LINCOS management in the Dominican Republic responded to community suggestions and began constructing the new LINCOS' in buildings instead of using the pre-fabricated containers (See Figure 18). In addition to not installing any new containers, three of the five LINCOS that were originally deployed in containers are being replaced with buildings (see Figure 19).[24]

Figure 18: The first five LINCOS units used the recycled shipping container.

Poor Intra-Project Communication or *"What's LINCOS?"*

One of the most evident shortcomings common to these projects in the Networked Learning space is the lack of communication and collaboration across projects with similar goals. This is hindering effective "field testing" of the various initiatives and the important sharing of experience that is so vital to improving future strategy. Much can be learned from LINCOS's ambitions, AVEs private sector collaboration, and the LABs' experience with youth groups, but without a mechanism for this exchange, the learning is not being disseminated and side-by-side projects are likely to "re-invent the wheel." For example, although LINCOS is run from the Office of the President (and is presumably a high level/high visibility endeavor), information about the

Figure 19: New LINCOS design – in a building

Box 6: LINCOS Telemedicine – A Disconnect Between Design and Need

If the goal of the telemedicine component in the LINCOS was to improve the access to health resources through an increased information exchange with medical experts outside the community using the telemedicine kit as a means of measurement and communication, to date, the telemedicine component of the LINCOS in the Dominican Republic can only be considered a total failure. With the exception of tests, not a single transmission from any LINCOS using any of the telemedicine units has taken place, according to LINCOS administrators in July 2002.

The reasons for the failure of this project are many, but include: 1) using the telemedicine unit requires very high technical skills which neither the nurse, doctor, nor LINCOS manager have; 2) there are no financial or other incentives to learn how to use the new tools; 3) for the transmission process to function, it requires the training and coordination of the doctor, the nurse, and the LINCOS manager, not to mention the international partners who will receive the data; and 4) the telemedicine kit was never integrated into the local health care clinic and existing set-up.

In spite of the in-country challenges to the telemedicine project, a more important explanation for the failure can be found in the initial design and implementation of the units. The kits were *technology-driven* as opposed to *problem-driven.* That is to say, a technology designed to transmit medical information via satellite was applied to a more general problem of poor health in rural communities. It was never determined whether the *inability* to transmit medical information via satellite was a contributing factor to the problem of poor health, or whether an increased ability to do so would result in any improvements. Thinking in these terms, it is no surprise that units have never been used. The LINCOS project should drop the telemedicine component all together and focus on more basic services that have proven to be helpful.

project is not readily found. During an interview with a technician from the Secretariat of Public Health who is involved in the design of a new telemedicine project, when he was asked what was learned from LINCOS' experience with telemedicine, the technician replied, "What's LINCOS?" Communication needs to be increased to ensure that scarce resources are allocated efficiently.

Private Schools

While youth in poor, public schools in rural communities continue to hope for better access to computers and wrestle with learning the movements of the mouse, a handful of private schools in Santo Domingo and Santiago are functioning at world-class levels. For example, the Carol Morgan School in Santo Domingo has over 300 computers, several servers, well-trained staff, and has integrated computers at levels competitive with the most technologically advanced educational institutions in the world. A few other private schools are competitive at this level, and then there is a drop off in quality to the many small private schools that struggle with many of the same issues of training and technical obstacles that confront the public institutions. As we discussed earlier, however, students in private schools are much more likely to have used computers than students in public schools.

Above and Beyond the Formal Educational System

A number of private entrepreneurs have set up training centers throughout the country that offer at least rudimentary computer training. Microsoft Windows and Microsoft Office Suite are standard operating systems and software and many of these private

training centers have an Internet connection. Some private institutes even offer hardware maintenance and programming classes. Most attendees are between 14 and 24 years of age, and while many classes are not always entirely comprehensive nor offer up-to-date in skills and software, users that were informally interviewed almost universally claimed to find the basic instruction both fun and useful. Pricing plans vary but private training centers usually have a sign-up fee followed by a monthly fee. Although not inexpensive, the cost is within reach for many local youth, whose parents have decided that ICT instruction is an investment worth making. In our HDITES survey, when lab managers[25] were asked if parents were ready to pay for their kids to study computers, they responded a resounding "Yes!"[26]

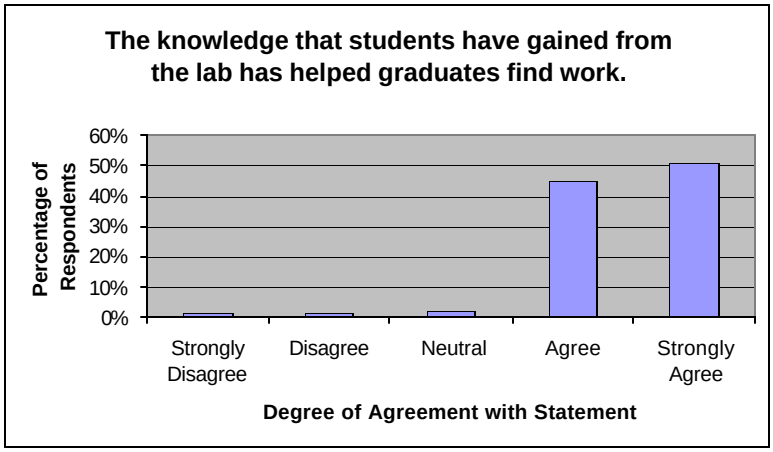
Box 7: Cutting Edge Connectivity Wasted

The photo below is in Restauración where both a LINCOS and a SEE Lab are installed. The SEE is paying approximately US$1,400 per month for *each* of the two VSATs pictured although one of the VSAT satellites is more than sufficient to run both labs.

Although many training centers are filled to capacity and some have graduated thousands of students, the high start-up costs and need for regular hardware upgrades often prevent them from being sustainable in the short run. It remains to be seen whether these private training centers are sustainable in the long term. At some point, the government may realize the value that these institutes add in providing training across the country, and may wish to consider a formal partnership or subsidy program that makes the sector more robust.

Some areas of the country are dominated by one training center with various branches but many smaller institutes are run by LAB managers from secondary schools who offer training in their homes to supplement their regular income. A few managers stated that

Figure 20: Linkages between computer training and job opportunities



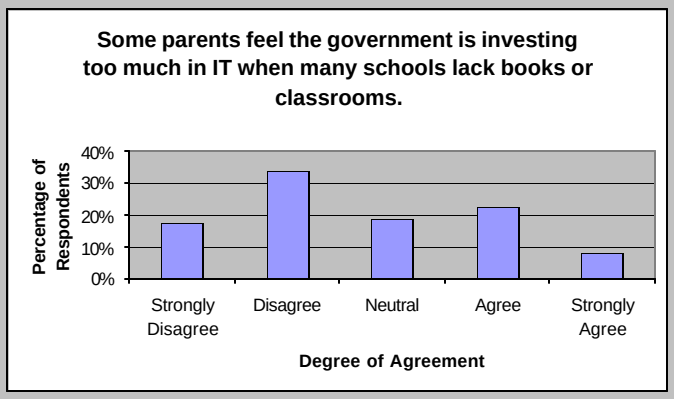
they would not be able to support themselves solely on the revenue from their school. Generally, a six-month investment of six to eight hours per week earns a capable youth a certificate that reads "Titulado en Informática" awarded in a formal ceremony with cap and gown. There appear to be direct linkages (though no guarantees) between this type of certificate and employment – many youth who have moved to a main city after graduating from high school to attend college have found that the basic skills and certificate helped them to find a higher paying job in a bank or office while they attended university (See Figure 20).

Notably, in the HDITES survey, owners of rural training centers observed that often the poorest children in their communities are most interested in taking computer classes because they see great hope and opportunity in computers that can help overcome all of the other obstacles that they face.

Box 8: Is there Support for or Opposition to government ICT investments?

During our research, we wanted to find out how people felt about the high levels of investment being spent on technology when many schools still lack basic resources like books, teachers, and classrooms. In particular, we were interested in hearing dissenting voices. Although more research needs to be done directly with families to learn more about local perceptions of the value of ICTs, primarily minority opposition was encountered towards the investments by the government in technology in public education.

In the HDITES, computer lab managers throughout the country had mixed opinions, but overall, more disagreed or strongly disagreed than were neutral or in agreement with the statement that "Some parents feel the government is investing too much in IT when many schools lack books or classrooms."



Our investigation and observations have led us to believe that even Dominicans who live in the poorest and most remote corners of the country are often not prohibitively far from a school or institute where they can select from a variety of ICT training options. In even remote areas of the Dominican Republic there exist computer schools that have responded to the demand for increased basic IT skills. Most of them teach basic introductory computers using the Microsoft Office Suite of applications but some, such as the Instituto Fronterizo de Formación Técnica (INFRONTEC) in the border town of Dajabon and INORI in Manzanillo also offer hardware maintenance and some basic programming. Both of these schools have graduated hundreds of students, are recognized by the SEE, and offer formal graduation ceremonies in addition to certificates. Some classes at INFRONTEC are even offered in Haitian Creole. Haitians

receive special permission to cross the border into the Dominican Republic to take the class and are then required to return to Haiti after the class is over.

Teacher Training

Teacher training is a key element in the process of integrating ICTs into the classroom. Without well-trained personnel to guide students and provide structure there are risks of greatly decreasing the value and impact of the technologies in the learning process. Teacher training remains a major challenge in the Dominican Republic, and one that is being addressed in a piecemeal fashion from a variety of providers. While we have previously discussed in some depth the current state of training for government computer labs, as follows we briefly outline some other initiatives and resources.

Training in Private Schools and the Risk of Brain Drain

Some private school administrators in Santo Domingo confess that they are of two minds regarding training their teachers. On the one hand, to stay competitive in attracting students they need to appear to be on the cutting edge of education. On the other hand, if they make a large investment in training teachers, those teachers will become more attractive in the job market and may leave for a higher paying job. Not only does the school lose the return on its investment, but a good teacher as well. Creating incentive structures for teachers is an important component in training. Changing habits, shifting routines and adapting oneself to a new process using new tools are daunting tasks. As is typical elsewhere in the world, Dominican teachers are often uncomfortable relinquishing power to students, whose computer skills often exceed those of the teacher. Since it is often difficult for non-teachers to understand these dynamics, it is important to have both teachers and students involved in the design of projects.

Box 9: Youth Groups as "outsourced" ICT support

Many teachers have been successful in mobilizing youth groups to take charge of many of the daily maintenance and upkeep of the labs. Given their advanced skills and high interest in seeing the labs continue as a community resource, the youth in the community are a perfect group to take charge.

Youth Group in Los Toros de Azua plays an active role in running their lab.

Advanced Training Classes

In Santo Domingo, teachers with the financial resources can enroll in high-end private training classes that address the incorporation of ICTs into curriculum. The Fundación Global de Democracia y Desarrollo (FUNGLODE) has been a pioneer of this trend. Not only do qualified individuals using project-based methods teach these classes, but they also go one step further and attempt to develop IT and Education *replicators.* The goal is for these *replicators* to go back to their communities and serve as local cheerleaders to spearhead initiatives to get others around them to integrate the technology in similar ways. Since these classes are quite expensive, the individuals taking these courses work in private schools and institutes and are often among the most advanced, dedicated and highly skilled in the country. Although this type of training is too advanced for many of the teachers who are just getting introduced to the computer, making this training available to more experienced teachers from public institutions through subsidies or private sponsors may later help to spur greater integration in public schools as well. The SEE should consider using training classes such as these and others as rewards for completing lower levels of training and other performance achievements.

Instituto Tecnológico de Las Américas (ITLA)

The Instituto Tecnológico de Las Américas (ITLA) is the training component of the Dominican government's Cyber Park (Parque Cibernético) project. It offers a wide range of training classes from basic Windows use to more advanced programming in state-of-the-art facilities located near the airport outside Santo Domingo. One main goal of the institute is to help increase the technical skills of the population so that they can work in the businesses that the Cyber Park hopes to attract. While few, if any businesses have yet to move into the park, ITLA is fully functional and offers a wide range of classes from Java and web site design for beginners to high-level strategic planning classes for experienced IT managers. Home to a Cisco Networking Academy, ITLA is the largest training facility in the country. Both the public and private sectors should maximize their use of this valuable resource with modern videoconferencing facilities and well-equipped auditoriums. ITLA is said to have been very successful in outreach to poor youth from surrounding communities, and has tried to extend its student base through such program as the provision of round-trip bus services from Santo Domingo to students without cars.

Instituto Nacional de Formación Técnico Profesional (INFOTEP)

Since 1980, INFOTEP has been providing technical training to the Dominican population. To date almost one million people (43 percent of which are women) have been trained in trades like machine mechanics, electricity, sewing, woodworking, automotive repairs, and media. In addition, over 75,000 individuals have received computer training.[27] The INFOTEP program is administered in Santo Domingo and in regional centers around the country. With respect to ICT training, INFOTEP is focusing on basic skills like Windows and Microsoft Office. It is financed through taxes as well as support from the central government and international organizations. INFOTEP subcontracts to local computer schools, which may make it a valuable partner in any large-scale training program and a valuable training resource for the country.

New Infrastructure Development

The SEE is in the process of a very ambitious upgrade to its own ICT infrastructure. The expansion includes a Local Area Network (LAN) and Wide Area Network (WAN) project complete with a full set of both in-house and third party administrative management

database solutions to include all administrative record keeping (such as human resources, inventory, and payroll) for employees of the SEE throughout the country. Funding for the plan has been approved through a project with the Association of Young Business People (ANJE) and installations are scheduled to begin in late 2002. The plan calls for the establishment of 350 additional computer labs for primary schools, the purchase of 1,000 personal computers for district and regional offices, and increasing the number of personal computers in the central SEE office by 770. The SEE will also reportedly install 900 electrical CPUs and 97 gasoline-powered generators to help keep computers functioning during power outages and low voltage.[28]

While expansions are moving forward, as discussed earlier, in some labs installed over three years ago computers remain sitting in their original boxes in schools that still lack electricity or a lab manager. In spite of this, officials expressed confidence that the current problems with the old LABs would be resolved shortly. Considering the management and capacity problems with handling the current infrastructure and the reputation of all governments in the Dominican Republic to allocate resources for "ribbon-cutting" sometimes at the expense of training and implementation, such plans are worrisome and send up a red flag. It is unclear whether the SEE *in practice* will be able to manage such an ambitious expansion without first having gotten their *current* labs up and running.

Box 10: Framework in place, objective *mis*placed

While the deployment of the LAN and e-mail addresses for all SEE employees continues, lab instructors use a yahoogroup to aid communication between the SEE and LAB and AVE managers. Out of the approximately 550 lab managers under the SEE, only 216 are registered in the group. Of the 216, only about 130 have functioning e-mail addresses (23.6 percent of all lab managers). When we attempted to contact the members of this group for the HDITES, over 90 returned e-mails were received from accounts that had been closed due to inactivity or because the inbox had reached its size limit. This anecdote is indicative of the stage where the SEE finds itself in terms of integration of IT in schools. In some cases, the framework is deployed (i.e. computer labs installed or listserv constructed), but the point of the project and its benefits (improvements in education or in this case, improved group communication) are sometimes lost.

Maintenance

One of the most difficult challenges the SEE faces is providing technical support to 440 (including both LABs and AVEs) computer labs across the country. Dust, heat, and electricity problems cause frequent technical problems. In response to the need for increased support in the rural areas, the SEE designed a mobile technical support team outfitted with small trucks to travel throughout the country attending to the needs of school labs. Although this fleet of vehicles and technicians has been operational for some time, it has yet to extend its reach outside of Santo Domingo because of problems with insufficient funds for gasoline and *per diem* allocations for the drivers. Unfortunately, management problems such as these are indicative of the types of issues that continue to hinder the efficiency of the SEE. One of the ways the Unidad Ejecutora wants to address this issue is to relieve some of the need for centralized technical support by helping communities get support locally instead of from Santo Domingo. This is part of the reason for greater involvement in local communities and one of the focal points of the "Technology Dialogues."

Conclusion: Matching the Best Laid Plans with Execution and Reality

Critics of the government's handling of the labs common ask questions such as *"How can they have put computers in schools where there is no electricity?"* or *"How could they have ignored the training component?"* It is important to point out that provisions for training and a solution to the electricity were both clearly articulated in the original proposal for the LABs.[29] However, in spite of the planning and efforts by well-intentioned professionals, these components fell short between design and implementation. While lack of community participation from the outset surely played a role, poor planning, short implementation periods, and political compromises are also likely suspects. To gain a more nuanced understanding of the where the process was derailed, a more careful look should be taken as to exactly where and why the setbacks occurred. While local officials involved throughout the various stages of the process are the best people to conduct this examination, they often lack the time, autonomy, or clout that Dominicans so freely offer to "outsiders." More research by experienced, independent institutions with a long-term stake in the Dominican Republic can help back up local initiatives and support their work.

As should be clear from our findings, integrating technology into the curriculum is universally a long and complicated process that requires addressing issues in management, training, and overall educational reform. Adapting this overarching theme to the Dominican Republic, it is clear that if the SEE wants to make this work, planners are going to need to find some way to better engage local communities. The IT committees and "Technology Dialogues" are both steps in the right direction, but they require follow-up.

Among the ICT stakeholders in the Dominican Republic, one can easily find various perspectives on the current situation: cynical, excited, hopeful, condemning, unrealistic, farsighted, nearsighted, caught up in the past at the expense of the present, and caught up in the *future* at the expense of the present. Stakeholders need to focus on what is currently taking place and temper their ambitions to what has been shown to be effective *in practice*.

