Incorporation of Information and Communication Technologies in Schools: The "Internet for Everyone" Project in Panama

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Abbreviations/Terms

AVE	Aula Virtual para la Enseñanza (Virtual Learning Classroom)
COSPAE	Private Sector Commission on Educational Assistance
GDP	Gross Domestic Product
IA	Implementing Agency
IADB	Inter-American Development Bank
ICT	Information and Communication Technologies
IFEP	Internet for Everyone Project
ITG	International Technologies Group
LAB	Government-run computer lab in the Dominican Republic
MEDUC	Ministry of Education in Panama
MEF	Ministry of Finance in Panama
ODF	Omar Dengo Foundation
PRODE	Educational Development Project
PV	Photo Voltaic
SEE	Secretary of Education in the Dominican Republic
UNDP (PNUD)	United Nations Development Program
UNETE	Unión de Empresarios para la Tecnología en la Educación (México)
UNICEF	United Nations Children's Fund
VSAT	Very Small Aperture Terminal Satellite

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Executive Summary

The Inter-Institutional Commission for the Internet for Everyone Project (IFEP) is in the process of completing its legislated mandate to "Provide Internet in all the public schools." The Commission, established by President Mireya Elisa Moscoso, is made up of the Ministry of Education (MEDUC), Ministry of Economy and Finance (MEF), and the Secretary of Science, Technology, and Innovation (SENACYT). By the end of 2003, the Commission seeks to contract the private sector to equip and maintain 634 of the 3019 public schools with 5 to 15 computers and Internet connections, covering 71 percent of the student population. Financed through the sale of public lands near the Panama Canal with an estimated budget of $83 million over the first three years, the project is unprecedented in size and aggressiveness of implementation.

The scale and pace of the project are cause for concern due to the limited institutional capacity, unclear goals, and failure to demonstrate the inclusion of lessons learned from past projects in the current design of the IFEP. Experience in other countries has shown that simply "Providing Internet" alone does not necessarily result in benefits to the students' learning and can waste resources and disappoint teachers, students, and community members. Although not formally stated, the Commission has espoused a vision for the project that is broader than simply "Provide Internet" and instead considers the goal of the project to improve primary and secondary education through the incorporation of technology in the classroom. This broader vision, however, requires an institutional framework with capabilities beyond those that currently exist.

The commission was designed primarily to carry out the purchase and installation of the computers. However, this design is unable to address teacher training, learning and educational content, intra-project communication, incentives for teachers, or community participation. The Commission therefore risks the labs going unused which could represent a loss of 30-50 percent of the initial financial investment in time and capital depreciation. To address these vital issues, the commission needs the backing of an institution capable of investigating, evaluating, and responding to the current gaps.

For the last ten months the commission has gone to great lengths to make an unconventional collaboration between the three institutions function. Representatives from all three institutions have worked outside of their job descriptions and volunteered their time to see that progress was made. While their work has brought the project within months of installing thousands of computers and internet connections in over 600 schools, the project cannot rely upon the willingness of the commission and then the teachers to voluntarily offer their time and energy to make sure the computers are used for educational purposes. "Juntemos y Hagamos la Fuerza" (Let's get together and make the extra effort) is not a long-term strategy. While it has brought the project to where it is, it is unlikely to carry it through the upcoming (and arguably more challenging) stages of implementation and maintenance. Incentive structures that align the interests of each party such that they have a real stake in the outcomes need to be put in place to ensure that the project can sustain itself.

The current institutional foundation and strategy puts an undue burden on a select group of dedicated teachers to integrate the computers in the classroom. At present, no money is allocated

for a specifically designated staff member either to offer ongoing basic technical assistance or to help regular (non-technical) teachers integrate the use of the computers into the existing curriculum. Considering the many competing priorities teachers face and the absence of financial or other incentives, it is unrealistic to assume that even the most ambitious teacher will sustain these additional duties. This report presents recommendations to improve the institutional foundation such that the average teacher managed by the average government official will be able to ensure the educational use of the computers within the classroom – moving the emphasis towards *systemic reform* and *institutional frameworks* rather than personal initiative and personal sacrifice.

Similar experiences in the Dominican Republic suggest that if this project does not have political autonomy, a change in the government can mean a drastic decrease in support for the labs. With its current structure, the IFEP runs this risk. An emphasis should be put on establishing an autonomous institutional framework with broad-based political support that can sustain itself across administrations.

For the Internet for Everyone Project to achieve the intended improvements in education, the Commission needs to look outward and create an environment that enables interested stakeholders in the private sector and civil society to participate actively. When combined with careful analysis of lessons learned from similar projects in the region, this approach will give the IFEP a base of knowledge and resources upon which to build a sustainable program.