Many stakeholders believe that creating a multi-sector dialogue around a national ICT strategy is an important component of solidifying local initiatives and pushing forward ICT integration. However, while they agree that now is the time for such a dialogue, exactly who, how, and why have yet to be defined. For the various ICT initiatives to take shape, some entity needs to initiate the discussion and present a vision with a plan that coincides with Dominican realities. One format being discussed is that of a "Working Group" in which a forum for open dialogue is established whereby ideas can be discussed in an environment in which there is a commitment to participate in what will certainly be a cumbersome merging of competing interests. While any such initiative is going to have setbacks, the Dominican Republic's challenge will be to make sure that these setbacks are not paralyzing and that the parties involved commit to sustaining the dialogue.

The catalyst for this discussion would ideally be well-respected, non-partisan, politically inclusive, and able to convene and inspire the private sector. The SEE, EDUCA, or UNDP could all play a role or they can investigate creating a new foundation like the proposed Fundación Dominicana Digital[30] with multi-sector partners. This group will need to draw on past experiences while capitalizing on the spirit and energy of the

population to create a sustainable forum with a unified, long-term vision that has the clout to force the government to follow through with its plans. As expected, getting any group of stakeholders to agree on a long-term vision will be difficult. Adding in the Dominican tradition of "drastic turnover" between government administrations will make it even more challenging. At the end of the day, policymakers risk being left scrambling to catalyze initiatives and maintain a collaborative inertia.

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Chapter Two
Network Use in Dominican Businesses

Introduction

There is a growing belief, supported by experience, anecdote and increasing empirical evidence, that countries that can effectively migrate their productive output to maximize the use of information and communication technologies in the production of goods and services can more effectively compete in the global economy. Competitiveness increasingly relies upon knowledge industries, which are deeply linked to the use of ICTs. The key to enhancing economic competitiveness through ICTs is the productive and efficient adoption of the new technologies by businesses. Businesses that are able to effectively employ information and communication technologies find more sophisticated and efficient ways of managing their external relationships and communications. This growing ICT usage helps form the critical mass of electronic transactions which supports a networked economy, both in terms of the network size and the demand for associated goods, services, labor and policy reform. Businesses remain dependent upon the learning environment to provide qualified labor and upon policy to shape the cost, reliability and overall environment within which ICTs are used. However, it is the use itself that is so crucial to the important efficiency gains that can contribute to overall economic competitiveness, the economic development process, and institutional reform.

Goals

We sought in this portion of the Dominican Initiative to better understand how Dominican firms view ICTs, are using ICTs and consider the overall ICT environment in the country. As the country's early adopters of technology, the views of business leaders within Dominican firms serves as an excellent bellwether of the main issues facing the Dominican economy, and can help to identify areas of needed action or intervention to help smooth the way for more effective ICT adoption overall.

Overview of our Findings

Building upon our specific findings about how business are using ICTs, our research suggests that the most pressing need vis-à-vis ICTs in the Dominican private sector is to develop deeper and broader institutional mechanisms to convene and encourage national dialogue on Networked Readiness issues. There is both a need and a desire by business leaders throughout the Dominican Republic for informed, action-oriented vision and leadership around ICT issues, and a frustration for the vacuum of these traits in the Dominican government. It seems appropriate and advisable for the Dominican business community to be proactive in developing the institutional capital and forums for debate, discussion and dialogue about the future of the country, how ICTs can play a role in that future, and what actions need to be taken to achieve those goals. An existing general business network such as Consejo Nacional de la Empresa Privada (CONEP) or the American Chamber of Commerce could serve as an excellent platform from which to launch this type of dialogue. What is clear is that the time is ripe for collaborative vision and leadership to emerge within the Dominican Republic around ICTs, competitiveness, and the Networked future of the country.

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Methodology

We have based our analysis on a series of elements, including:

- **Qualitative and semi-structured interviews across sectors to understand context.** Our team interviewed business leaders, entrepreneurs, technologists, educators and publishers, as well as government officials to gain a qualitative understanding of business use of technology.

- **A survey of businesses to measure technology adoption and perceptions.** Building on the foundation of qualitative interviews, we developed a quantitative survey in partnership with the American Chamber of Commerce of the Dominican Republic (AmCham), based on random sampling and other statistical techniques. The survey gathers information about demographics, adoption and use of information and communication technologies, and opinions about education, government and impact of technology.

- **Drawing on other research.** We also draw on other published and unpublished research from our own work in the Information Technologies Group (ITG) at the Center for International Development (CID) at Harvard University and other groups, about economic development in the Dominican Republic and comparisons with other countries and regions. For example, research used in CID's *2002 Global Competitiveness Report* and ITG's *Global Information Technology Report 2001-2002,* jointly published with the World Economic Forum.

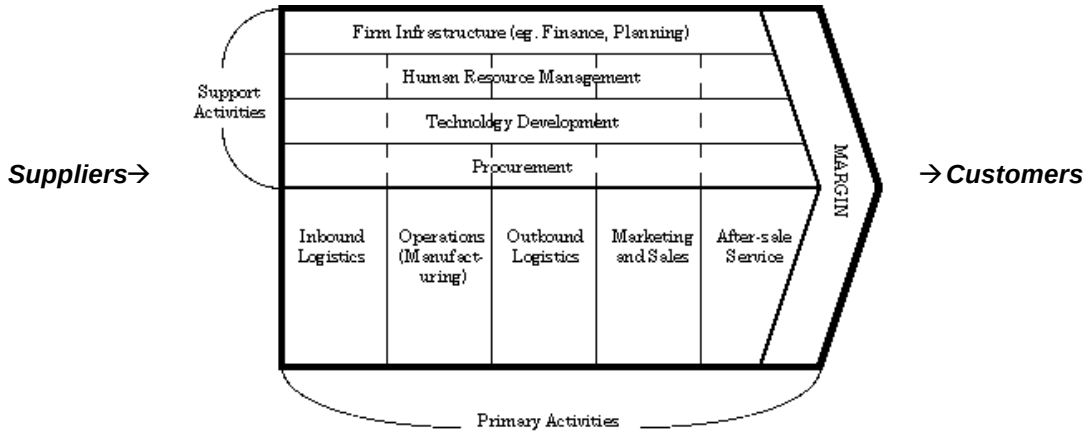
Framework for Analyzing Survey of Business Use of Technology

As mentioned, a major portion of our research on the Networked Economy took the form of a direct survey of business, measuring adoption of technology as well as certain opinions about education and government. Before delving into the survey results, however, it is useful to put them in context, and briefly ask what technology in business is used *for – what the context of technology, and expected benefits are.*

- **Information and communication technologies can automate or *informate.*** It is important to distinguish between technologies that replace human activity – those that automate – versus those that provide people with access to more information, allowing them to take a broader and more connected view in mind as they act.[31]

- **Accordingly, ICTs improve current processes and create new ones.** In most businesses, automation and 'informating' starts with accounting processes. From there, it may move to finance in general, manufacturing resource planning or purchasing. In these examples, the technology is not creating a new process, but improving it. One useful model in analyzing this process improvement is Harvard Business School Professor Michael Porter's value chain, as seen in Figure 1. Note, however, that informating technologies can dramatically change an industry, as it did when eBay 'informated' the process of auctions, by introducing a direct consumer to consumer capability which was impractical before the advent of the Web.

Figure 1: ICT and the Business Value Chain



Source: Roger Clarke, Dept. of Computer Science, Australian National University. [online] at http://www.anu.edu.au/people/Roger.Clarke/

- **ICT has value as an enabler – beyond efficiency improvements.** According to the above model, selling products online (the most narrow definition of e-commerce) has value in automating a process and also *informating* it. However, it is only one part of a much broader set up processes that make up the business, and the value of the technology must be considered in that context. Taking that view, the value of ICTs is expressed in several ways, and it is a mistake to focus only on efficiency and cost reductions resulting from technology implementation, as this misses major benefits of many technologies. For example, potential benefits include efficiency, productivity, quality, innovation and organizational change.

- **ICTs and Competitiveness**. As businesses and industries adopt these technologies that yield a range of benefits, competitiveness on the level of the firm, the industry and ultimately the national and regional economy can be enhanced.

- **The Dominican Republic is in a transition period.** Our research has shown us that there has been uneven adoption of ICTs by business across sectors, geographies and technologies. As the country moves from an economy based primarily on manufacturing to one that relies increasingly on telecommunications and service-based sectors, growth pains and challenges will present themselves. Action by both the government and business leaders who can champion the use of ICTs will be essential to make this transition phase as smooth as possible.

Survey of Business Use of ICTs: Structure and Caveats

In order to assess Network Use by business, we interviewed 36 companies randomly chosen from the membership of the American Chamber in the Dominican Republic, a leading business organization in the country. In order to gain a more complete picture of the Networked Economy in the Dominican Republic, we asked who these companies were, and how they used technology, along with their opinions about education, ICTs and government. In order to improve the quality of the responses, all interviews were conducted in person, by one of a team of five interviewers. The survey included five sections:

- **Section 1: Company demographics.**
- **Section 2: Opinions about worker education, skills and hiring.**
- **Section 3: Use of technology.**
- **Section 4: Opinions about the impact of technology on productivity and other factors.**
- **Section 5: Opinions about ICTs and government in the Dominican Republic.**

Several caveats also apply to the research:

- **Results are likely to be biased toward urban firms.** We took our overall research population to be the membership of AmCham, which at roughly 3,000 firms is likely more internationally aware and more technologically sophisticated than the overall population of firms in the Dominican Republic. Further, we limited our interviews to the more urban regions of: Santo Domingo, the Cibao valley (including Santiago, Bonao, Moca, La Vega, and San Francisco de la Macoris), Puerto Plata and La Romana. We also do not capture the large numbers of micro businesses, such as the thousands of *colmados* and small family businesses with fewer than 10 employees throughout the country.

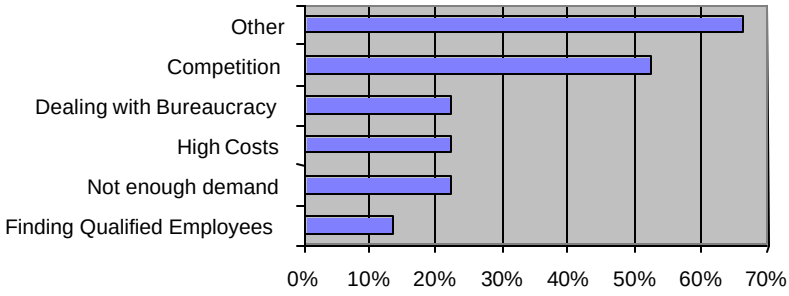
- **Businesses are not alike, and they use ICT differently.** A manufacturing company encompasses different processes than an accounting firm. Similarly, a large firm of 5,000 employees will also have processes different than a small one, even if in the same industry. These differences make for strikingly different adoption of technology: a small corner store may outsource its accounting to a neighborhood firm and have no need for an internal accounting system, while the top priority for a tobacco grower may be quality control for an international clientele.

- **Difficulty in capturing the quality of ICT use.** A simple self-reporting survey cannot capture the quality of use of technology. Just as businesses differ, so do the quality of their ICT efforts. Many technologies require training, and may also need significant organizational and personnel changes to reap their full potential benefit. Even in the largest global firms this is a significant barrier, and more ICT projects fail because of the human aspects than the technical.

Key General Issues for Business in the Dominican Republic

In the process of interviewing many people in the Dominican Republic, several key issues of importance to business and economic development were raised. Above and beyond strict ICT issues, these factors provide a wider and more general context within which business are dealing with technology issues

Fig 2: What are your biggest challenges in business today?



(Percent of 36 companies responding)

As one of the first questions in our business survey, we asked companies: "What are your biggest challenges in business today?"

We heard a variety of responses (see Figure 2) but what was most consistent was the diversity of problems faced by business. Apart from a host of issues that are bundled under the "Other" response, business leaders most often cited competition and difficulty in dealing with government bureaucracy as specific problems.

Many companies also mentioned the following specific issues, which could fall into the "other" category:

- **The electricity shortage is causing major problems.** Power outages are a major issue for the country, with some parts of the country and poor *barrios* suffering outages nearly every day for several hours. This imposes high costs on businesses that must buy generators, fuel and inverters (*inversores*) in order to maintain a stable electricity supply. High fuel costs are a correlated major concern.

- **Concern about the government's role in education.** Many executives mention concerns about education in the Dominican Republic, and availability of skilled knowledge workers as the Dominican Republic has moved into more knowledge-intensive industries. There is a general perception that politics often supersedes quality as motivation for school organization, and that a lack of a stable civil service in education makes quality improvements difficult.

- **Corruption and bureaucracy are major barriers to business growth.** There is also a perception that government and business have a poor working relationship due to high costs and inefficiency imposed on business by both business and government corruption. Companies mentioned 'facilitation payments' that were required in some sectors, and the common practice of hiding profits to avoid burdensome taxes. Many essential laws designed in partnership with business have languished in the National Congress.

- **Overseas competition in low wage industries is causing job losses.** Some interviewees in our project estimated that approximately 20,000 textile jobs were lost in 2001 due to competition from lower wage countries like China, Honduras, Haiti and Korea. Firms in the Dominican Republic are setting up plants in Haiti, while many foreign owners of firms are also moving production. This pressure clearly raises the stakes for economic development in the country.

- **Free zones depend on favorable trade regulations.** Much of the business in the free zones of the Dominican Republic was essentially created by portions of the U.S. Caribbean Basin Trade Protection Act, which sought to protect U.S. yarn and cloth producers by allowing duty free assembly in the Caribbean. Without such protection, many of these firms would fold, creating massive restructuring.

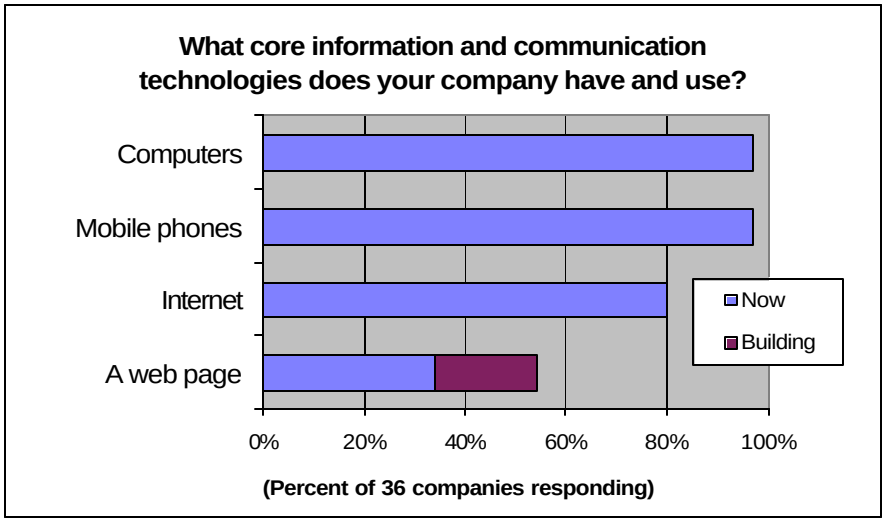
- **Sector specific requirements often outweigh technology.** Each sector has specific problems and concerns. The decline in tourism due to the terrorist attacks in the U.S. in September 2001 was palpable. Tobacco manufacturers, faced with competition from Central and South America, are seeking expanded government support in agricultural research, including cigar wrappers. These issues affect the

fundamental environment of particular economic sectors, and often outweigh specific issues around enabling technologies.

Section 3 Survey Results: The Use and Prevalence of Technology in Business in the Dominican Republic

From the survey, we found that use of information and communication technologies by business in the Dominican Republic is pervasive. Of AmCham members in the urban Dominican Republic, we now know that most companies use computers and mobile phones (97 percent), 80 percent have Internet access, and over half either have or are building a web page (see Figure 3).

Figure 3: Use of mobile telephones and computers is pervasive.



Box 1: The value of e-mail

One large textile manufacturer in one of the Santiago free zones told a story of how valuable e-mail had become to their business.

As early as the mid 1990s, the company used email frequently to communicate with clothing designers, marketers and distributors in the United States. Orders, status, questions and a variety of communication took place over e-mail.

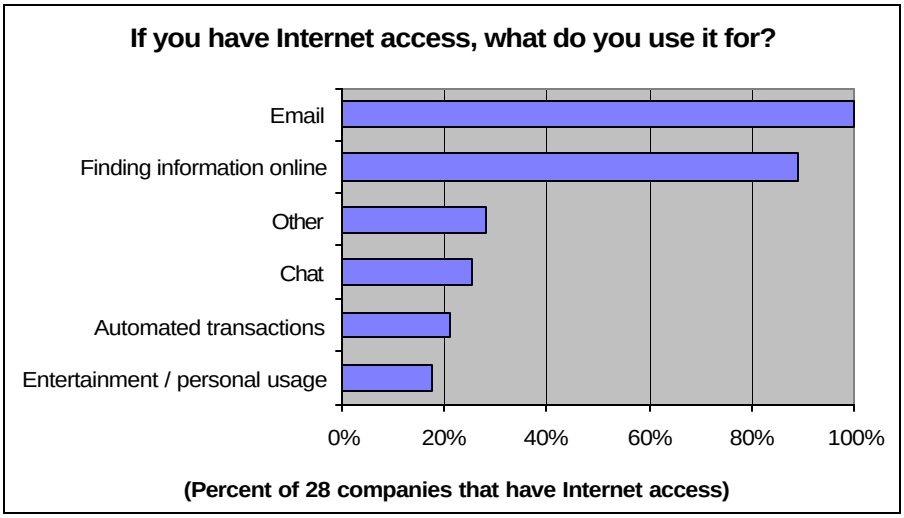
At one point, there was an e-mail outage for some reason. After four days, the CEO of the firm told the IT staff: ***"If our e-mail is out for three more days, we are out of business."***

This story illustrates the critical value that e-mail has taken on for corporations in the Dominican Republic – particularly for those with international ties and time-sensitive communication.

- **Most companies have Internet access, and all of those use e-mail.** When we asked companies with Internet what they used their Internet access for – the results were noteworthy: 100 percent of these companies used e-mail, and consistently in interviews cited e-mail as the most valuable aspect of the Internet, allowing rapid

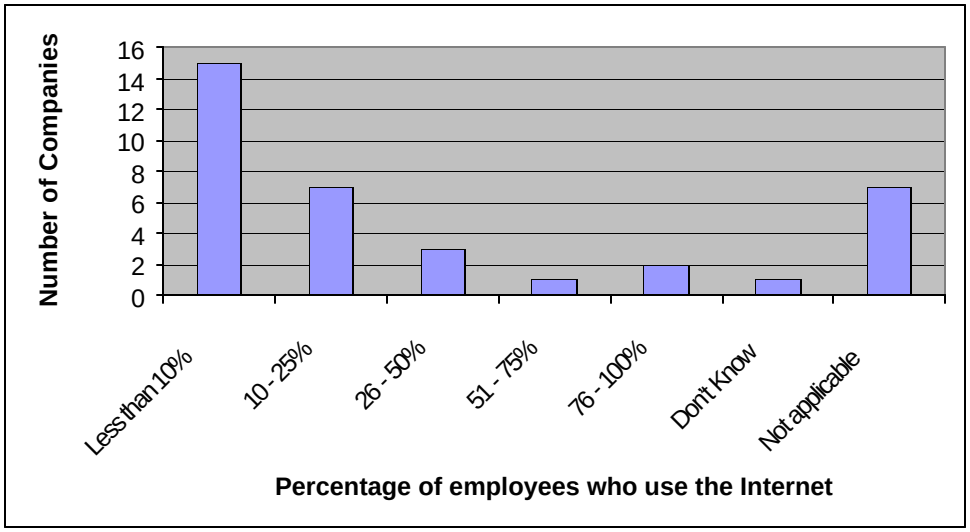
contact with suppliers, customers and partners both in and out of the Dominican Republic.

Figure 4: How Companies Use the Net



- **Most Firms Have Internet Access, but Few Employees use the Internet.** Seventy-five percent of the firms we interviewed have the Internet, but within those firms, only a small percentage actually uses it. In our firms surveyed, 61 percent of companies reported that less than 25 percent of their employees used the Internet, regardless of the firm having Internet access. Based on our experiences in other countries, this could suggest that only employees who have a direct need for the Internet, or senior management, are given access.

Figure 5: Within the Firm, Employee use of the Internet



- **Use of the Web is mainly for basic information and customer service.** Of the 36 companies we interviewed, one-third had an active Web site, and 20 percent more were in the process of building a site. We asked those companies with an active site what it included, and found 75 percent use their sites to post basic information about

the firm, while 50 percent use the site to provide customer service and support information, and less than 10 percent have Extranets or transactions on the site (see Figure 6 and Box 2).

Box 2: Progressive use of the Web

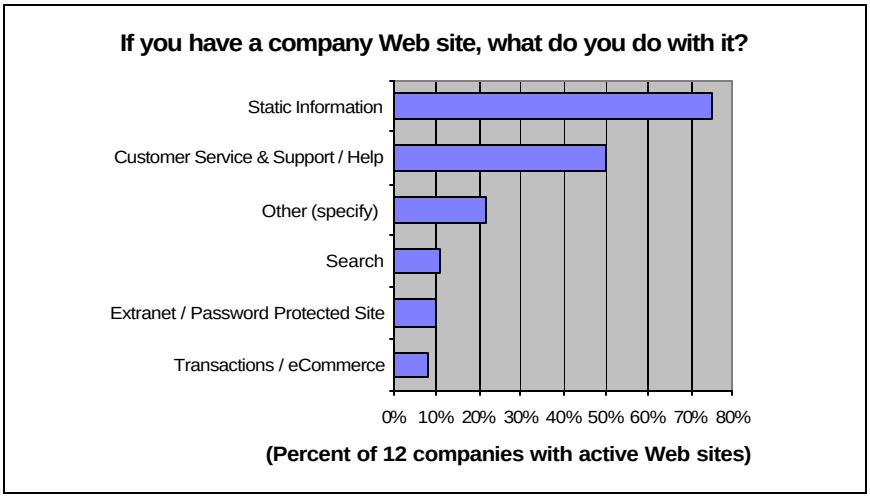
Businesses in the Dominican Republic are going through development in web use – beginning with basic information, moving to customer service and support, and eventually providing specialized information for subsets of their partners (as in an Extranet) and transactions.

This progression and development of Web use (see Figure 6) is consistent with experience in other regions of the world: As companies build IT capacity, they often launch a Web site motivated by company pride and image, and see what happens. As customers and partners learn about the site, the next step – extremely valuable and requiring much less technical expertise and infrastructure than transactions or Extranets – is customer support.

This progression makes perfect business sense: customer support is one of the most vital services a business can provide – building the brand, marketing reach, and customer loyalty. It is also one of the most costly and information intensive.

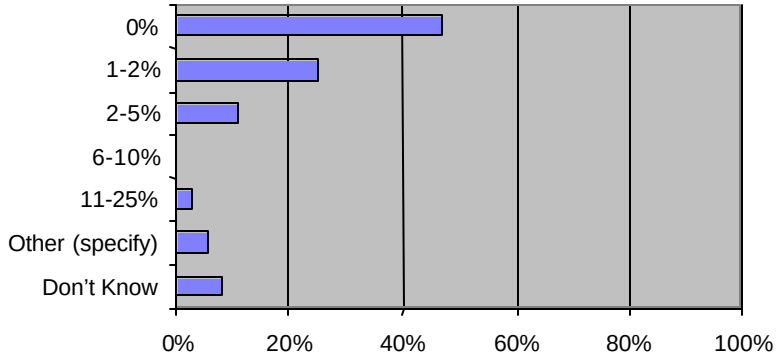
Moving information that is frequently requested to the Web frees up workers in the firm to focus on higher value-added activities. Like any technology, this is not without costs and a learning curve – but the economics of the Web, of very low variable costs, make it a good long-term bet.

Figure 6: What do you do with your Web site?



- **E-commerce (sales) is hard to define, and insignificant for most firms in the Dominican Republic.** E-commerce, now much maligned because its potential was over-hyped throughout much of the world, is narrowly defined as "order placement using electronic means" and includes such methods as consumer Web transactions (what most people think of when they hear e-commerce) as well as e-mail from a purchasing agent, or Electronic Data Interchange. Thirty-nine percent of our sample did report some use of e-commerce, with three percent reporting that between 11 percent and 25 percent of their order were placed electronically (see Figure 7).

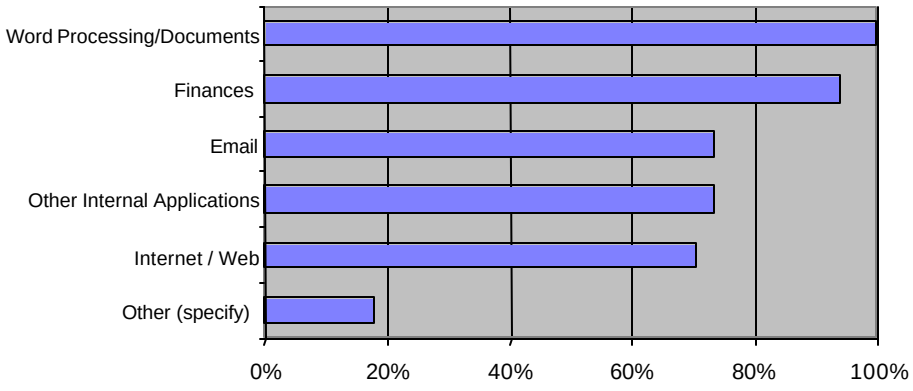
Figure 7: What percentage of your companies sales come via eCommerce? (including Web, email, electronic data interchange, etc.)



(Percent of 36 companies responding)

Computers automate and informate documentation, finances, and communication. We can infer from our survey that nearly all members of AmCham in urban areas use computers. But what do they use them for? Word processing and accounting top the list, but a large number of firms use software bought from third parties, or systems designed internally for internal process automation and *information.*

Figure 8: If you have computers, what do you use them for?

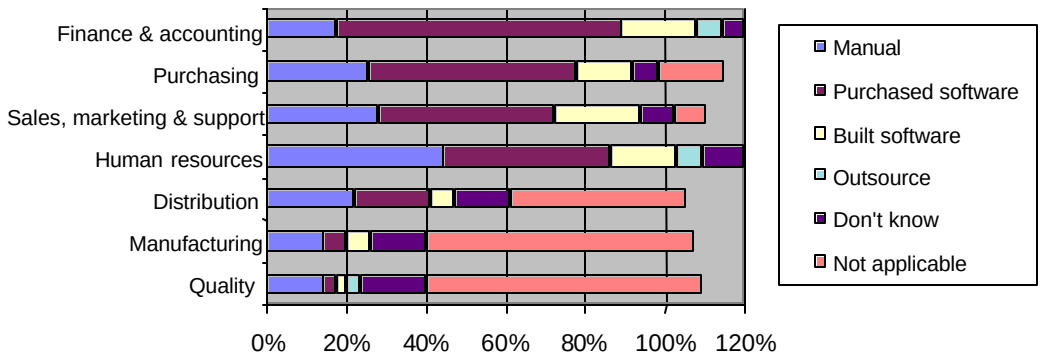


(Percent of 35 companies using computers)

- **Word processing, finance, internal applications and e-mail.** Thirty-five out of 36 firms interviewed use computers, and the one that did not was a small bakery. From this we can infer that computer use in the Dominican Republic, at least in urban areas, is widespread, and that often, the small firms not using technology may not need it at their current level of development. Of these 35 firms, 100 percent used computers for word processing, and 94 percent use PCs for accounting and other financial application (see Figure 8). As indicated previously, e-mail is used by all firms in our sample with Internet access.

- **Firms buy software for accounting, purchasing, customer support and human resources.** In order to gain a more detailed understanding of how ICTs are used in particular processes and functions, we asked firms about how they managed technology in the common support and primary activities of accounting, purchasing, sales, marketing & customer support, distribution, manufacturing and quality.

Figure 9: What technology does your company use to execute the following processes?



Percent of 36 companies responding
(does not total to 100% when multiple approaches are used)

Firms could select systems based on manual processes, purchased or built software, or outsourced arrangements (see Figure 9). When possible, if software was purchased, we asked what software the firm used. Many firms used multiple systems in a function (e.g. some purchased software augmented by systems developed in-house).

From the data, we can see that finance, purchasing, customer support and human resources are the processes most common across firms. This is expected, as many firms we interviewed are in service and distribution sectors. Outsourcing is most prevalent in accounting and HR, while manual processes roughly balance IT systems in human resources.

Box 3: Homegrown Dominican-specific, and global process automation packages, or "Why we brought in the PeopleSoft consultants from Miami…"

Much of modern corporate IT budgets around the world is now devoted to large packaged applications: SAP, Oracle, PeopleSoft, J.D. Edwards, Siebel. These names bring fear into the hearts of even the most steady CFOs and CIOs, due to their well-earned reputation for disrupting and changing established process to eke out efficiency gains. That said, as these systems have matured they have also become the most proven examples of how technology, implemented together with organizational changes, can create lasting improvements in productivity.[1]

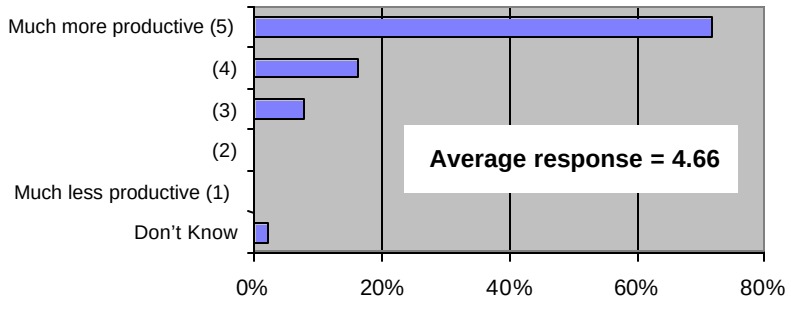
Most medium-sized firms tended to use systems developed in the Dominican Republic, based on databases such as Microsoft Access or Filemaker Pro. Many firms developed their own applications for mainframes or database front-ends. Larger firms used Enterprise Resource Planning, Customer Relationship Management, and/or Human Resources Automation systems from global suppliers.

Based on our few interviews with very large firms in the Dominican Republic, there was general agreement that it was very difficult to find local implementation and support teams for global packaged applications. More than once we heard mention of "flying in the team from Miami" for implementation. Implications for Networked Readiness are two-fold: the country is advanced in adapting computer systems for local needs, but needs to develop a local base of developers and consultants skilled in large-scale packaged application support.

Section 4 Survey Results: Opinions about ICTs and their impact on productivity.
In the previous section we have seen how ICTs are used in Dominican businesses. This section deals with what that use is for and how these technologies are perceived.

- **Businesses believe that ICTs have made them much more productive.** There was strong agreement among urban businesses to this effect – with 72 percent of interviewees saying that ICTs have made business "much more productive," and an average across 36 companies of 4.66 (see Figure 10).

Figure 10: Information and communication technologies have made businesses in the DR...



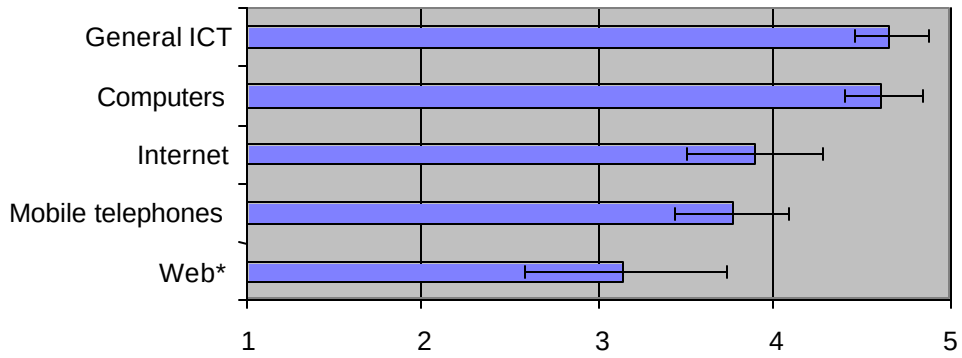
(Percent of 36 companies responding)

❖ **Computers and mobile telephones top the list in productivity improvement.** In comparing productivity improvements due to different technologies, however, computers certainly came out on top, with an average rating of 4.62, where 5 means "much more productive" and 1 means "much less productive" (see Figure 11).

This was followed by the Internet, with an average rating of 3.89, mobile phones rated at 3.76, and the World Wide Web at 3.15. Other technologies, such as Enterprise Resource Planning systems, were not in sufficiently broad use to gather comparable data.

Figure 11: Opinions about productivity improvements due to certain technologies

(1 = Had no effect on productivity improvement, 5 = Dramatically increased productivity)



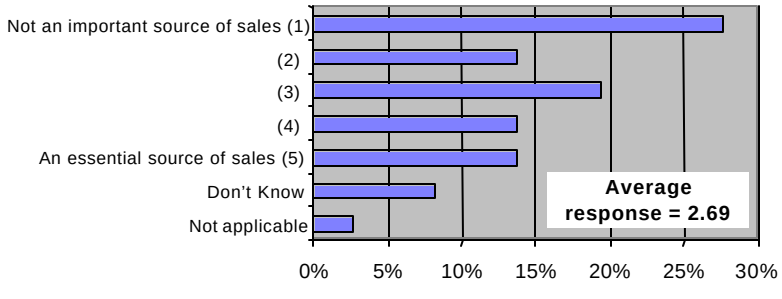
(Percent of 36 companies responding)

Error bars indicate 95% confidence interval

*** *indicates "essential tool in our business***

❖ **Most companies do not believe that e-commerce is or will be an important source of sales.** In our survey question measuring opinions about electronic commerce, 32 Percent of firms said the e-commerce was an important (4) or essential (5) source of current and/or future sales (see Figure 12). 41 percent gave it a rating of (1) or (2) where (1) indicates "not an important source of sales." For many of the firms in service industries, or with a focused set of clients, this makes perfect sense.

Fig 12: e-Commerce now (or in the near future)



(Percent of 36 companies responding)

Box 4: Laggard or enthusiastic adopter?

As shown in Figures 10 and 11 and the preceding data, the Dominican Republic is an enthusiastic adopter of computing and Internet technology – there is a generally prevalent belief that computers and the Net dramatically improve productivity.

In our interviews, our team was impressed by the optimism of business executives for technology, and there was a consistently strong connection made to the rapid growth of mobile telephony in the Dominican Republic.

There is a strong perception that deregulation of the telecommunications has worked well, and multiple interviewees mentioned that "the Dominican Republic is the mobile leader in the Caribbean."

Box 5: The Case of Enelpunto.com: Business-to-Consumer e-commerce or information portal?

In the boom years of 1995 to 2001, much was made of business-to-consumer (B2C) e-commerce. Many firms around the world were launched to take advantage of what was thought to be a huge opportunity. Enelpunto.com was launched in the Dominican Republic by Grupo Financiero Nacional (GFN), as a portal for Latin America. Very soon Enelpunto.com, like many other firms, realized that electronic businesses still needed to make money to survive.

- **Enelpunto.com started out as a Spanish language portal.** The initial intent of Enelpunto.com was to garner the eyeballs and attention of the Latin Internet market. As the firm grew it began to come up against larger competitors like Yupi.com, acquired by Microsoft in June 2001.