The recommendations include the following:

1. **Improve the Institutional Platform:**
   a. **Autonomous Foundation:** Funded by and in close coordination with the Minister of Education, a foundation would handle all the day to day maintenance of the labs and coordinate outside partnerships, community relations, content development, curriculum design, and teacher training.
   b. Implementing Agency: This may relieve some of the institutional burden from the Ministry but is contingent on uninterrupted support from the Ministry of Education and highly dedicated officials. This option is vulnerable to changes in government administrations which can jeopardize the long-term viability of the project.
   c. **Reform current Ministry Structure:** Improvements to the current structure can significantly help the project. However, reforms will likely take time beyond that which is allocated for the project. In addition, even the most efficient Ministry will remain highly susceptible to changes in government administrations which can compromise the project in the long-run.
2. **Increase Budget and Incentives for Teacher Training:** At 4 percent, the current budget allocation for teacher training is far below the recommended level of 30 to 40 percent of total project costs. More time and resources should be dedicated to ensure teachers are adequately trained both on a basic technical level and in ways to integrate the use of the computers into the curriculum. To move this along, incentives need to be put in place to guarantee that teachers make an effort to both learn and incorporate the use of the lab.
3. **Open the Labs to the Community:** Allowing the community access to the labs and opening them up after school hours and during weekends and vacations will allow more people to benefit from the use of the systems. Increasing community participation can also carry indirect benefits in the areas of maintenance, security, and community development.

4. **Create Paid Staff Positions to Supervise Labs:** Specifically designated staff should be created who are responsible for keeping the labs functioning and ensuring that they are being integrated effectively.
5. **Increase Partnerships with Civil Society:** This will allow organizations with strengths in training, community participation, content, and curriculum development to contribute to the project. Incentive-driven partnerships will help ensure desired outcomes and long-term sustainability.

The above challenges should not discourage Panama from investing in computer labs, but rather encourage policy makers to leverage the demonstrated enthusiasm for the labs to invest not so much in boxes of wires but rather in people and institutions. This can support other needed educational reforms like parent and community participation, curriculum reform, decentralization, and local empowerment. The reasons why Information and Communication Technology (ICT) integration in education is difficult are the same reasons for which it is important - it involves much more than technology and can be a driving force behind a larger package of educational reforms. Thus, the potential of ICT integration goes far beyond their direct benefits, effectively acting as a nexus for other reforms and community-level advances.

Introduction

Recent advances in information technology have fostered an interest on the part of developing countries and development practitioners to leverage information and communication technologies (ICTs) for social and economic development goals. One of the areas where ICTs can help is in primary and secondary school education. As a result, governments around the world strive to provide computers and internet connectivity to their educational institutions with the hope that it will serve as a transformative educational resource to help achieve desired improvements in literacy, language acquisition, and math and science, while simultaneously developing basic technological skills. While small scale pilot projects to integrate technology into the educational process have shown promising results, many of the large scale projects underestimated the challenges of teacher training, maintenance, and increased institutional strain. As a result, financially strapped governments wrestle with unanticipated logistical, technical, and operational hurdles and many find themselves ill-equipped to resolve them. In turn, governments have adopted a more outward-looking approach seeking partnerships with the private sector and civil society to help run their program.

In the last 5 years in ICT for education, the following seven points ring clear:

1. The principle challenges are more in the area of institutional capacity and teacher training rather than in technical areas.
2. Many governments have struggled to assume all the responsibility for the projects.
3. The most successful projects are characterized by decentralized management, strong collaboration with the private sector and civil society, and active participation of local communities.

4. Community integration is a critical factor for both the full use of the labs and for their long-term sustainability.
5. Teacher training is much more complex and costly than is often expected.
6. If the project does not have political autonomy, a change in the government administration can mean an end to the lab's effectiveness.
7. Long-range financing is a primary concern from the initial stages of the project.

Furthermore, even though some governments planned extensively and anticipated many of the above challenges, many large scale projects have yet to result in measurable improvements in education. This is not to say that improvements have not taken place, but rather that in many cases, it is too early to tell. This is due less to negligence or inadequate leadership and more to the complexity of the project and the additional burden it places on often already weak institutions.

Purpose of this report

This report provides a framework for thinking about the salient issues with the IFEP. The focus is on investigating *systemic reform* and *institutional frameworks* that may eliminate the need for policy makers to rely on personal initiative and personal sacrifice of teachers, school administrators, or government officials.

Methods

This document is based on over forty semi-structured interviews conducted in Panama City as well as the experience and insights gained through working with the Commission from December 2002 to January 2003 in Panama City. After a review of some experiences from

countries in the region, an emphasis is put on experiences in the Dominican Republic, Costa Rica, Chile and others. The recommendations focus around three alternatives for institutional models as well as more general recommendations for priorities in the next 6-8 months of the project.

Why Internet and Computers in Schools in Panama?

In the most recent World Bank *Panama Poverty Assessment: Priorities and Strategies for Poverty Reduction*,[1] the word "computer" or "internet" does not appear anywhere in the text of the 408 page document and the word "technology" appears only twice - once referring to agricultural technology and another referring to sanitary technology. While beyond the scope of this consultancy, it is important to contextualize this investment within Panama's educational reform strategy, educational philosophy and overall social and economic development goals and acknowledge the opportunity costs that exist. It may be worth taking an even farther step back and asking "Why Internet and Computers?" Are there more important priorities to improve education in Panama? Do the goals of the project coincide with the goals for education at the community level? How was this decision arrived upon?