- **It soon changed to focus on the Dominican market, offering e-commerce services.** Residents abroad in the United States and Spain drive value. As of our interview with Enelpunto.com in January 2002, they were getting the bulk of their Web traffic from Dominicans living abroad.

- **e-Commerce is not the highest priority in the Dominican Republic today – communication is.** The firm soon found that residents were not ready to take advantage of e-commerce offerings. Credit card fraud in the Dominican Republic is the 7th highest in the world, and while a digital signature law was recently passed in September 2002, it is at the time of this writing too soon to understand the effects of this legislation. Developing consumer e-commerce depends on building trust for electronic transactions, and on the readiness of consumers to use these systems.

- **Successful firms will find new ways to offer value – including electronic remittances.** The success in telecommunications and the explosive growth of Internet usage in the Dominican Republic show that technology for communication is highly valued by Dominicans, and is particularly driven by communication and interactions with the approximately two million Dominicans living overseas. There are many ripe opportunities for using information and communication technologies to build on this communication and fund transfer from overseas – potentially saving commission fees and cutting transaction times as well.

Box 6: Technical skills in the Dominican Republic: Hard or easy to find?

Many said that technical skills were hard to find in the Dominican Republic. Many firms and experts, in early conversations about the status of technical skills in the Dominican Republic, indicated that it is hard to find and hire workers with sufficient technical training. We sought out to test this early hypothesis by asking companies this question in our business survey.

But survey results said something different. Doing so, we asked businesses four questions – and nearly all of the results indicate the opposite of our hypothesis. In fact, most urban businesses in the Dominican Republic seem to believe that skilled and experience IT workers are relatively available, that it isn't too difficult to find these workers, and that most skilled and experienced IT workers in the Dominican Republic are citizens, not foreigners. Perspectives were mixed on whether skilled workers left the country.

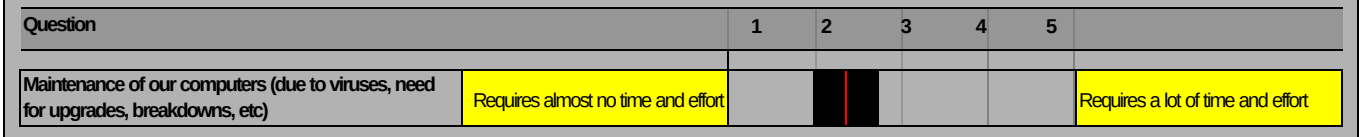
Figure: Average responses from our survey on a 1 to 5 scale

(Methodology note: the black bar represents the '95 percent confidence interval' – this area marks the region of responses in which the average response from interviewees in our overall AmCham set would fall.)

But companies still say it is hard to find specialized skills. Many interviewees still say that specialized skills – particularly with specialized enterprise resource planning and customer relationship management software packages – are still hard to find. More troubling is a lack of software programming skills in the country, but this is being augmented by initiatives like a Linux users group in Santiago and various training programs underway, particularly at private universities in Santiago and Santo Domingo.

From this we conclude that basic 'técnico' skills are well developed. Many companies we talked to are able to find technical support relatively easy. Many have outsourced support or receive it on call from the firms that sold them the computers. We talked to one accounting firm on the north coast of the country that raved about service it received from an outsourced provider in Puerto Plata.

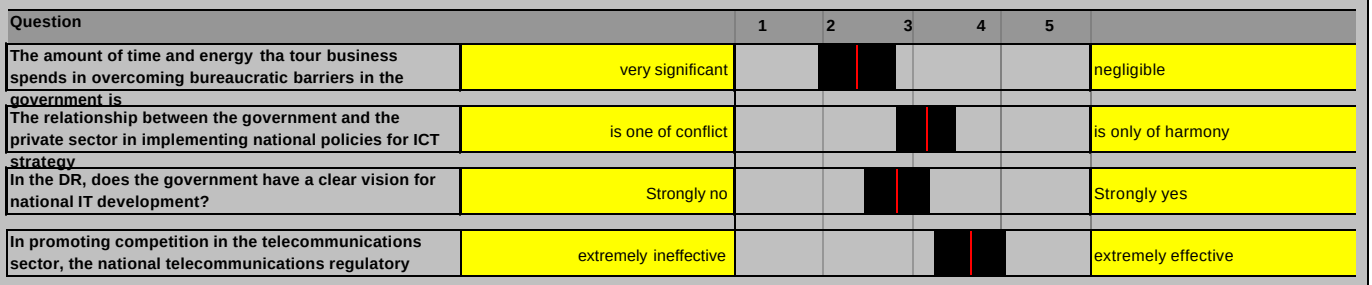
And companies are able to support their use of computing technology. Because of the outsourced service arrangements that firms are often able to make with *técnicos*, and general availability of trained technicians, firms saw maintenance of their computers as a small issue – not requiring excessive time.



Box 7: Can information technology bring more transparency to government?

Companies view corruption and government bureaucracy as a significant problem in the Dominican Republic.

A frequent theme in our interviews with business was excessive government bureaucracy in the Dominican Republic, as well as corruption. This inefficiency plagues businesses as they seek to complete essential processes. Our quantitative survey confirms this feeling, with businesses averaging 2.37 on a scale of 1 to 5, with 1 meaning that the amount of time and energy it takes to overcome bureaucratic barriers being "very significant" and 5 meaning "negligible" (See data below).



(Note from the data above that government is seen as playing a useful role in promoting telecommunications competition through the regulatory authority, INDOTEL, but that it is not seen as having a clear vision for IT).

However, businesses see technology as a tool for transparency. In several interviews we conducted, small business owners saw the Web as a tool for transparency. One firm was able, using the Web, to download important forms that it needed to complete a government process. Managers of the firm indicated that prior to the availability of this Web system, they needed to bribe a government official, or walk into a bureau with a highly placed official or military officer, in order to get the forms they needed.

But commitment by the government is unclear to fully implement ICT systems geared toward transparency. This example above, of moving forms online, is an excellent way for the government to reduce corruption by eliminating needless bottlenecks in government process, which lower level functionaries can use to extort payment. Furthermore, there are also larger opportunities for the government to use linked systems, tracking finances, human resources, budgeting and payments throughout the system. Large firms are increasingly adopting these systems from firms like SAP or Peoplesoft, expressly for transparency and so they can "see where the money goes." It remains to be seen whether the government will be willing to take on this major challenge.

The Big Lesson: Tap into the Enthusiasm – Business as a Leader for Coordinated National Vision and Action

A major theme that we heard again and again from business leaders was the lack of clear vision and action by the government on facilitating ICT activity in the Dominican Republic. Since the time of the bulk of our research, a number of changes have occurred that seem to be positive steps, including the passage of the digital signature law and a renewed attempt to reorganize government authority concerning ICT policy. It

is hoped that these actions improve the overall climate for dialogue and action around ICTs.

In spite of what the government does, however, from the private sector side, there appear to be good opportunities to improve the institutional capital that exists around ICTs. Our team was consistently struck by the high levels of enthusiasm for the Internet, computers, cell phones and PDAs in the business community. The private sector represents the cutting edge of ICT adoption in the country, and is many steps ahead of the government and NGOs in terms of understanding how ICTs can fundamentally improve basic processes and enhance competitiveness. Organizations such as the Consejo Nacional de la Empresa Privada (CONEP) or the American Chamber of Commerce have created the type of basic institutional infrastructure for dynamic and interested networks that could convene informed discussion about issues that the Dominican business community faces vis-à-vis ICTs.

Now is the time to deepen and broaden this leadership by the business community in the area of ICTs. The formation of a council or network of Chief Technology Officers where common needs or challenges can be shared is the kind of action that could plant the seed for greater coherence around a national vision for ICTs.

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Throughout our conversations with business leaders was a lot of enthusiasm, as well, for the creation of informal or formal Working Groups devoted to specific ICT-related issues. If the business community were to take the lead in fomenting dialogue around Networked Readiness, it could catalyze and show the government the possibilities that exist. One of the strengths of the Dominican private sector has been its willingness to tackle and provide leadership on major societal challenges such as education, where there is a need for more resources and less encumbered decision-making – Networked Readiness is yet another area where the mantle of national leadership could fall naturally in the business arena. All that is needed is for those firms and individuals to step forward and begin to convene. From convening would come more open dialogue, and from more open dialogue would come action.

Chapter Three
Network Use in Dominican Society

Introduction

While most ICT use remains confined to more urban and wealthy communities in the Dominican Republic, cellular telephones, computers and the Internet are being rapidly adopted throughout the country. Dominicans, particularly in the urban areas, have a strong interest in technology. Technology fairs are held periodically, which showcase the latest in digital cameras, laptops, desktops, Personal Digital Assistants (PDAs), as well as the generators that many households and businesses need to run them, due to the precarious and unreliable provision of electricity. Televisions are extremely common in Dominican households, regardless of social class; it is not uncommon to find modest and humble homes with state-of-the-art entertainment appliances – televisions, Digital Video Discs (DVDs), Video Cassette Recorders (VCRs) and advanced stereo equipment. Pricing plans for ICT services are extremely dynamic competitive, responding to surging demand.

Cellular Telephony

By far the most recognized, popular, and well-developed area of ICT use in the Dominican Republic is cellular telecommunications. In 2001, the Instituto Dominicano de Telecomunicaciones (INDOTEL), the government's telecommunications regulatory body, reported 1,270,082 registered cell phones in usage,[32] (a cellular teledensity of 14.5 percent). The Dominican Republic has made a public commitment to universal telecommunications coverage, establishing it as a legal mandate of the regulatory body,[33] and it seems likely that cellular technology will play a large role in meeting that goal, due to the greater ease and lower cost of infrastructure deployment, as well as its overwhelming popularity. Cellular teledensity surpassed the concentration of landlines in the Dominican Republic in 2001.

The popularity of cellular telephones has had an indelible effect on Dominican daily life, particularly in urban areas, where the ring of cell phones can constantly be heard on the street, in buses, in malls, office buildings and even unwelcome places such as movie theaters. Cell phones are a status symbol to many, worn on belt buckles almost as badges and Dominican citizens announce with pride that they have the most advanced cellular phone technology at their fingertips. But beyond being a fashion statement, it is also seen as a crucial productivity tool, particularly in businesses. In the business survey that we carried out with the American Chamber of Commerce of the Dominican Republic, 87 percent of businesses believed that cell phones had increased their productivity. As Orlando Jorge Mera, the President of INDOTEL, remarked, "The mobile phone has gone from being a luxury item to being a tool for resolving everyday problems of citizens."[34] Bit by bit, cell phones are also becoming a rural phenomenon as rural cellular networks are built out.

According to INDOTEL, the Dominican Republic had just over 1.4 million cell phone subscribers at the close of the first trimester of 2002,[35] out of a total population of around 8.6 million. Affordable phones and plans, coupled with aggressive promotions and campaigns, have contributed to this burgeoning market. Perhaps as important is the notoriously slow installation of a residential line, often measured in months, and its relative high cost. The competitive prices for long distance to the United States that cellular communications offer are another recognized advantage, especially considering the vast number of Dominicans with relatives living and working on American soil. One astute Dominican flower vendor, with stores in New York and the Dominican Republic,

recognized this phenomenon and now offers a "Stay Connected" bouquet with a cell phone and pre-paid calling cards.

Cell phones are seen by many as an indispensable business tool. In the main commerce centers of Santo Domingo and Santiago, it is rare to encounter a business card without a cell phone contact number. Outside of work, they are just as ubiquitous, as Dominicans of all ages connect and communicate.

Cell phones have opened up new industries and creative uses to generate income. The Metropolitan Transit Authority (AMET) recently banned the use of cellular phones without a hands-free device while driving, and officers on strategic corners are on the lookout for infractions. As a result, street vendors in Santo Domingo, who sell anything from fruit and candy to windshield wipers and tool sets, have increasingly been offering scores of cell phone accessories. Dozens of individuals cram the streets of Santo Domingo draped with hands-free devices, cell phone clips, and portable chargers. These goods have been a part of the informal market for some time, but with the recent limitations on cell phone use while driving, savvy vendors recognized a reason for surging demand, and hit the streets.

Taxi drivers all over the country carry a cell phone, which makes them immediately accessible to clients; enterprising drivers use the phone to offer informal services to customers without relying on the dispatch, where they compete with an entire fleet of cars. And workers from plumbers and mechanics to salesmen and construction foremen report that cell phones have increased the efficiency of their business.

Box 1: The Darker Uses of Technology in the Dominican Republic

Unfortunately, the Internet and the expansion of wireless technology have also made some unscrupulous enterprises more efficient. There is a thriving cell phone black market, where stolen phones are sold at discount prices. And prostitution, a prevalent industry for both locals and tourists in the Dominican Republic, has developed with the times, integrating new technologies. With the introduction of the beeper, which offered an anonymous channel of direct contact, the "*chica bíper*" or "beeper girl," was born. By circulating a number where they could be reached at any time to coordinate details, the *chica bíper* became a recognized element of Santo Domingo nightlife. Cell phones have eclipsed beepers in this capacity, and the use of wireless technology to facilitate prostitution is still an unfortunate reality. The use of the World Wide Web in Dominican sex tourism has been documented in the international press, as foreign tourists can use the Internet to "reserve" both male and female companions for their vacations. Offshore Internet gambling in the Dominican Republic has also made inroads.

The Internet

Data from INDOTEL place the number of active Internet accounts at 70,116.[36] Estimates of the total number of Internet users vary between 150,000 and 400,000, although there is little understanding of how many users share each account. For example, the recent release of a high-speed Asynchronous Digital Subscriber Line (ADSL) connection by CODETEL has made it very easy for users to create private networks. One local technology observer has reported that many budding entrepreneurs buy the ADSL service and offer the connection to neighbors for a small fee.

Internet usage tends toward communication and entertainment purposes: e-mail and chat are extremely popular. Some, who see ICT as a potent tool for development, are

disappointed in the limited use of Internet and technology specifically for social welfare. Some observers point to the experience of the country's only neighbor, Haiti, as an example of a more productive mindset concerning technology. Due to Haiti's precarious political, environmental and socio-economic situations, it is not surprising that there is an immediate connection made between technology and its use to combat these realities, an equation which seems to be less automatic in the Dominican Republic, where chat and websurfing are much more common. Some Dominican ICT observers are quick to point out that while Haitian universities have invested in large, functional computer labs with this focus in mind, the largest public Dominican university had still not provided similar facilities to the students as of 2002.

The level of ICT integration into the daily lives of Dominicans is surprisingly extensive. As mentioned above, good quality stereos and televisions are very common in Dominican households, regardless of income level. These have become important elements of everyday life and have been used in innovative and creative ways. Radio has been used as the original distance-learning tool in the country. Radio Santa María, based in La Vega, has been offering literacy classes and basic reading tutoring over the airwaves for over 40 years. Centro Puente, or Centre Pont, in Neyba uses radio to educate both Dominicans and Haitians, help organize environmental efforts, and create a culture of goodwill between the two communities. Catholic Masses have been broadcast on television and radio for some time, giving the elderly, the handicapped and those isolated by distance the opportunity to participate in the service.

Box 2: The local global entertainment industry

Computers are a key component of the booming cottage industry of pirated CDs and DVDs, which are sold in tourist areas and marketplaces around the country, complete with computer-based color prints of the album covers. Many home-run video rental stores, which are found in small communities and large cities alike, often offer bootleg copies of first run DVDs and the latest video games.

Computers have also made their way into the functioning of many logistics of daily life. Tollbooths have an automated system in which the operator selects on-screen images of common vehicles, from sedans to SUVs to tractor-trailers, to collect data on traffic and highway use. This system requires a minimal amount of training and literacy to operate, yet has had a positive impact on public finance, as the information collected informed the government of the potential of toll booths as a serious source of revenue, leading to a recent 200 percent increase in tolls. New malls and shopping centers in the capital have computerized visitor information panels with touch pad screens, directions to stores, floor by floor maps, and audio and video advertisements and promotions. Talk shows, which touch on political issues, entertainment, sports or local goings on are extremely popular, and are a very common format both for television and radio. Opinions fly freely, and many of the listeners and viewers are eager to offer their ideas. Increasingly, television shows are offering an e-mail address where their public can respond. Many radio and TV commercials and print ads point interested consumers to their Web site for more information.

Internet cafés have become more and more prevalent. Santo Domingo and Santiago have many computer centers, and there are increasing numbers in more marginal areas of these cities as well. Many smaller towns in the interior have also seen the Internet café take root, some as full-fledged establishments, others as family-run businesses in their own homes. Tourists' need to keep in touch has spawned the growth of Internet

cafes in major tourist areas. One telecommunications company has focused on these areas as an integral part of its business strategy, aggressively targeting the growing Internet needs of many hotels and tourism hotspots.

Locally Relevant Content

Considering the small size of the online population within the Dominican Republic, there is considerable Dominican content on the World Wide Web. This is a result of the large Dominican Diaspora population that is eager to stay in touch with the island personally, politically and culturally. All major newspapers have Web sites,[37] which are updated daily and offer advanced features such as search engines, film trailers and news archives. The smaller free newspapers, which entered the market very recently with sweeping success, have also gone online. Many Web sites are designed by U.S. Dominicans, or often with them in mind. Several Web sites include simulcasts of radio and television stations on the island, as well as news, cultural pages, and personal pages with images and nostalgic descriptions of hometowns left behind. The size of the overseas population, as well as pressing political battles over issues such as suffrage for U.S.-based Dominicans, point to an increasing importance of the World Wide Web as a forum for informational, political and social outreach.