ICT and Education in Practice

Over the last ten years policy makers and international education specialists have been experimenting with ICTs as one way to improve education. Although over time most agree that ICTs can be a powerful supplementary tool in education, it is becoming increasingly clear that incorporating their use in the classroom is more challenging than expected. Evaluation of impact is particularly elusive because any data that do exist are dubious at best. One set of studies by

[1] Panama Poverty Assessment: Priorities and Strategies for Poverty Reduction, Vol. 1. Main Report, June 28, 1999 Report No. 18801 PAN, World Bank

SRI International of the World Links for Development program has returned some interesting and encouraging findings, but it is clear that the research community is still in the process of developing effective metrics for impact analysis.[2]

- Many governments underestimated the importance of training.
- Integrating computers into the classroom has shown to involve much more than simply adding another tool to the teacher's arsenal, but rather a profound change in the role of the teacher in the classroom.
- Costs of maintenance and recurrent costs are higher than expected.[3]

In addition, relatively little investigation has taken place to determine the effects of ICT integration on learning relative to other educational improvement projects. In spite of an absence of a sound justification for such a large investment, one encounters little protest to ICT projects. Part of this may be due to unrealistic expectations, but it could also be attributable to the "sexy" appeal of ICTs. In addition, "wired" schools are often symbolic of a more sophisticated, higher quality, and modern education, regardless of whether or not the computers actually increase learning.

Teacher Training

The area where ICT and education projects have confronted the largest barriers is with respect to teacher training. This may be partly due to the common tendency to think in terms of tangibles at the expense of intangibles but further aggravating this proclivity is the fact that widespread teacher training in ICTs requires overcoming institutional, operational, and educational barriers. To put it simply, the experiences detailed below will show that investing in hardware without

[2] See http://www.worldbank.org/worldlinks/english/html/sri.html
[3] The small attention given to cost and maintenance projections given in this document does not reflect the importance of this component of this project. While this analysis is beyond the scope of this briefing, it should be clear that they are critical factors that need to be addressed.

adequate attention given to training can cause labs to remain closed, unused, and is unlikely to provide significant benefit to the teachers, students, or community.

Figure 1

10 Points to prevent mistakes of the past with ICT and Education

- Claudio de Moura Castro, Inter.-American Development Bank

1. It is essential that people do not become discouraged during the first stage of the Project because of disastrous results
2. Computers should not be installed before logistical problems and maintenance issues are resolved
3. Computers should not be installed without some basic content
4. Unprepared teachers is the largest difficulty
5. Begin to use the computers immediately after they are installed
6. Schools should feel free to develop their own content and define their own use
7. Mistakes from other projects cannot be ignored
8. Teachers have the final word on the use of the computers
9. National projects to introduce computers need to decide if there are going to select new software or contract out to make new content
10. Computers should not be sent without a complete packet of produc tivity software

10 Ten Lessons for ICT and Education in the Developing World

-Robert Hawkins, Director of ICT for Education program at the World Bank Institute (Formerly World Links for Development)

1. Computer labs in developing countries take time and money, but they work
2. Technical support cannot be overlooked
3. Noncompetitive telecommunications infrastructure, policies, and regulations impede connectivity and sustainability
4. Lose the wires
5. Get the community involved
6. Private-public sector partnerships are essential
7. Link ICT and education efforts to broader education reforms
8. Training, Training, Training
9. Technology Empowers girls
10. Technology motivates students and energizes classrooms.

Before designing a teacher training program the goals of the project need to be clearly stated. Since the primary purpose of the labs will dictate the training strategy, it is important to have a clear understanding of exactly what the IFEP sets out to accomplish:

What is the primary purpose of the labs?

- Educational use within the school? Outside the school?
- Administrative function within the school? Outside the school?
- Educational use for the community?
- General purpose use for the community?
- Paperwork? Personal interest? Recreation? Games?

Without remuneration or other recognition, experience in the Dominican Republic suggests that the goodwill of teachers or community members cannot be relied upon to carry a project through in the long run. After spending time and resources on largely ineffective government-run

training program a few countries are now experimenting with smaller, more incentive-based programs like:

Private Training Institutes: The government serves the role of regulator and gives specifications for training to the private training centers. These centers are often spread throughout the country and thus minimize travel time and costs.

Voucher System: A system whereby the government gives private computer training centers a list of skills they want their teachers to learn and then gives vouchers to teachers so that they can go to whichever recognized training center is most convenient for them. This provides an incentive for the training centers to provide the best possible training and to accommodate teachers' schedules.

Case Study: Costa Rica

Costa Rica is one of the most frequently mentioned countries when discussing ICT and Education in Latin America. Not only because it has succeeded at connecting 100 percent of their primary schools and 50 percent of their secondary schools, but also because of their strong pedagogical orientation and their success with achieving some integration in the curriculum.