The Dominican yellow pages have recently made the transition to the World Wide Web, offering an online search service that includes residential and business information and government offices nationwide, as well as a growing database with information of Dominicans abroad.[38]

ICTs and Social Action

Chat, e-mail and other entertainment uses of the Internet may be wildly popular, however, the opportunities that technology offers non-governmental organizations (NGOs) and social actors have also been recognized and utilized. The Dominican Republic has a highly developed network of NGOs dedicated to issues spanning Dominican society. The "ICT for development" community, which focuses specifically on the role of technology in social and economic development, is an extremely small subset of that group. Nonetheless, there are signs that ICTs are being increasingly utilized by NGOs from numerous sectors as a tool for social action and community development.

Issues facing Dominican education are discussed in greater detail elsewhere in project documents for the Dominican Initiative. However, one of the most widely recognized obstacles to quality public education, teacher training, was the impetus for a particularly interesting private initiative. Perhaps the most complete and targeted Dominican online resource for educational tools and training was created by an entrepreneur in Santo Domingo. In 1997, this individual had the idea of creating an online educational resource center, with links for teacher training, and proposed it to the Secretary of Education. The idea was turned down. The importance of the idea was still clear, but it was equally evident that the technological resources necessary were not available. In 1998, he opened an Internet center on El Conde, a main pedestrian thoroughfare and shopping area in the capital. The company, B27, now has four centers in all. El Conde, 27 de Febrero, the main artery of Santo Domingo, and two in lower-income areas of the city: Ensanche Ozama in the east, Herrera in the west.

Using technical resources from this chain of Santo Domingo Internet cafés, some research and a bit of creativity, the resource center became reality in 2001. A server was created at a very low cost by bypassing the need for a dedicated IP address using a U.S. company to assign a domain name to a dynamically assigned IP address. Two 14 year-old techno-savvy Dominicans authored a program to bypass the need for a router. The Web site,[39] named after a renowned Dominican educator, includes recent documents and studies on education, resources promoting quality and efficiency in teaching, and an original online book concerning legal and practical issues in Dominican education.

Another technology-based social effort is fueled by the conviction that one crucial contributor to the social ills of the Dominican Republic is the fundamental lack of solidarity. This project contends that fostering a culture of unity and fraternity would combat many of the issues facing the country, and that the message fostering solidarity must be creative in its presentation and inclusive in its scope. As a local TV presenter with his own morning talk show, the head of the effort sees broadcasting as one component, but also recognizes computers as a way to facilitate development by "skipping steps" and as an effective medium for the solidarity message. He currently organizes an online newspaper with international contributors,[40] and is formalizing projects for the future. One concept, dubbed "Internet Ciudadano" would work with computer vendors to offer computers as awards for distinguished community service. This program would help community leaders get online, and put tools in their hands to further their social work.

Box 3: The .do Dominican top-level Domain Name

The official registry of the ".do" domain is under the auspices of the Pontificia Universidad Católica Madre y Maestra (PUCMM), a well-respected private university in the country. There are presently over 5,300 registered pages with the country-level ".do" domain. There are many more that are Dominican-operated, but many opt for the ".com" option. Many large businesses prefer it, and many small businesses who are receiving guidance from IT consultants, are counseled to use the ".com" designation if possible.

There are numerous examples of Internet use either for community welfare or to increase the efficiency of organizations with established social programs. One organization based in Santo Domingo is dedicated to facilitating communication and exchange among non-profits across Latin America. The Networks and Development Foundation, FUNREDES, focuses specifically on the use of ICT for development. The social goals of the organization - empowering persons and communities, collaborating and social networking, producing local content, and facilitating a diversity of languages, cultures and opinions – are reached through technological means. Their flagship project, Methodology and Social Impact of ICTs in Latin America, or MISTICA by its Spanish acronym, looks to strengthen social actors focused on technology through collaborative work, create a network of people to discuss and investigate the social impact of technology, and support regional dialogue to establish an agenda of action. MISTICA involves 236 volunteer participants from Europe, Africa, North and South America in a virtual community of academics and social activists.

In addition to the above objectives, MISTICA also is interested in process, and investigating tangible methodologies for collaboration over the Internet. The project

uses a methodology called EMEC (Efficient Management of Multilingual Electronic Conferences), a moderated environment which does not allow any message to be posted. They are screened for quality, and are then posted as an abstract of the complete message. MISTICA participants span four languages (Spanish, English, French and Portuguese); the messages are translated, so that the author can write and the recipient can read in their own respective languages.

The MISTICA project has drawn considerable attention. The initiative's Web site www.funredes.org/mistica receives 400,000 hits a month, and the project was a finalist in the Stockholm Challenge, a contest that recognizes innovations in ICT for development. The head of the organization has been approached by the International Labour Organization (ILO), which has shown interest in the possibilities this methodology presents. The possible applications are far-reaching; this online conference structure is already being used to connect NGOs and social actors from numerous regions, with the gradual fine-tuning of the framework, it could easily be modified for academic, business and diplomatic and government purposes.

Box 4: Creative ICT Projects for the Public Good

There are signs of creativity in using ICTs for the public good in the Dominican Republic. For instance, one private citizen developed the idea of putting the Juan Pablo Duarte Museum online, with pictures and information, as a tool for education. The cost of the effort, in both time and money, was negligible, and is beneficial to students, citizens, the Dominican community abroad, and anyone interested in the country's history. The Web site will be functional in the early months of 2003.

A number of people we interviewed mentioned the idea of using *colmados* as possible telecenter sites. As one of the most Dominican of institutions that can be found in countless neighborhoods/streets/towns, their frequent position as the geographic and social center of many rural communities and their relatively stable electrical infrastructure make them attractive for some sort of telecenter initiative.

These kinds of creative projects merit deeper investigation, discussion and perhaps deployment.

The Catholic Church, which has historically been, and continues to be, a significant force in Dominican society, is also using technology for its social efforts. The Church's use of ICTs, both internally and in interaction with Dominican Catholics, is an interesting addition to the networked landscape of the Dominican Republic, and may prove to be a significant catalyst for ICT expansion.

The Dominican Catholic Church is implementing efforts to tap into the potential of ICTs for evangelization, organization and communication nationwide. Currently, all Jesuit priests have and regularly use e-mail, and plans are underway for all priests in the country to follow suit. The Church in the Dominican Republic presently has two main ICT goals: to provide every parish in the Dominican Republic with e-mail and an Internet connection (practically all in the capital are connected.), and establish a prepackaged software package designed for the needs of parishes as the standard operating system.

Another project in the Dominican Catholic Church merges new technology with the country's legacy as the first colonial foothold in the New World. Until 1953, all church records in the Dominican Republic had to be registered and stored in the capital, in the Archdiocese of Santo Domingo. When church officials began reviewing this information, it became clear that they had a tremendous wealth of documents dating far back into the colonial period. With Italian and German funds, a project was launched to catalog all this

information on computers. In addition to the obvious importance of this effort for historical circles, this project may have a very practical and important repercussion: in the Dominican Republic, birth certificates, baptism and marriage records can be very difficult to find, which complicates educational enrollment, provision of health care, land titling, among others. This cataloging initiative could facilitate future record keeping, making these documents more readily available, and the provision of public services more efficient.

The NGO community in the Dominican Republic is a vibrant, organized body of diverse groups, and many are using ICTs as a tool to strengthen this position. One umbrella organization, Alianza ONG, is an alliance of non-profits working in health, education, social justice and other areas. Alianza has developed a Web site that includes links to all member organizations, many of which are small local outfits. Many of these organizations submitted "creative pages," collages that portray the group's efforts, which were scanned and presented online with contact information. This is a pragmatic, halfway strategy for integrating groups that have little or no ICT training, and reveals the growing recognition that an online presence is an important tool.

One project that expands on this idea is the Dominican Development Gateway, a product of the World Bank's global project. The Dominican Republic is one of only three Latin American countries with active Web sites connected to the World Bank's Development Gateway, a worldwide program to facilitate and connect technology use for social advancement.[41] The Dominican site is a portal to numerous government and non-profit organizations working in areas of health, education, environment, poverty reduction, and others. Again, many of these organizations do not have Web sites of their own, but now can benefit from an online presence with contact information and activities listed.

The private sector is an extremely dynamic social force in the Dominican Republic, and a number of Dominican companies have been national leaders in confronting issues ranging from urban planning to education to self-regulation, stepping in where public sector efforts have been less successful. As we have discussed elsewhere in this report, the private sector is well-suited to step forward and provide badly needed leadership and vision in the ICT sector as well.

Non-formal ICT Training

There are a number of opportunities for basic computer training as well. INFOTEP, the government-run technical training organization, offers free training to employees of companies that contribute to the INFOTEP fund. As it is required by law to pay one percent of payroll costs to the organization,[42] this means that virtually all employees of legally recognized companies have options available throughout the country, through a network of INFOTEP training sites, affiliated organizations, community programs, and training in collaboration with companies. One Internet café owner in Santo Domingo mentioned that INFOTEP approached him and asked that he offer free classes due to the surplus of funds available. When asked about the effect of increased

One small business owner in a lower income area of Santo Domingo saw INFOTEP as a way of evening the playing field, as individuals from all of society are learning computer basics, mentioning that "just about every poor person in the area is taking classes…the [INFOTEP] centers are full."

technology use on the gap between rich and poor, one small business owner in a lower income area of Santo Domingo saw it as a way of evening the playing field, as individuals from all of society are learning computer basics, mentioning that "just about every poor person in the area is taking classes…the centers are full."

The state-run Dominican Center for Export Promotion (CEDOPEX) began a program to support small and medium exporters, known as PYMEX, to help train small and medium enterprises (SMEs), many of which are small agricultural producers, in the basics of international trade, logistics, and other relevant sectors. Among the training PYMEX offers is a certification program in the current technology utilized in transport payments, as well as the strategic use of the Internet as a tool for foreign commerce.

CENAPEC, a recognized leader in distance education, has been offering educational courses since 1972. Through a network that spans 24 of the 31 provinces, they presently offer home completion courses covering material from sixth grade through high school. All of their clients completing high school coursework also receive a computer basics course, if local infrastructure allows.

Academia Online

Dominican institutions of higher education are well represented online. All major universities have a Web site, and some are expanding online services to their students; the Pontificia Universidad Católica Madre y Maestra (PUCMM) has recently developed an online registration system[43], while the University APEC (UNAPEC), has an internal grade reporting system online for students to check their progress. Many of the top universities are members of a network designed to facilitate communication and information sharing among institutions. The Dominican University Academic and Scientific Network (Red RUDAC) was a project officially formed in 1992 with financial support from the Organization of American States (OAS) and technical assistance from the University of Oregon. The Red RUDAC consists of a network of high quality computers which connects both PUCMM campuses (Santo Domingo and Santiago), the Instituto Técnico de Santo Domingo (INTEC), the Universidad APEC (UNAPEC) in Santo Domingo, the capital's public university Universidad Autónoma de Santo Domingo (UASD) and the National Council for Higher Education (CONES). Each school assigned a technical team to oversee the infrastructure on their campus and to encourage use of the network. In recent years, communication has tapered off, particularly because of high turnover rates in these teams, mostly due to competitive offers from larger companies. Nevertheless, the Red RUDAC stands as an important tool for students and educators, as well as a foundation for possible future expansion; the original plan called for the connection of all interested institutions, including high schools. While that proved to be an overly ambitious first step, it shows recognition of the importance and utility of this new capability. As these universities are beginning to integrate videoconferencing into the academic framework; by all accounts this experience in interconnection has proven its value, and should foster further interaction.

There are other signs that technology is becoming a more familiar component in education. One international publishing company has established itself in the Dominican market and is integrating multimedia packages into its regular textbooks. Virtually all of the publisher's books include a companion CD-ROM or diskette. For students, this resource serves as a study tool, which helps explain concepts and offers review exercises. The teacher version includes a guide to using the book, complete with

suggestions and ideas to use in the classroom with these materials. Many books also include a password for students and teachers; students are offered further links, practice tests, etc, while teachers have access to full answer keys, chat and other resources.

These book/CD-ROM tools are presently available only in a number of Dominican private institutions from primary to university level, and have been very well received by the Dominican educators who use them. These materials are a far cry from those in the public school system, which is well-known for being limited to using an insufficient number of very old books. It is relatively common for public school teachers to either pair up students for the use of a book, or charge students for photocopies of the text.

The Limits of Dominican e-Commerce

Electronic commerce remains limited overall in the Dominican Republic, and has been held back by the small consumer Internet user base, lack of cultural proclivity to use credit cards, lack of consumer protection and e-commerce laws, fear of fraud and general infrastructure and logistical issues. What e-commerce does exist is creative and is highly focused on niche service markets.

Some businesses have recognized the growing interest in the Internet and are offering a variety of services using technology. Some telecommunications providers offer online bill payment, while online banking is also available with most banks, although some restrict the service to corporate accounts. There is even a partnership which combines the two: Orange Dominicana, in association with Banco Popular, offers a mobile banking service which allows client to check their account, pay their Orange bill, and order and cancel checks on their mobile phone. Some cellular providers offer WAP capability on their phones, but it is very underutilized, and the dramatic change visible in the new "cell phone culture" has not included popular usage of this feature. Two new services offering high-speed Internet connections through cable television lines have recently entered the market looking to target a growing population, those with both cable television and home computers.

The classic model of e-commerce, however, in which a commercial transaction is solicited, verified and purchased online, has generally not been embraced in the Dominican Republic, neither by the private sector nor by consumers, for a number of reasons. Logistically, the Dominican Republic is not ready: reliable delivery of goods is simply not available, and addresses, a main piece of information, are often unverifiable or inaccurate. For instance, it is not uncommon for a street to have multiple houses with the same number. The postal system is plagued with problems – recently the postal service went on strike, and as of

Box 5: Creativity in the Face of Uncertainty: Hybrid Systems of e-Commerce

Faced with few legal guarantees of online safety, but aware of the possibilities of computer-based commerce, some Dominican businesses have gotten creative. For example, a large Dominican hardware/home supplies chain uses a hybrid form of e-commerce, in which the consumer chooses the merchandise online and provides a telephone number. The order is then verified by phone, and the client picks up the order at the store.

A similar system is used for pizza orders with most major chains. The order is placed online, and paid for in cash once the pizza is delivered.

October 2002 some residents in Santo Domingo were still receiving mail from June 2001.

However, a much more significant barrier to e-commerce in the Dominican Republic is lack of consumer and private sector confidence in electronic transactions. Consumers have little confidence in the security of online transactions, and perhaps their experience justifies their wariness. The president of the Bank Security Committee of the Association of Commercial Banks of the Dominican Republic recently estimated that the country "in twelve months would easily reach RD$400 million (approx. US$22.7 million)" in fraudulent credit transactions.[44] With this stemming primarily from face-to-face transactions; the Internet in the minds of many merely adds an extra layer of uncertainty and risk.

Merchants have similar misgivings. There is no legislation protecting the private sector from disputed charges. One large retail chain reported that it was not unusual for an opportunistic consumer to deliberately sign the receipt differently than on the card, and later dispute the charges. Under the present legal standards, the company usually loses the transaction and the merchandise. Without legal protection, the company has established internal measures to protect itself: any cashier that completes a transaction without thoroughly inspecting the card and signature is often fired. The prospect of compounding risk by eliminating personal contact and dealing with virtual customers is simply too much for many businesses. In numerous conversations that our research team held with business owners, it was clear that confidence was a main barrier to the further development of e-commerce in the Dominican Republic.

On September 4th, 2002 the government put into place an electronic commerce and digital signature law, addressing what many considered a major factor holding back e-commerce in the Dominican Republic. This recognition by the public sector concerning these issues is a positive sign, and welcomed by all. At this time it is too soon to gauge the impact of these laws on the growth of e-commerce in the Dominican Republic.

Web Presence

Most large retail chains have Web sites, often static pages with information about special offers, the history of the company, upcoming events, and other relevant items. Many companies, small and large alike, seem to have an online presence without a real understanding of its utility and purpose. A number of sites are either not functioning, very out of date, or are lacking important details. For instance, one large retailer offers furniture online, with the prices in pesos and US dollars, but has not included pictures of the actual merchandise. One IT director of a large chain mentioned that they see themselves as on par with competition from the U.S., and a Web site is simply necessary to remain competitive, despite the fact that a very small amount of their business is generated by the site.

The enthusiasm in the private sector for technology is undeniable and pervasive; however, the focused, strategic use of this technology often seems to be lacking. It is difficult to discern whether many companies have Web sites because they are strategically positioning themselves for an increase in IT integration or if it is merely due to the recognition that the larger, industry-leading companies have one as well. While it often may be the former, the lack of attention to detail, poor Web site promotion and other factors tend to point to the latter. From our interviews with business owners, one

attitude that seems prevalent among many Dominican business leaders is that they have built Web sites for their companies because it was seen as faddish and the "thing to do," even when the investment provided no clear advantage nor was associated with any particular strategy.

Small Business Access: Project 999

As we have discussed in Chapter Two, smaller businesses are also going increasingly online, and computer use is quite high among leading businesses. One private sector partnership between the National Financial Group (GFN), one of the largest financial conglomerates in the Dominican Republic, and a small US-based IT company looks to encourage this trend further. This effort may change the face of Dominican small business by making both a basic PC and credit card verification capability within reach of many family-run and smaller enterprises.

Presently, if a merchant decides to offer credit card transactions in his business, he can either purchase a Verifone device from a bank, which runs for approximately US$1,000 plus printer, or sign a contract of delayed payment that includes certain conditions. For instance, there is often a per transaction percentage to the bank, or a clause which stipulates that if a merchant generates less than RD$25,000 (~US$1,500) in credit transactions in a month, he pays the bank a fee. For smaller companies, this high initial cost and contractual penalties may be a significant financial deterrent from expanding the options of transaction for their business. Furthermore, there is a high demand for Verifones, and banks tend to give first priority to businesses that are the most profitable, meaning that small businesses often have to wait as long as a year for their device.