The Omar Dengo Foundation (ODF) was set up specifically to administer the ICT and education activities in the country and is largely credited with the Costa Rica's success in this area. Created in 1987 by Costa Rican businessmen and intellectuals, the ODF is a private, non-profit foundation dedicated to "promote the improvement of the quality of Costa Rican education through the introduction of new technologies and educational innovations."[4]

Salient aspects of the Omar Dengo Foundation

- Responsible for the design, implementation, and maintenance of the project
- Supported in part by the Ministry of Education for salaries and training
- Absence of central control of the Ministry of Education (More autonomous than a project run solely by the Ministry)
- Efficient procurement process
- Able to contract consultants with relative ease
- Focused on designing pedagogical materials

Contributing factors of success of the Omar Dengo Foundation

- Focus on training of teachers
- Captures the interest of academics whom give weight to the project and help ensure it is sustained across changes in government administrations

[4] See http://www.fod.ac.cr

- The press helps pressure the Ministry to continue supporting the project
- New positions were created and funded by the Ministry to help support the labs
- Outward-looking and collaborative approach

Diverse Board of Directors: One reason many argue that the Omar Dengo Foundation is successful is because it has a powerful and influential board of directors with representation from all sectors of society and all political parties. This enables relative consistency across changes in government administrations. This is not to say that things run completely smooth, but for the most part funding is not interrupted and the staff and administration remain relatively unchanged. This allows the development of local capacity and institutional memory and helps build confidence at the school level that the project will continue.

Chile - Red Enlaces

Chile's Red Enlaces (Network Links) is another program to provide computer assisted education to Chilean primary and secondary schools. The program began in 1992 with 12 schools. *Enlaces* uses a decentralized cluster strategy with an emphasis on collaborations with 26 universities. The universities provide content development, local management, and maintenance. A minimum of 20 teachers in each school as well as the director need to endorse the program and participate in the training *before* they are eligible to get a computer lab. In Chile's case, the labs were for the "educational community" in general and not only for the students. The school was responsible for local fund raising to pay the salary of the lab manager.

Case Study: Dominican Republic[5]

One country's experience that is particularly relevant to Panama is that of the Dominican Republic. In 1996, then President Dr. Leonel Fernandez promised to "Connect all the high schools to the internet." Thus began a huge government project to put 20 computers and a VSAT satellite in over 340 schools throughout the country. In spite of a dedicated staff with good intentions, the project got off to a very rough start and after 3 years many of the labs were barely being used, if at all. While in some cases several years past before some computers were operational, recent interventions have helped the project get on track and most of the labs are now working. Given the size of the project, its similarities in size and scope to the IFEP, and the comparable economic and educational characteristics, much can be learned from the Dominican Republic to avoid similar delays.

Main characteristics of the computer labs installed by the Secretary of Education (SEE) in the Dominican Republic

- 343 throughout the country
- 3 phases of implementation, beginning with 100 schools
- 20 computers, VSAT for every high school
- Private sector was contracted to provide the VSAT service
- The Secretary of Education was responsible for the technical upkeep of the computers
- 1 additional teacher was added to the payroll of the SEE
- 1 additional technician was added to the payroll of the SEE

Aulas Virtuales para la Enseñanza (AVE)[6]

- Mobile units containing 10 computers
- Collaboration with large telecommunications provider CODETEL –
- 92 units throughout the country
- Located in the property of the school.

[5] The report Dominican Networked Readiness can be downloaded from http://web.media.mit.edu/~gkirkman/DominicanNetworkedReadiness.pdf

[6] "Virtual Learning Classrooms" in English

- 10 computers, DSL Connection, diesel generator, air conditioning
- 2 AVE managers paid for by the SEE
- CODETEL was responsible for the technical support

The AVE's units are generally thought of as being effective in providing basic connectivity to communities that may not have previously had access. However the program is not without problems, not the least of which is a total lack of content. The computers were installed without any productivity software. In spite of this, some innovative AVE managers have been effective in capturing and maintaining students' interest, but it is accurate to say that as of June 2002 the units were not yet "integrated" into the education process.

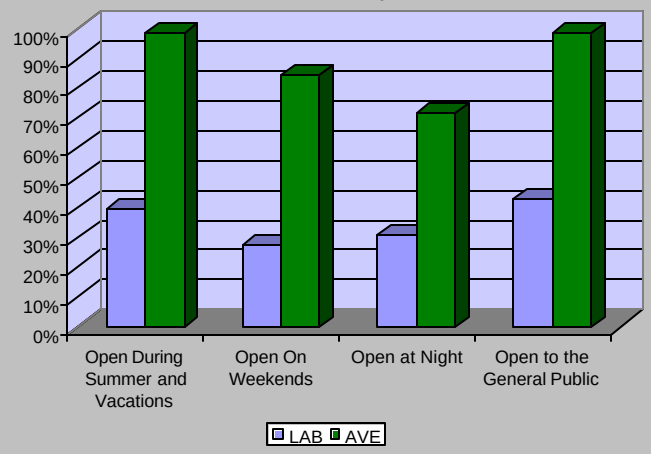
Teacher Training - Experience from the Dominican Republic

1. Most of the time and money spent on training did not result in efficient or effective training.
2. When the program began there was no plan or goals established to integrate the use of the labs in the curriculum.
3. After 5 years, many teachers still have only the most basic skill set on *operating* the computers and very little training in actually *integrating* their use in the classroom.
4. Planners are now investigating a program where after a teacher completes a certain number of hours of training they will then qualify to purchase a computer with a government-subsidized finance package. This project was designed after realizing that the best way to elevate use by the teachers was for them to have a computer of their own so they could learn in their spare time and in the comfort of their own home.

Dominican Republic – Survey of Use in AVEs and LABs

In August 2002, the most comprehensive survey to date was conducted on the use of both the AVEs and the LABs in the Dominican Republic. Researchers surveyed over 180 LAB and AVE managers to backup qualitative data on how well the program was achieving its stated goals. The following graphs present some of the findings.[7]

Figure 2: Are Labs in the Dominican Republic open to the community?



This graph shows how the differences in implementation and management of a project might impact whether or not the lab is open to the community. According to the stated goals of each project, both the labs surveyed in the above graph should be open to the community all the time.

Differences between LABs and AVEs[8]

For the purposes of comparing the two projects it is easy to think of the LABs as a typical computer lab installed and maintained by the government under a short timeline. In turn, the AVEs can be thought of as a public/private collaboration of self sufficient (electricity and air conditioning included) trailers (mobile but designed to remain stationary) outfitted with 10 computers and with maintenance services contracted to the private sector and paid for by the Secretary of Education.

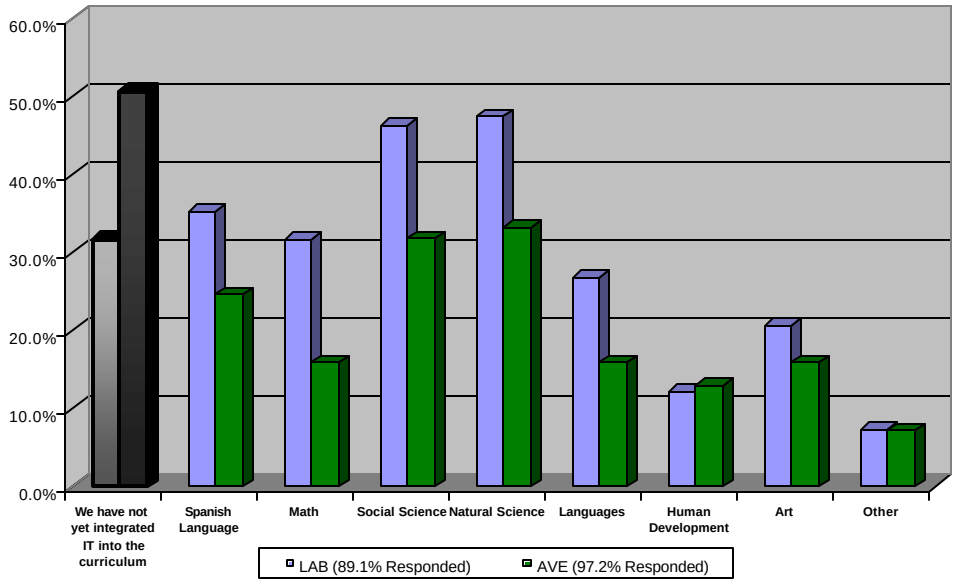
[7] The complete results of the survey can be found in the Report: Dominican Networked Readiness from: http://web.media.mit.edu/~gkirkman/DominicanNetworkedReadiness.pdf

[8] AVE refers to the Aulas Virtuales para la Enseñanza and LAB refers to the computer labs implemented by the Secretary of Education (SEE). The word "lab" is used more generally to include all types of labs discussed in this report.

Dominican Republic – Conclusion:

Integration into the curriculum requires much more than hardware.

Figure 3: In what areas have you incorporated ICTs into the curriculum?



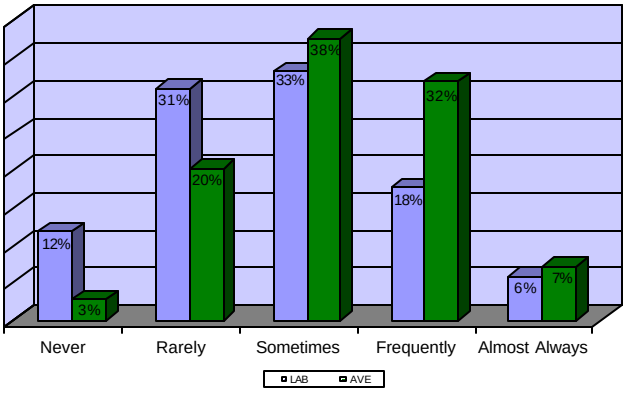
Many centers have yet to integrate the use of the technology in the curriculum

According to the lab managers surveyed, the understood mission of the computer labs is to "improve education using technology." Nevertheless, as evidenced by the statistics in Figure 3 above, after five years[9] of the project, many centers have not begun to incorporate the use of the lab in the curriculum.