A U.S.-based company has entered the Dominican market offering a small device with a keypad and a credit card reader that plugs into any computer. The device was originally designed for final consumers who wanted to safely buy merchandise on the Internet, but it is being marketed in the Dominican Republic as a point of sale for small businesses. Security is increased, as the device encrypts the card information before it gets to the merchant's PC, creating a "bank eyes only" transaction. The verification number is given to the merchant without any of the information being stored on the merchant's system. While this obviously benefits the customer, there are some evident advantages for the merchant as well. Many small and micro-enterprises do not satisfy minimum requirements for a Verifone account; this device allows for smaller businesses to offer this service. Customers can use ATM and PIN debit cards, while the present verification system is not PIN enabled. The device works with any basic PC or laptop, and perhaps most importantly, costs approximately US$80, which is a fraction of the US$1,000 banks charge for the Verifone system.

The company has forged a strategic partnership with divisions of GFN: Bancrédito, a major bank, Tricom, the telecommunications company, and Enelpunto.com, the pioneer Dominican e-commerce site. GFN is making efforts to reach consumers and smaller businesses, offering the tools necessary for e-commerce to grow. Through an initiative known as Project 999, Bancrédito is offering a package to its small business and consumer customers which includes the above-mentioned credit card reading system, an IBM PC and printer and Tricom Internet connection for RD$999, or approximately US$55.

At upper income levels of Dominican society one can find very current, up-to-date technology. Efforts such as Project 999, as well as the influx of resources from the Dominican community in the United States and the availability of quality "Brand X" computers may help to expand the number of home PCs, a crucial factor for e-Commerce and increased technology integration. In the meantime, the Dominican private sector is waiting for the day when PCs become a more common household fixture, rather than a luxury of wealthier families.

Government Policy and Network Use

Many factors drive the development of information communication and technologies, but the government can play a unique and vital role as articulator and catalyst, creating the institutional conditions and standards necessary in order to expand the social and economic benefits derived from ICTs. This influence can facilitate the use of technology by creating an environment that encourages communities, individuals and organizations to invest in and use information and communication technologies. The government can play a major influence in driving Networked Readiness by acting as a user of technology. At the same time, policy can be detrimental when it provides weak or vague legal, financial and institutional support or when it discourages use of ICTs either through barriers to trade and investment (e.g. high tariffs) or through restrictions such as cumbersome technical standards or licensing requirements.[45]

While it still lacks an overall, coherent strategy, the government of the Dominican Republic has slowly begun to turn to the question of the role that ICTs should play in Dominican social and economic development. While the government has made some positive strides in areas of ICT policy, other areas have been untouched or are in their early stages of development.

One of the greatest advances in recent years has been the formation of the telecommunications regulatory body, INDOTEL. Although the telecommunications industry was in many ways functioning well before its foundation, INDOTEL has played a vital role in promoting and maintaining the development of one of the most advanced telecommunications infrastructures in Latin America as well as setting the standard for customer rights and institutional legal structure in the Dominican Republic. The existence of a body which upholds and regulates free and fair competition is a huge step forward in Dominican business, particularly in a sector which historically has been unilaterally dominated by one powerful firm. There are voices of dissent, but the broad consensus is that INDOTEL has been extremely successful in its formation and has had a positive impact in the telecommunications sector.

In general, though, government ICT policy has been fragmented, unfocused and disorganized. Until recently, the Dominican Republic did not have a recognized technology authority with responsibility of coordinating and defining national technology policy. Instead, government and private sector organizations have worked on technology issues in an isolated manner. This lack of coordination between organizations has led to an absence of a clear national vision, a duplication of effort and the existence of conflicting policies and projects. The recent formation of the National Committee for the Information Society (CNSI) may begin to finally provide the Dominican Republic with this much-needed coordination and vision.

Continuous change of administration has also hindered the formation of a cohesive ICT vision. One common criticism of the Dominican Republic's limit of one four year term (which has just recently been changed with the reinstatement of the Constitutional right to reelection, passed in August) is that with each administration change there has been a reinvention of the wheel or changes that leave many projects unfinished and policies overturned. This affects all policy areas and technology is no exception. The previous administration placed a significant emphasis on ICT development, investing heavily in ICT in education and promoting a vision of putting the Dominican Republic at the forefront of technology in Latin America through the creation of a Cyber Park and the Instituto Tecnológico de Las Americas (ITLA).

Although the current administration's focus on technology is not as pronounced, and indeed, there are noticeable differences between public political rhetoric and less-publicized ICT-focused programs, ICTs are nonetheless included in the current agenda and recently it seems to have received more attention, particularly in the formation of CNSI, the passing of the e-commerce law and in the creation of a government portal. The current administration has also focused on INDOTEL in promoting much of its ICT policy, particularly in the area of universal access.

Appendix
The Telecommunications Sector, the Government, and Dominican Networked Readiness

Overview

This appendix is meant to put the preceding chapters in context by generally outlining the telecommunications and governmental environment within which Dominican Networked Readiness is unfolding. Telecommunications regulation, competition in the sector and government initiative are important determinants and influences of the cost of and access to ICTs. As such, it is important to lay out the broad trends and players in these arenas in order to better understand how ICTs are being used within Dominican society and the economy.

Although rapid growth in telecommunications has been a worldwide trend over the past several decades, even in the global context, the Dominican Republic is noteworthy. The telecommunications sector in the Dominican Republic has experienced explosive growth in the past decade and is playing an increasingly important role as a major contributor to the Dominican economy. In 2001 the sector's growth rate was 15.4 percent[46] and in a report for January-March of 2002 the Central Bank placed the sector's growth rate at an remarkable 29.3 percent, making it by far the sector with the highest growth rate in the economy (with manufacturing being the next closest at 13.2 percent).[47] This rapid growth is reflected in the telecom sector's increased participation in the economy's GNP, which in the last 11 years (1990-2001) jumped from 2.1 to 6.6 percent.[48]

A Brief History of the Telecom Sector

In 1883, a U.S firm offered telegraph service connecting the Dominican Republic to larger islands in the Caribbean, a step that laid the foundation for an industry which has become a source of both significant revenue and Dominican national pride. When the Dominican government became only the third country in the hemisphere to privatize telephone service in 1930, the Compañía Dominicana de Teléfonos (CODETEL) began its unchallenged dominance of the industry for decades.

In 1988, All-America Telecommunications, the descendant of the same company that pioneered telecommunications in the country almost a hundred years earlier, attempted to enter the market, resulting in the signing of an interconnectivity agreement with CODETEL in 1990. The Dominican telecommunications market saw the entrance of Tricom in 1992, whose early strategy was fueled primarily by long-distance call centers. Conflicts began to arise between these providers concerning interconnectivity issues, and the International Telecommunications Union (ITU) was eventually called in to mediate. As a result of private sector initiative and financing, the ITU also played a large role in the drafting of the Telecommunications Law of 1998. In the year 2000, a second wave of competition entered the Dominican telecommunications arena, with Orange, a branch of France Telecom, and Centennial Communications, an U.S. firm which acquired All-America, establishing themselves as players in a rapidly expanding market.

Market Structure of the Telecommunications Sector

Major Players

There are four main companies in the Dominican telecommunications arena: CODETEL, Tricom, Centennial and Orange. These companies dominate the fixed line, mobile, Internet and long distance services. As follows are brief descriptions of these four main telecommunications providers.

CODETEL

The Compañia Dominicana de Teléfonos has been the dominant force in telecommunications in the country since 1930. Its position as a privately-owned monopoly freed the company from the capital constraints that a state-owned body would experience, and technology arguably flowed into the Dominican market faster than a public enterprise could have managed. However, the years without competition seemed to take their toll on the efficiency and strategic planning of the firm, as woeful customer service became a widely recognized feature of CODETEL. In recent years, in the face of competition CODETEL has proven to be much more nimble and creative in its provision of service, while still maintaining a firm hold on the lion's share of the Dominican telecommunications market.

Tricom

Tricom is a Dominican-born company publicly traded on the New York Stock Exchange. The company entered the Dominican market in 1992, and has expanded to become the second largest firm in Dominican telecommunications. Along with fixed and mobile telephone service, Tricom has recently aggressively expanded its product base, acquiring a national cable television provider and offering a high-speed Internet connection service. Tricom's 2001 Annual Report cited over 625,000 clients, including 364,000 wireless customers, an estimated 180,000 fixed lines, 65,000 cable subscribers and approximately 10,000 Internet clients.[49]

France Telecom Dominicana (Orange)

France Telecom Dominicana, commonly referred to by their brand, Orange, established itself in the Dominican wireless market in 2000. It is the only provider in the country using the European GSM system for cellular telephony. Orange has staged an aggressive marketing campaign, together with an ambitious expansion of infrastructure and coverage: according to the company 85 percent of the Dominican population can receive Orange service in their community. While this claim evidently reveals an urban bias, Orange has been expanding into smaller towns and areas of lower population density.[50] France Telecom reported a total of approximately 279,000 wireless customers in the Dominican Republic at the close of 2001.[51]

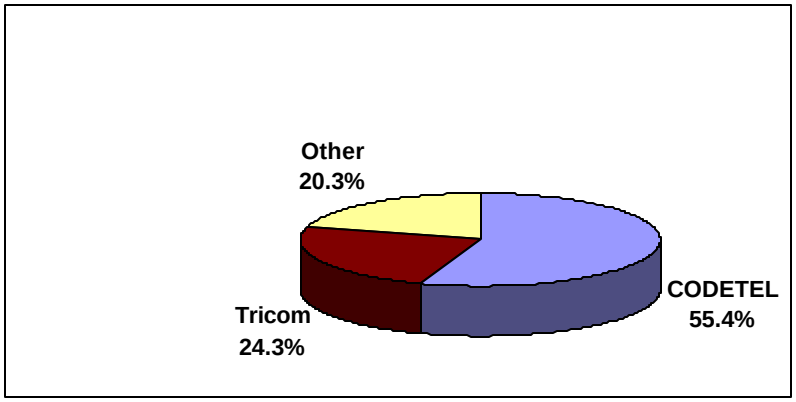
Centennial

Centennial gained a foothold in the Dominican Republic through the oldest telecommunications service provider in the country. All America Cable and Radio (AACR) began its operations in 1883, providing telegraph services utilizing the first submarine cable connecting the Dominican Republic to the rest of the Greater Antilles. Years later, AACR was also the first company to provide Internet service. In 2000, the US-based Centennial Corporation acquired 70 percent of AACR, and Centennial Dominicana was born. The cellular phone provider was the first to install a 100 percent digital wireless network, with coverage that is primarily focused in the larger urban centers, serving Santo Domingo and many of the towns on the highway east of the capital, Santiago and much of the central Cibao valley, and a few tourist centers on the north and east coasts. According to Centennial's records, they presently serve approximately 88,906 cellular clients, as well as a small number of fixed line and Internet customers.

Services Provided and Relative Market Share

Complete and accurate market share data are difficult to obtain because the telecommunications sector is extremely competitive and companies consider this information to be sensitive and potentially damaging if made public, making them hesitant to share data. In addition, INDOTEL is currently performing a market study, which has made the companies even more guarded about their information. In this report we use the most reliable figures and data that we could obtain. Figure 1 presents data that are good rough estimates of the market. As can be seen, CODETEL and Tricom are the two dominant carriers in the total telephony market.

Figure 1: Total Market Share Fixed Line and Mobile Telecommunications

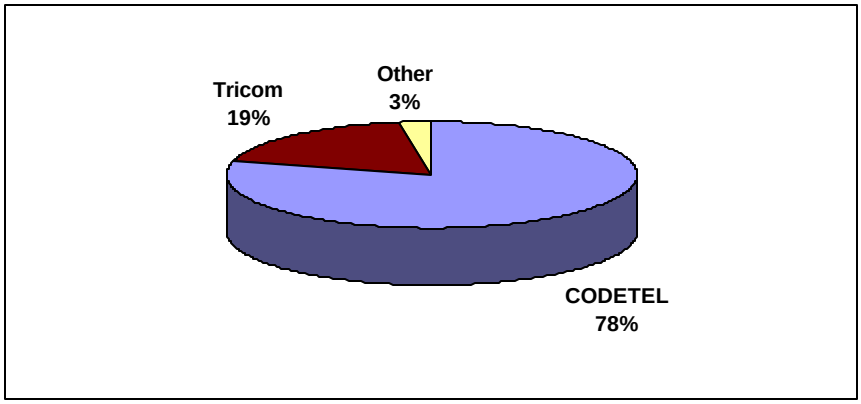


Source: *Listín Diario*, March 2002.

Fixed Line Telephony

As the former monopoly and most established company, CODETEL had a huge advantage in the already well-established fixed line market and has been very good at guarding its market share. CODETEL still controls 79 percent of the market with 754,360 total fixed telephones (including residential, business, wireless local loop and public phones). Only Tricom has presented any real competition, capturing 18.5 percent of the market with 17,700 lines.[52] Centennial also is involved in the fixed line market, but has not aggressively pursued this option, preferring to instead focus on other areas.

Figure 2: Breakdown of Fixed Phone Line Market Share



Source: *Listín Diario*, March 2002.

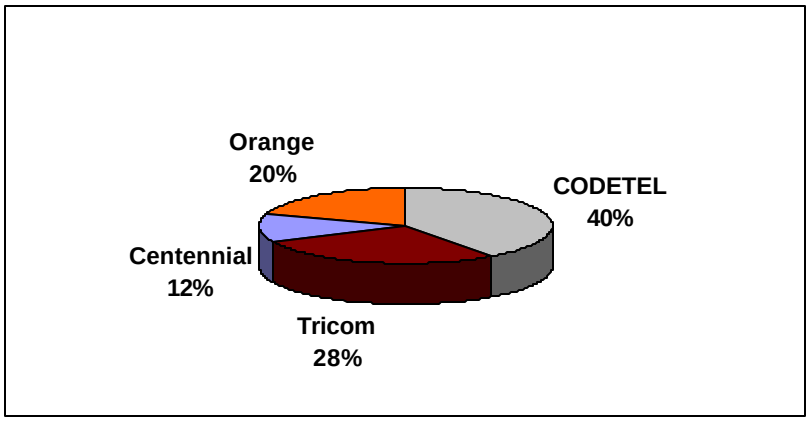
Cellular Telephony

The mobile phone industry reached a milestone in 2001 when the number of mobile lines in the Dominican Republic surpassed the number of fixed lines. While fixed line growth is decreasing -- with 8.2 percent growth in 2000 and 6.8 percent growth in 2001 – mobile phone use is exploding, with over 66 percent growth in 2000 and 80 percent growth in 2001.[53] The Dominican Republic is fast approaching another milestone of mobile lines doubling fixed lines. July 2002 statistics show 1,435,906 mobile lines as compared to only 961,560 fixed lines.[54]

Because the mobile phone industry is relatively new and dynamic, and due to its necessity for new infrastructure, which allows firms to bypass the past dependence upon CODETEL's vast fixed line network, newer entrants have been able to more competitively participate in this market than in the provision of fixed lines. Although CODETEL is still the biggest player, competition is much more evenly spread in this market, as seen in the Figure 3. Incumbency also holds much less value in the mobile arena as the recent entry of Orange shows; after entering the market in November of 2000[55] the company was able to capture 20 percent of the market in less than a year and a half (March of 2002).

Another noteworthy aspect of the cellular service market is that 75 percent of cellular accounts are prepaid. The explanation given for why most people choose prepaid is that they have more control over their consumption, even though they pay about seven times as much per minute.[56]

Figure 3: Breakdown of Cellular Phone Market Share (# of Accounts)



Source: *Listín Diario*, March 2002.

Internet

There are few Internet Service Providers (ISPs) in the Dominican Republic and the market is not very competitive and marked by much greater concentration of monopoly power. Seven ISPs are registered with INDOTEL, but CODETEL remains dominant with an estimated 90 percent of the market,[57] followed by Tricom and Centennial. Most observers attribute this dominance to CODETEL's strength in infrastructure and ease on the part of the customer of using the same provider for both Internet and fixed line. CODETEL and Tricom offer high speed DSL service and have ties to cable companies, allowing for provision of broadband/cable access.

Dominican Telecommunications Regulation

General Telecommunications Law

April of 1998 saw the promulgation of the law governing the modern telecommunications industry in the Dominican Republic. This law legally established elements crucial to telecommunications expansion, such as open entry of companies and mandatory interconnection. The formation of an autonomous regulatory body, the Instituto Dominicano de Telecomunicaciones (INDOTEL), was authorized, to be funded by a portion of a two percent levy on end-user telecommunication services and net international settlements, known as the Contribution to Telecommunications Development (CDT). The law also lays out universal telecommunication coverage as a goal, and mandates the creation of a fund for projects to expand network coverage to areas of low profitability, which is financed from the CDT levy.

> "The dea of the right to compete is new in the Dominican Republic."
> –INDOTEL Official

The law grants INDOTEL the powers necessary to fulfill its regulatory function, empowering it to establish regulations of a general nature and the technical norms that will govern the telecommunications industry. The legislation also establishes a series of measures to promote the free functioning of the telecommunications market under conditions of effective competition. These provisions constitute the first legal instrument that the country has adopted to regulate competition concretely and in detail in a particular industry.

Another innovation in the telecommunications law is its functional focus to regulate telecommunications services, emphasizing the type of service in question and not the type of company offering it, as occurred with previous legislation. In this way the new law does not regulate telephone companies, but rather telephone service, which implies that a single entity can provide several types of services, independently of its main or original function. This new focus allows a single company, with technology that traditionally was associated with a particular type of service, the ability to provide several. In this regard, the law acknowledges the importance of the trend toward technological convergence, and allows for flexibility among companies in the provision of services.