[9] Depending on how the years are counted. While the first installations began in 1997, many labs have only been operational for less than one year. Survey results are averaged across all labs surveyed and do not reflect the length of time the lab has been in operation.

Anecdotal reports from the Dominican Republic suggest the participation of the director of the school in the project is an important component for success. Not because the director of the school is necessarily involved in the day to day functioning of the lab, but rather because in the organizational culture of the schools in the Dominican Republic, the director's support of the project is often critical to motivate the teachers. Dominican policy makers found that the best way to gain the support of the director is to provide them with at least basic technical training and explain the justification of the integration of computers and their potential benefits towards students' learning.[10] In some cases, a formal mandate from the secretary of education or at least the regional director is required to provide the incentive for the school directors to take the computer labs seriously and encourage teachers to begin the process of integration. Figure 4 to the right shows the relative participation of school directors of two projects in the Dominican Republic. The graph illustrates two important points: participation of the directors in both projects is low and participation is relatively higher in the AVEs than in the LABs. However, according to the mission and purpose of the labs, participation of the school director should be the same in both labs. Interestingly, participation is *higher* in the AVEs, where the unit physically resides *outside* of the school than in the Labs, where the lab is usually one of the classrooms within the same building.

Figure 4: How often does the principal of the high school participate in the lab?



Participation is higher in the AVEs where the unit physically resides outside of the school.

[10] Paulino Ogando, Interview June 2002.

Intra-Institutional Coordination: Setbacks and Risks in the Dominican Republic

The figure to the right demonstrates what can happen when there is poor coordination between projects. The picture shows two VSAT[11] satellites in a rural community in the northwestern region of the Dominican Republic. On the left is a LINCOS[12] unit and on the right is a school. The Secretary of Education is paying approximately USD $1,400 per month for *each* of the two VSAT satellites pictured, even though *one* of the VSATs is more than sufficient to run both labs. In addition, the school VSAT on the right was not functional when this picture was taken. As with many labs throughout the country, the computers remain in boxes inside the school. The reasons for such a waste of resources lies partly in the poor coordination between projects and partly in narrowly conceived contracts with the private sector. The organizational chart on the following page demonstrates the structure of the two projects relative to each other. When considering the organizational obstacles between the two projects and the communication hurdles required (not to mention political obstacles), it should not be a surprise that there is little coordination.

Figure 5

Two side-by-side VSAT satellites demonstrate a lack of institutional coordination.

[11] VSAT stands for Very Small Aperture Terminal satellite
[12] LINCOS units are self-contained computer and connectivity labs for use in rural areas. There are 17 LINCOS worldwide, 2 in Costa Rica and 15 in the Dominican Republic. For more information see the report *Dominican Networked Readiness* at http://www.media.mit.edu/~gkirkman/DominicanNetworkedReadiness.pdf and http://www.lincos.net

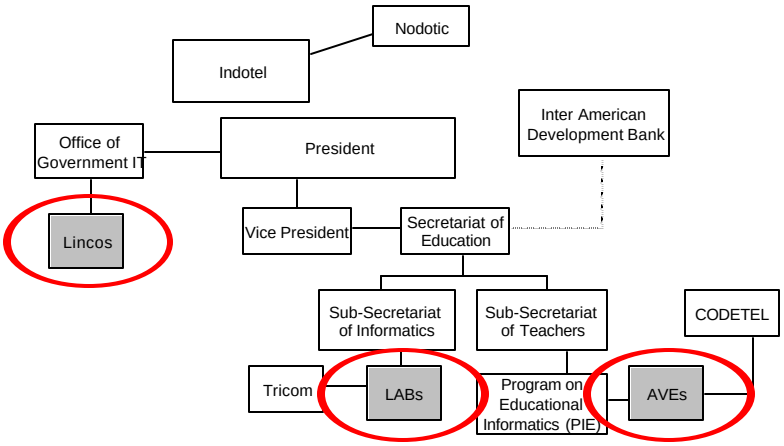
Electricity

One of the biggest *technical* (non administrative) reasons for unused computers in rural Latin America is lack of or inadequate electricity. Figure 7 below shows the risk of not planning effectively to provide electricity for the computers. Of the 3,019 public primary and secondary schools in Panama, 1,577 (52 percent) lack electricity.[13] How will Panama overcome this tremendous obstacle?

Figure 6:

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

Figure 7: Organizational Chart of Projects in the Dominican Republic



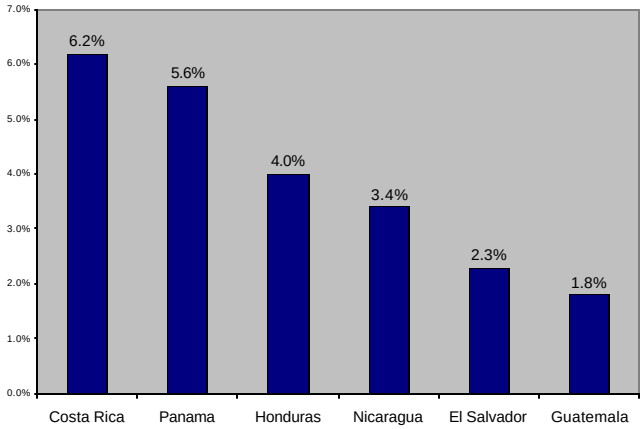
Source: Kirkman, *Dominican Networked Readiness*

[13] MEDUC, Jan. 2003

Panama and Public Education

Much of the economic development literature of Panama refers to two distinct countries: the rich Panama and the poor Panama. While overall GDP for Panama is relatively high at $6,000, in terms of inequality, Panama lies among the most unequal countries in the world. With a Gini coefficient of 0.49,[14] the poor are very poor and the rich are very rich.[15] Over one million people (37% of the population) live in poverty and over half of those (19% of the population) live in extreme poverty. Rural poverty is much higher at 67% in poverty and 39% in extreme poverty.[16]

Figure 8: Percentage of GDP spent on Education, 1998



Source: *Informe de Progreso Educativo Panamá, 2002*

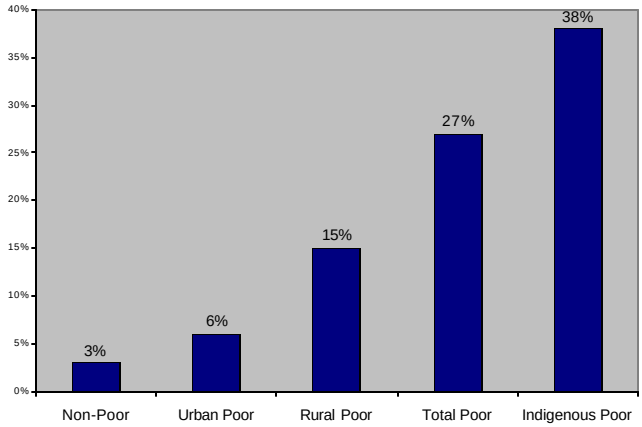
Public education at the primary and secondary levels in Panama is analogous to the overall economic situation in that while the overall figures are relatively positive in comparison to other countries in the region, large divides remain between rich and poor schools, and urban, rural, and rural-indigenous areas. While the percentage of GDP spent on education is relatively high in comparison to its neighbors (Figure 8) and nearly all Panamanian children attend primary schools and more than half attend secondary school, rural and indigenous areas show lower

[14] Gini Coefficient is a measure in inequality with possible values of 0 to 1 with 0 being perfectly equal, and 1 being perfectly unequal.
[15] UNDP Human Development Report 2002, GDP is PPP 2000.
[16] Panama Poverty Assessment, Priorities and Strategies for Poverty Reduction, World Bank, April 2000, #20307

literacy rates (Figure 9) and the indigenous poor are three times as likely to repeat grades in primary school.[17]

One of the greatest barriers to addressing the rural disparities is overcoming the geographic and demographic challenges of the country.[18] Panama has an extremely dispersed population with over 6,000 villages of less than 50 inhabitants each and over 4,300 small communities of less than 2,000 people. In addition, about two percent of the population live in areas that are only accessible by airplane, boat, or horseback and many rural-indigenous communities lack road access and sometimes do not speak Spanish.

Figure 9: Net illiteracy rates for the poor over the age of 9, 1997



Source: *Informe de Progreso Educativo Panamá, 2002*

These geographic and population characteristics result in the majority of the schools in Panama with only 10-20 students in one-room with one teacher, who sometimes lives in the school. The 634 schools included in the first stage of the IFEP contain 71 percent of all students. Therefore, 2,385 schools make up the remaining 29 percent, an average of 68 students per school.[19]

[17] *Informe de Progreso Educativo Panamá,* Programa de Promoción de la Reforma Educativa en América Latina y el Caribe (PREAL), 2002.
[18] See Appendix III for map of coverage of labs
[19] Preal report, using 558,203 total students.

Infoplazas[20]

Infoplazas are government funded community internet access centers with 10 computers and Internet connections located in both urban and rural areas which specifically target students. Infoplazas is a program under the Secretary of Science, Technology, and Innovation (SENACYT). There are currently 38 spread throughout the country. Infoplazas partners with NGOs, foundations, and civic and community groups in the communities in which they are located to help promote use and contribute to some of the operational costs. Although the IFEP will be implemented in *schools* and the Infoplazas project is focused on *community* connectivity, the mission and utility of the projects are very similar in spirit and much can be learned from the experience of the Infoplazas. In spite of the fact that the Infoplazas program is part of SENACYT the IFEP does not appear to be building upon the lessons learned in the Infoplazas program.