The Instituto Dominicano de Telecomunicaciones (INDOTEL)

INDOTEL was formed in 1999 as the entity charged with the responsibility of exercising the government's regulatory function in the area of telecommunications. INDOTEL is charged with regulating and supervising the trading of goods and the rendering of services in the industry, and overseeing the application of the provisions of the law as it pertains to telecommunications. INDOTEL is also legally recognized as the mediator in the event of conflicts regarding telecommunications service, both between providers and consumer/provider disagreements that have remained unresolved.

INDOTEL was designed to have operational, jurisdictional and financial autonomy. Financial independence for the organization was penned into the General Telecommunications Law with its funds being legally derived from the previously mentioned two percent tax on all telecommunications services. The recognition of INDOTEL as the high authority in the resolution of conflicts telecommunication sector has secured its jurisdictional sovereignty.

Despite the legal powers and privileges granted the organization, some question the political autonomy of INDOTEL, particularly following a decision by the Supreme Court which overturned Article 81.4 of the Law that designates positions in the Executive Council as four-year posts that could not be revoked. The purpose of this article was to give INDOTEL a high level of autonomy and be relatively immune to political activities. In the waning days of the former administration, the INDOTEL head resigned, and the current INDOTEL head, Orlando Jorge Mera, was appointed. Due to the constitutional inviolability of the post, the incoming administration believed that their right to appoint leaders had been compromised. The case went before the Supreme Court, which ruled that the article was unconstitutional, granting the President of the country powers to remove any Executive Council position, a situation that stands to this day.

During our interviews, we heard other criticisms of the young organization. Some industry observers feel that INDOTEL oversteps its boundaries as regulator at times. One commonly cited example was its decision to intervene in concerns over “rounding of minutes,” the practice of charging customers full minutes for fractions of minutes used. Some saw this as infringing on a company’s right to create and implement a business strategy; some firms may choose not to round minutes and utilize that as a key component of their marketing campaign, others may see it as a significant point of profit. Another concern has been the ballooning of INDOTEL personnel, and subsequent questions concerning their efficiency. At its inception, the organization had approximately 50 to 60 full-time employees, a number that has risen to almost 300.

INDOTEL presently has more lawyers on staff than all four telecommunications providers combined.

In spite of the lessening of institutional independence, and the concerns voiced above, INDOTEL has earned its reputation as an effective, well-organized and largely politically-neutral body. Its professionalism and strict policy of transparency have helped form and maintain this perception. INDOTEL follows a stringent process in the establishment of regulations which includes the use of public audiences, the publication of regulations in public media and the official bulletin of the institution, as well as posting of all regulatory instruments, both approved and pending, on the Internet.

Though small, the Dominican Republic is seen as a good market for expansion. Recently a number of companies including AT&T (USA), Sprint (USA), D-G Cell (Ireland) and Telefónica (Spain) have expressed interest in entering the mobile and residential markets. In evaluating these solicitations for entry, INDOTEL head Orlando Jorge Mera said, "INDOTEL will act according to the law in the sense that it will make the decision on legal principles that the companies meet the technical and legal requirements."[5859] This presence of a regulatory body with a considerable amount of political and financial autonomy, and a reputation for respect of rule of law, is a rare element in the partisan Dominican political scene, and INDOTEL has contributed much to foreign confidence and interest in investing in the burgeoning Dominican telecommunications market. Many see INDOTEL as a standard for institutional reform and operation, and consider it a model for future reforms in the Dominican Republic. For a relative newcomer, INDOTEL has established itself as a respected government body whose competence has contributed to the success and continued growth of the telecommunications industry.

…INDOTEL has earned its reputation as an effective, well-organized and largely politically-neutral body. Its professionalism and strict policy of transparency have helped form and maintain this perception.

Fund for Development in Telecommunications (FDT)

One black mark in the Dominican Republic's telecommunications prosperity is its low teledensity, particularly in rural areas. Although the urban areas can tout infrastructure that is on par with the world's best, many rural areas of the Dominican Republic are still without access to basic telecommunication services. Many areas with geographic factors of rough terrain, long distances from urban centers and small populations are not seen as profitable for investment by telecom companies. The Fund for Development in Telecommunications (FDT) was established to provide subsidies to telecommunications companies in the implementation of social projects that would otherwise not be financially viable or appealing.

As mentioned above, this fund stems from the two percent tax included in telecommunications services bills (primarily telephone and cable). Approximately 1.8 percent goes toward the FDT, with the remaining 0.2 percent going to the administration of INDOTEL. The fund was at RD$310 million (US$17.7 million) and increasing at the time of publication of INDOTEL's *Memoria* in May of 2002.[60] For the current period, the FDT funds are being directed towards four projects with high social impact: the installation of satellite-based public telephones in communities with no phone capability, a telemedicine project in collaboration with the Secretariat of Public Health and Social

Assistance (SESPAS) and a regional hospital in Santiago, the creation of a nationwide educational WAN network as well as an educational resource portal, and the construction of 15 sustainable community telecenters. The INDOTEL Web site[61] offers detailed information concerning the contracts, providers, and technical details of these projects.

The Dominican Government and Networked Readiness

Dominican society is profoundly political; issues are passionately debated by all, and party loyalty runs deep. Part of this devotion stems from the adversarial, winner-take-all atmosphere in the public sector. The effect of political partisanship is deepened by the lack of a professional civil service. When a new presidential administration takes office, it is common practice to fire virtually all public employees under the past administration, and to subsequently fill the posts with political appointees and campaign workers. The *caudillo* legacy of government as paternalistic benefactor is alive and well, as public works projects are seen as barometers of administrations, and government visibility must always be high.

While these realities often severely hamper the continuation of effective policy, leading more often to political one-upmanship and jockeying for position, there is a positive consequence to this unfortunate reality: Dominicans from all levels of society are passionate about politics and closely follow the actions of the government. The political knowledge of the average Dominican would be the envy of a number of congressional representatives throughout the United States. As a result, the government is widely recognized as a significant social actor, and often a social influence. It is here where the government's policies on innovations such as IT take on an intriguing importance, as an administration that reflects the importance of modernity and technological advancement brings these issues to the forefront of national attention.

The current president has publicly been somewhat aloof concerning the changes technology has ushered in, and has focused the bulk of his efforts towards other issues. He is widely recognized as a candid speaker with a demeanor and outlook that many Dominicans personally identify with, and he in many ways presents himself as the antithesis of a technocratic leader, frequently chiding a political rival for having spent his time in the Presidential Palace "playing on the Internet." In spite of this, there are significant steps that are being implemented within the government to modernize the public sector, and it seems that while in rhetoric and the popular press the persona of the intransigent, humble farmer wins out, in policy, there are officials within the Mejía administration who recognize that neither the administration nor the country can afford to totally ignore technology as a major factor.

Public Sector Efforts Towards ICT Integration

The Mejía administration has been criticized by many for the strong fiscal readjustment policies collectively known as the *paquetazo*, which broadened the list of taxable products, instituted a monthly 1.5 percent business tax on projected earnings, and imposed a tax on consumption of alcohol, tobacco and other items. However, one provision under these measures has had clear benefits in the IT sector, as it eased duties on all IT hardware - personal computers, laptops, routers, cellular phones, and PDAs. This has made these products more accessible to Dominican consumers, and

helped local distributors, as these measures have made it cheaper to purchase locally than to buy in the United States, the usual market of choice, and ship the hardware.

Within the public sector itself, government organizations are seeing the value of modernization and are planning on the integration of technology as a crucial aspect of future operations. The Metropolitan Transit Authority (AMET), a police force specifically designed to help tame notoriously disorganized motor traffic, is currently investigating a program utilizing hand-held computers to give tickets and report the infraction to a central system. The Vice President and Secretary of Education, Milagros Ortíz Bosch, has expressed the hope that the Education ministry can become "the first *Secretaría* to work without paper."

The Technical Secretariat of the Presidency (STP) includes a branch which primarily focuses on using technology to streamline the administrative infrastructure of the central government. This organization's mandate is to serve as a catalyst and promote IT use in public sector structures, and serve as consultants for government projects that utilize ICTs. The government also contracted a Spanish consulting firm to conduct an in-depth study of the workings of the Dominican government and ways that ICTs could increase efficiency.

This office primarily targets intra-government operation and establishment of the basics: necessary infrastructure, training and awareness among staff, and transition efforts. The government operates the National Institute for Public Administration (INAP), which trains public servants in efficient practices. INAP is beginning to instill the importance of computer literacy as a tool for effective management in public servants.

On the technical side, the Technological Institute of the Americas (ITLA) runs a program which trains *multiplicadores* who then pass these skills on to colleagues in their respective branches of government focusing on basic uses of technology and software. This two-pronged strategy looks to better prepare public sector workers for IT integration. And the need is clear: according to a senior government official involved in the internal modernization project, roughly 20 percent of current intra-government communications are done by electronic means, an amount which they believe should be greatly improved upon.

One of the current projects of the office is a government portal, which was launched in August of 2002 (http://www.info.gov.do) and as of September 2002, is in its final stages of testing. This effort is meant to facilitate intra-government operation, offering a central location for all government institutions to communicate, share data and facilitate the provision of services to the public. Currently, the portal only offers static content, but future plans are for it to be expanded to offer services such as payment of taxes online and interactive filling out of forms.

The Dominican government is expanding its use of portals for the benefit of the private sector as well. With US$1.2 million of financing from the Inter American Development Bank (IDB), a project is underway to provide a virtual point of access to the business community. The site would offer services that facilitate a variety of needs of the business sector: registry of new companies, online tax payment, a virtual marketplace to facilitate the sale of goods and services to the government, and availability of commonly used documents for download.

Instituto Tecnológico de Las Américas (ITLA)

The Technological Institute of the Americas stands as one of the most visible and tangible steps taken by the Dominican government to ensure the wider integration of technology. ITLA is a state-of-the-art training facility on the outskirts of the capital, conceptualized and constructed during the previous administration. ITLA offers classes and seminars to a wide range of individuals, from professionals and small entrepreneurs to government officials and teachers. Skills covered include software specific training as well as courses tailored to specific disciplines such as IT integration in the classroom or supply chain management. Many high school students also attend ITLA to develop a technical specialty beyond their basic education.

The institute integrates private involvement in its administration, as its executive council includes representatives from a number of recognized private universities, as well as directors of relevant government bodies, including the Secretaries of Education, of Labor and the Secretary of Higher Education, Science and Technology, among others.

This alliance between private and public stakeholders may have helped limit the effects of the inevitable and drastic changes between administrations. While the issues ITLA was created to address have become less of an official priority and some initiatives did not survive (such as the concept of offering free Web pages to Dominican companies), ITLA is still being used effectively as an educational resource that reaches important and varied sectors of Dominican society.

Parque Cibernético

The Parque Cibernético (Cyber Park), which shares ITLA's campus, is part of an ambitious initiative to attract foreign technology-based investment; the Park provides a high quality, technologically advanced base of operations for foreign firms interested in establishing a presence in the Dominican Republic. The Park boasts high-speed fiber optic networks, satellite linkup, videoconferencing and other capabilities. With global experiments in data entry outsourcing, regional call centers, and foreign computer assembly plants, the Cyber Park was envisioned as a strategic tool to bring the Dominican Republic into this expanding market. Presently, the Park is still trying to attract a significant client base.

IT and Corruption

The possibilities of IT for combating corruption are on the radar screen of the Dominican government either. The Inter American Development Bank is funding a project to use technology to organize and increase the efficiency of government mechanisms. The initiative aims at creating a financial system that monitors budgetary spending, as well as an acquisition system that traces the process from beginning to end; a system that has had proven results in limiting corruption in Mexico and Chile.[62] One senior government official involved in the technological modernization of government estimates that the Dominican government could save hundreds of millions of pesos through transparent practices. What remains to be seen is the amount of political will behind harnessing the full capabilities of technology in the fight against corruption. The prospect of efficient, transparent government functions could easily be seen as a threat to the established systems of patronage that exist in the Dominican political arena. Political appointments

are present at all levels of the public sector and are an important tool for survival in a fiercely competitive environment.

Leakage in Customs

One area that may serve as a gauge of government commitment is the Customs service, which is rife with extralegal transactions and arrangements. Worldwide, customs services have been shown to be prime sites for corruption; under-declaration and illegal negotiations plague similar organizations in countries all over the map. The Dominican system, however, further facilitates illicit activity due to its fragmented and disorganized structure. Although the customs process is automated and utilizes computers, the system remains completely decentralized. As of mid-2002, each port had its own computer system and port house, weakening established protocols and giving greater freedom for unauthorized transactions. A well-thought out centralized automated system could help standardize procedure, improve information collection and accuracy, and effectively deter much corruption, but has yet to be implemented.

There are countless examples of easily identified, publicly discussed, inefficient bottlenecks throughout the Dominican government. While ICTs can aid as a tool, political will and carefully implemented reform are the most important elements. As public dialogue and both domestic and international pressure exert some influence over future action. Yet there are signs of official acknowledgement of the enormity of the task. At a recent conference held by the National Free Trade Zone Council (CNZF), the public regulatory body governing free trade zones, one of the most well received presentations was from the Salvadoran delegation touting their automated Customs service, which lowered corruption as well as processing time. Dominican government officials were extremely curious and were interested in implementing a similar program. However, only time will tell whether interest and enthusiasm will translate into effective reform of Customs in the Dominican Republic.

IT as Tool for Public Transparency: Santiago's Strategy

The private sector is well aware of the possibilities of IT as a tool to increase transparency. One of the boldest urban planning initiatives undertaken in the Dominican Republic is currently underway in Santiago, in the Strategic Plan of Santiago (PES). This initiative stands as the first privately-formulated plan of its kind to be endorsed and implemented as the official planning strategy of a Dominican city. One of the projects under the PES is the creation of a virtual clearinghouse of socio-economic information concerning the output of Santiago and the fertile Cibao Valley. Santiago residents have been seeing the establishment of PriceMart and other large companies in the city, and have begun to ask what attracted these investments. All economic indicators and information are calculated in Santo Domingo and tend to stay there, meaning that local interests in Santiago are unaware of the impact and possibilities that their city offers. With the creation of this independent collection and dissemination of economic information, Santiago leaders can get a clearer picture of what they have to offer investors, and give them the power to attract these investors themselves, bypassing the capital completely.

Santiago residents see another facet of this virtually posted economic information as a tool for public sector transparency – more egalitarian distribution of funds. According to PES, Santiago currently generates between 12 and 14 percent of GNP, yet the municipal government receives less than one centavo (1/100th of a peso) per citizen.

With greater access to information, city leaders have greater leverage to pressure the central government for a reevaluated allocation of funds.

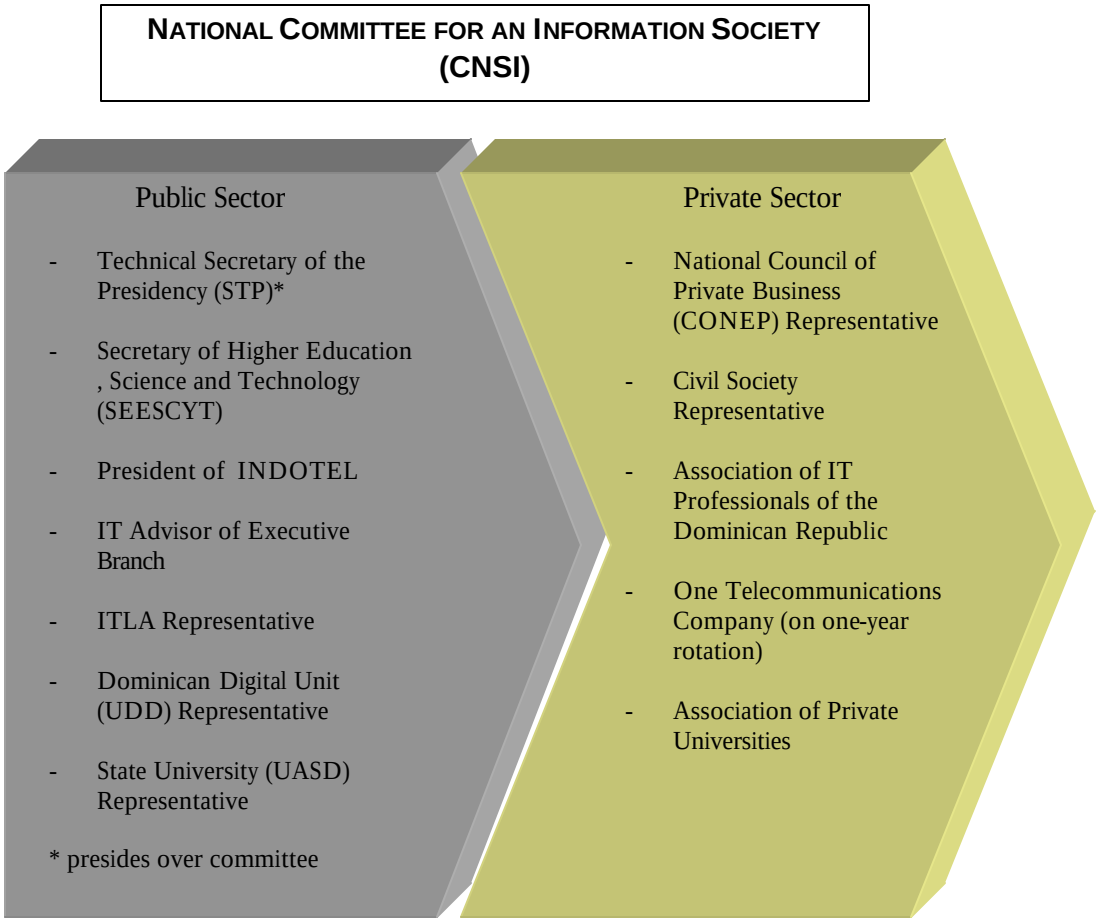
National ICT Strategy

Countries around the world are increasingly integrating ICT strategies into their national development plans. Yet it is widely believed that the success of this integration depends on participation from both the public and private sectors, as well as from civil society. The government can help as coordinator, articulator and catalyst, providing a clear vision of technology development and fostering and directing this development through public policy. The government of the Dominican Republic to this point has struggled to provide a clear, unified vision concerning ICTs that transcends partisanship and transitions of power. Until recently, there was no clear authority in the Dominican Government concerning ICT policy. The Technical Secretary of the Presidency (STP by its Spanish acronym), INDOTEL, and the Secretariat of Higher Education, Science and Technology (SEESCYT) could all arguably have been relevant institutions, but none had a specific, recognized mandate. Recent steps have been taken to address this problem, however, which may lay the groundwork for a deliberate, structured national strategy regarding the technologies that hold promise for improvements in the social, cultural and economic landscapes of the Dominican Republic.

Decreto 686-02: National Committee for the Information Society

With the technical and financial aid of the IDB, the Dominican government recently made a significant step forward in the institutionalization of IT integration with Decree 686-02, passed in late August. This piece of legislation creates the National Committee for a Society of Information (CNSI), a working group of public and private sector representatives, to design effective national policies and strategies concerning technology. Staying true to the current administration's focus on the possibilities technology provides to help reduce the digital divide, the CNSI was formed under the premise that "the State must provide a technology structure that is capable of designing policy and strategy that will democratize the access and use of Information and Communication technologies to Dominican society, which will reduce the accentuated digital divide that exists between the rich and poor."[63]

The committee is to be headed by the Technical Secretary, with the Sub-secretary of Information Systems having direct responsibility for the application and execution of programs related to information technology in public administration. The CNSI includes the following members:



The CNSI is divided into three working areas: Access and Connectivity, Electronic Government and Electronic Commerce. The CNSI's general tasks are defined to be:

- outlining the general guidelines of the country's ICT strategy
- meeting periodically to evaluate the progress of different projects
- define the trends of ICT policy in the country
- knowledge transfer and public diffusion of information related to ICT activities

Dominican Digital Unit

The CNSI is a policy think-tank of sorts, and will advise the Dominican Digital Unit (UDD), which is the body officially empowered to implement the strategies recommended by the CNSI. The UDD is authorized to "lead and support the creation of networks of cooperation between the public, private and academic sectors; realization of studies and knowledge transfer to society and the business community; and communication, dissemination and promotion of ICT use in the Dominican Republic."[64] According to public documents, the UDD will enjoy fiscal and functional autonomy. At of October 2002, these bodies were in their formative stages, and the efficacy and relevance of their efforts could not be ascertained. However, the official recognition of the importance of a clear, coherent policy on ICTs and the creation of institutions to

eliminate duplication of effort and ensure the synthesis and implementation of these strategies are encouraging.

Other Laws

Like many other countries, the Dominican Republic is still in the process of establishing laws for many elements of the Networked World. The formation of INDOTEL has provided solid regulatory laws that filter into various aspects of IT policy (see Dominican Telecommunications section). In addition, an e-commerce law was recently passed and various laws are going through the process of approval.

e-Commerce and Digital Signatures and Documents Law (Ley de Comercio Electrónico, Documentos y Firmas Digitales)

On September 4th, 2002, President Hipólito Mejía signed the "Law of e-Commerce, Documents and Digital Signatures," which creates the legal foundation for online transactions critical to e-Commerce. This law establishes INDOTEL as the regulating body regarding verification services, and sets guidelines concerning crucial issues such as authentication and integrity of electronic communications, consumer protection concerns, definition of and requirements for use of digital signatures, and characteristics and requirements of certification.

The issues of consumer and retailer confidence in virtual transactions have been previously discussed in Chapters Two and Three as a tremendous barrier to further advancement of e-Commerce in the Dominican market. The promulgation of this legislation is an important step in the establishment of standards and structures which promote the trust crucial to advancement in computer-based business.

Pending e-Government and Electronic Crime Laws

Proposed legislation exists to address electronic government and electronic crime. As they plan currently exist as of October 32002, the e-Government Law will address issues such as e-procurement, payment of taxes over the Internet and completion of forms such as birth certificates online. It will also address intra-government activities.[65]

Currently any crimes committed over the Internet must be addressed with the already existing laws, but often these laws do not easily apply to Internet crime. The law for electronic crimes is planned to address network-related offenses including theft of information, piracy, attacks to servers, destruction of data and defamation.[66]

Technical Appendix One
Supplementary Materials to Chapter One
ICTs and Schools/Communities

Overall Research Methodology for Chapter One

Over 100 semi-structured interviews were conducted in addition to visiting over 30 schools, meeting with over 200 teachers and many more students and community members. The following map shows some of the locations where interviews and visits were conducted with school administrators, community members, teachers, regional directors, AVEs, LABs, LINCOS centers.

Figure: Sites visited to carry out the research in Chapter One [67]

Harvard Dominican Information Technology and Education Survey (HDITES):

As part of the Dominican Initiative, an online survey was conducted of lab managers to support the empirical evidence gathered through personal interviews and visits.

The survey was conducted in late July 2002 from Santo Domingo via a polling Web site. The link was emailed to teachers and managers. It contained 47 multiple choice and short answer questions. It was promoted by the SEE and Peace Corps volunteers in rural areas.

Population Surveyed

- 195 Surveys returned, 163 total managers and teachers' data included in the final results[68]
- 71 of the 107 total AVE Managers or 66.4 percent of total population
- 92 of the 443 total LAB Managers or 20.8 percent of total population
- 29.6 percent (163) of total population of 550 total AVE and LAB Managers
- 291 of the 343 labs are open and functioning at some level (84.4 percent).

We intended to include private schools and LINCOS in our final results, however; insufficient responses were received to draw any conclusions from the data.

Survey Methodology

- E-mail addresses used in the survey were provided by the SEE and gathered from a SEE managed yahoogroup that was complied from an ITLA training course for managers.
- Anonymity of individual responses was established to gather more responses and more candid answers.
- With the exception of some IP address through custom email responses, there was no way to check for duplicate responses.
- U.S. Peace Corps volunteers helped to facilitate implementation of the survey.
- Personnel from the SEE telephoned teachers and managers and asked them to fill out the survey.

Summary of Basic characteristics of each telecenter

343 Secretary of Education Labs (LABs) run by the Secretary of Education (SEE) located in every high school throughout the country.

- 20 Computers[69]
- Network Server
- Printer
- VSAT Internet Connection
- Microsoft Office Suite provided
- Located in one large high school classroom specially equipped with air conditioning, security and grounded electrical wiring.

Figure: SEE Lab in the Northeast

90 Aulas Virtuales para la Enseñanza (AVEs) in partnership with the largest telecommunication provider, CODETEL.

- 10 Computers in a trailer
- Located on the property of school
- Internet connection
- Video Conferencing
- Phone
- Printer
- Housed in a self-contained trailer

Figure: AVE trailer located on school grounds

15 LINCOS Units (Little Intelligent Communities)[70]

- 6-10 Computers
- Network server
- VSAT Internet Connection
- Video Conferencing facilities
- Television
- Video taped content in areas like health and agriculture
- Community Radio
- Telemedicine Unit
- Housed in a shipping container or building in an accessible location in the community.

LINCOS Costs

- Monthly Maintenance of the LINCOS (Manager Salary, expenses, misc.) = US$1,400 without the VSAT Connection
- US$1,358 per VSAT per month is the cost to the SEE.
- 32 K upload
- 500K download (Usually 250-300K real output)
- Batteries 1,000 pesos each, 24 per inverter = 24,000 pesos[71]
- 24 Batteries cost approximately 24,000 pesos (1,000 pesos/battery) – Need to be replaced every 1-1.5 years. = approximately US$140/month maintenance fees just for the batteries.
- 27 Kilo Generator is what is in the some LINCOS = RD$170,000 = $10,000USD
- 10 Kilo Inverter costs about 75,000 pesos[72]
- Battery costs about 24,000[73]

Design changes to the LINCOS in the 2nd and 3rd generations were:

- 40-280 volt regulators and 10 Kilo inverters accompanied with a bank of 24 car batteries instead of gas powered generators in the 3rd Phase.
- 2nd Phase of 5 went out with 10 Kilo inverters in addition to gasoline generators.
- 3rd Phase of 5 (except one where there is no electricity at all) will be installed without gasoline generators and only inverters with battery banks. Inverters are less expensive up front than batteries, do not use fossil fuels, and are likely less expensive than gasoline generators.[74]
- "Toldo" (Canopy) is being phased out in favor of a less expensive traditional shade structure.

Figure: LINCOS in new Building

Technical Appendix Two
Supplementary Materials to Chapter Two
ICTs and Business in the Dominican Republic

Context within Ongoing Competitiveness and National Dialogue Work

At a national level, use of technology by business and government – the Networked Economy – is an important determinant of international competitiveness and may be an essential enabling tool for development priorities.[75] However, Networked Readiness and more specifically, analysis of issues of Networked Economy, should serve as one input to a national competitiveness strategy, building on priorities established by a broadly based national dialogue. The Dominican Republic has several ongoing related projects that establish a broader context and serve as complementary efforts to our results – the following is a very brief summary of several of them:

- **USAID / Chemonics Competitiveness and Cluster Projects.** The U.S. Agency for International Development contracted with the Chemonics Legal and Institutional Reform Consortium in July 1998, to begin a program aimed at "lay[ing] the groundwork for a national competitiveness program while promoting dialogue between the public and private sectors."[76] Chemonics issued its final report, based on a series of local workshops, in December 2000, including a report on the role of clusters in competitiveness which was an extension of the initial project scope.

- **World Bank Integral Development Framework.** The World Bank launched an Integral Development Framework project in 1999, aimed at producing consensus and coordination around development goals in the DR. However, as late has July 2001, the initiative had not born results. According to the IDB: "One consequence has been that the Integral Development Framework launched by the World Bank in 1999 as a pilot undertaking in the Dominican Republic has yet to produce any concrete results. This initiative sought to build consensus and forge alliances on common strategic priorities for development, eliminate waste and duplication of effort and stress the achievement of concrete results. Yet, despite a significant, open and participatory debate on key national issues, the process has not yielded any specific coordination matrix, because of constant election-induced changes in players and priorities. In its dialogue with the authorities, the Bank will stress the importance of addressing this lack of coordination, which takes on particular importance given the fiscal situation and the projected needs for counterpart funding, and the country's financial obligations under the current portfolio."[77]

- **Inter-American Development Bank (IDB).** On April 18th, 2002, the IDB announced that it would be lending US$55 million to the government of the DR, to support competitiveness of the food and agriculture sector. Components of the program include cash rebates to farmers adopting innovative technologies, and "a National Food Health and Safety system will be established, and the National Surveillance and Monitoring Project for Food residues and Hygiene will be activated."[78] In September 2002 another IDB loan was announced that targeted ICTs specifically. More detailed information about the ICT activities that the IDB will support can be found in Appendix One.

- **Dominican Government.** Since the launch of this project, the government of the Dominican Republic launched several initiatives geared toward national competitiveness.

Business Survey

As discussed in great detail in Chapter Two, together with the American Chamber of Commerce of the Dominican Republic we carried out a randomized survey of AmCham's membership.

The survey guaranteed anonymity of respondents and was carried out between June and August 2002 in the Dominican Republic.

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The entire report draws primarily upon internal project resources such as the Dominican Household Education Survey (DHES), the Harvard Dominican Information Technology Education Survey (HDITES), the business survey carried out with the American Chamber of Commerce of the Dominican Republic, as well as hundreds of formal and semi-structured interviews, numerous trips to the Dominican Republic, and the observations and experiences of 4 researchers-in-residence in Santo Domingo during 2002. The following are specific other resources used for each chapter.

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Endnotes

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[3] See Technical Appendix One.

[4] Referring generally to a computer lab.

[5] Project No. Dominican Republic-0149 "Desarrollo Institucional para la Sociedad de la Información"

[6] This is the line of thinking for the *Fundación Dominicana Digital*

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[8] As of October 2002 using the exchange rate of approximately. 18:1. Teaching shifts are 4 hours long, a teacher can have 3 shifts per day, but not all in the same school, and teachers have to travel frequently and are often not able to get three shifts. Source: Unidad Ejecutora de la SEE

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[13] [online] at http://www.revistainterforum.com/espanol/articulos/Tecnologica2_050601.html)

[14] Data from personal interview.

[15] Special thanks to Meredith Pearson for helping to interpret the data from the DHES survey.

[16] Statement was phrased "Los Padres Estan Disputos a pagar para que sus hijos estudien"

[17] We also analyzed computer usage and willingness-to-pay according to income per capita, and our results were very similar.

[18] Circular No. 05, January 31, 2002. Secretariat of Education of the Dominican Republic

[19] Unidad Ejecutora, July 2002

[20] Remember the "Manager" is the person responsible for the computer lab and "Teacher" is a regular (usually math or science) teacher.

[21] Secretariat of Education, August 2002.

[22] Of the 163 total lab managers in the survey, 151 responded to the question of "Have you completed and online course" 49 responded "Yes." Assumptions cannot be made for the population managers as a whole and this statistic likely reflects a strong upward bias.

[23] Phone services in the LINCOS units are provided through Voice Over Internet Protocol (VOIP) via a Very Small Aperture Satellite (VSAT). Incoming calls are free of charge and residents can buy a phone card to make outgoing calls.

[24] (For additional design changes made to the LINCOS see Appendix__)

[25] "Manager" refers to the teacher specifically in charge of the computer lab and "Teacher" is used to describe a "Non-IT" teacher of math or science.

[26] The Spanish word used in the survey for "ready" was "Dispuesto"

[27] INFOTEP website. http://www.infotep.gov.do

[28] Presentación ANJE, July 24, 2002.

[29] Secretaría de Estado de Educación y Cultura, Programa de Informática Educativa, Propuesta General

[30] Fundación Dominicana Digital proposed by the Unidad Ejecutora in 2002.

[31] Zuboff, Shoshana, "In the Age of the Smart Machine," 1988.

[32] *Indicadores Telefónicos de la República Dominicana a Marzo 31, 2002*, INDOTEL, [online at] http://www.indotel.org.do/sector/estadisticas.htm

[33] Ley General de Telecomunicaciones No. 153-98, Capítulo VII

[34] Cadet, Marcos, Listin Diario, "Celulares desplazan el servicio residencial", March 10, 2002 page 1D

[35] [online at] http://www.indotel.org.do/Site/sector/estadisticas.htm

[36] *Indicadores Telefónicos de la República Dominicana a Marzo 31, 2002*, INDOTEL, [online at] http://www.indotel.org.do/sector/estadisticas.htm

[37] For example, see [online at] http://www.listin.com.do, [online] at http://www.hoy.com.do, [online at] http://www.elcaribe.com.do.

[38] [online at] http://www.paginasamarillas.com.do

[39] [online at] http://www.salomeu.com

[40] [online at] http://www.perspectivasciudadanas.com

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[42] See Ley 116, 1980 and Reglamento 1894, 1980.

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[53] INDOTEL data, [online] at http://www.indotel.org.do/sector/estadisticas.htm.

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[55] INDOTEL data.
[56] *Listín Diario*, "La composición del mercado telefónico cambia rápido por la incursión de nuevas compañías," March 10, 2002.
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[58] Cadet, Marcos, "Empresas extranjeras hacen contactos para venir a RD," *Listín Diario*, March 12, 2002.

[60] INDOTEL, *Memoria*, May-August 2002, pg. 46.
[61] see http://www.indotel.org.do
[62] See http://www.compranet.gob.mx and http://www.compraschile.cl.
[63] "Poder Ejecutivo crea Comité Nacional para la Sociedad de la Información" [online] at http://www.presidencia.gov.do website, September 5, 2002
[64] Decreto 686-02
[65] Felipe, Yaneris, "Aquí es más fácil usar Internet que en otro lugar", *Listín Diario*, June 9, 2002.
[66] Ibid.
[67] Microsoft Encarta Encyclopedia and GPS Utility software.
[68] Because of low response rate, 32 private schools and LINCOS units were not included in the final report.
[69] Some labs were only installed with 10 computers, others because of unresolved technical problems have less than 20 in operation.
[70] As of August 2002, 10 LINCOS existed with five more expected to be opened by early 2003.
[71] Using the exchange rate of 17.8 Dominican pesos per U.S. dollar
[72] A 10K Inverter with 24 batteries will provide about 5 hours a day of use on the computers.
[73] From an interview with a LINCOS administrator
[74] Batteries need to be replaced anywhere from 1-2 years depending on use, maintenance, and environmental conditions.
[75] See for example Catherine Mann's chapter in the 2002 Global IT Report, "*Electronic Commerce, Networked Readiness, and Trade Competitiveness.*" <Online at http://www.cid.harvard.edu/cr/gitrr_030202.html as of 8/31/02>
[76] From Chemonics LIR Consortium website, summary of Task Order #801: "Critical Assistance to the Government of the Dominican Republic Policy Reform Efforts." [online] at http://www.liriqc.com/LIRIQC_DR_801_Summary.htm as of 8/31/02>
[77] IDB Dominican Republic Country Paper 7/25/01, page 11.
[78] IADB Press Release, 4/18/02, "IDB APPROVES $55 MILLION TO SUPPORT COMPETITIVENESS OF FOOD AND AGRICULTURE SECTOR IN DOMINICAN REPUBLIC" [online] at http://www.iadb.org/exr/PRENSA/2002/cp9702e.htm as of 8/30/02>