Other ICT and Education Initiatives

With the enthusiasm in all levels of society for incorporating ICT in education, many isolated initiatives have been launched in Panama in both urban and rural schools. Some projects are supported by local politicians who seek to contribute to their district, others by foundations like the Fundación Galindo, and still others who receive foreign donations through companies like Microsoft to establish a computer lab. While no comprehensive study has been conducted, anecdotal reports suggest that success of these projects is mixed. Some have provided extensive teacher training and others none at all. While some show positive preliminary results, others still

[20] For more information on Infoplazas see http://www.senacyt.gov.pa

struggle with financing, technical, and other problems and have yet to get up and running. In some areas, U.S. Peace Corps volunteers are helping to integrate some of these labs into schools and communities. While the Peace Corps in Panama does not have an official program area dedicated to ICT and education, it is becoming an increasingly important component of their work as both communities and volunteers take a greater interest.

Current Projects

Figure 10

Project	Number of Labs	Current Status
Isolated Independent Initiatives	Approx. 30-50	Unknown
PRODE[21] Phase I	31	Already Installed
PRODE Phase II	30	Planned for March/April 2003
PRODE Phase III	180	Planned for May/June 2003
Internet for Everyone - *Planned*	634	Planned for July/August 2003
Total:	***Approx: 915***	

History of the Internet for Everyone Project

The *Internet for Everyone Project* (IFEP) in Panama began with the Law 20 of May 7, 2002 in which Article 29A states that the government must "Provide Internet in the Schools."[22] With that mandate as a base, President Mireya Elisa Moscoso established an Inter-Institutional Commission made up of the Ministry of Education (MEDUC), Ministry of Economy and Finance (MEF), and the Secretary of Science, Technology, and Innovation (SENACYT) to work together on the issue. President Moscoso asked the Commission to give this project the highest priority. Since June of 2002, the Commission has been meeting regularly and is finalizing the plan to realize the installations of labs in 634 schools.[23]

As a part of a previous and unrelated project within SENACYT, a feasibility study was conducted to research the possibility of installing computer labs and internet connections in 125 schools. The IFEP used the feasibility study as a platform for information on the 634 schools, making assumptions about the needs of the 509 schools not included in the study based on results from the 125 schools surveyed. No other feasibility study has been conducted on this project.

[21] PRODE stands for "Proyecto de Desarollo Educativo" or Educational Development Project funded by the Inter-American Development Bank.
[22] Internal SENACYT documents
[23] SENACYT, January 2003

While the study detailed various ways to connect to the internet depending on the resources available in each community, because of the timeline of the project, it was decided that VSAT satellites would be used on all 634 schools. Although VSAT satellites are one of the most costly of all possible alternatives, it was chosen because it is the only technology that can work on all schools regardless of geographic location and can be implemented with relative ease and speed – a primary goal of the current administration in spite of the fact that some of the schools may be able to connect via a simple telephone line, a much less-expensive alternative.

Overview of Internet For Everyone Project

While the stated mission of the IFEP is to eventually install labs in all schools, the 2,385 schools that are not included in the initial installation are more realistically considered "left out" of this stage of the project. Little planning has been done to provide access to these schools, the financing plan is uncertain at best, and since no feasibility study has been conducted little is known of the needs of the schools. This is not to argue that these schools should be included at this stage but rather to point out the realistic limits of the scope of this stage of the project.

Coverage

Figure 11

To be installed by:	Urban Schools	Rural Schools	Indigenous Schools	Total Schools	Currently with Building and Electricity	Currently with building only	Currently with electricity only	Average Cost Per School	Total Cost USD
November 2003	**265**	**290**	**79**	**634**	**319**	**152**	**163**	**$38,097**	**$24,153,425**
?	?	?	?	2,385	?	?	?	$24,895	[24] $59,374,660
								Total Cost of Project	***$83,528,085***

Source: Propuesta de Capacitación para Docentes y Técnicos, Panamá Diciembre 2002.

Stage One Estimates of Student Population Coverage:

Figure 12

# of Schools	# of Students	# of Computers	Average students per computer	Percentage of all students
634	419,306	5,060	83[25]	71%
2,385	*138,897*	*?*	*?*	*29 %*

[24] Since a feasibility study has not been conducted of the remaining 2,385 schools, any cost estimates are rather arbitrary.
[25] Schools are divided into 3 categories depending on size. Largest schools receive 15 computers, medium schools receive 10 computers, and small schools or schools requiring solar energy receive 5 computers.

Cost Estimates

Figure 13

Estimated Costs Projections for 634 School based on Survey of 125 Schools[26]		
Computers	$	16,373,950
Internet Fees	$	16,219,900
Physical Improvements	$	11,767,500
Security	$	2,973,000
Training	$	1,329,500
Installation of Solar Panels	$	19,155,000
1 percent operation fee	$	678,189
Total:	**$**	**68,497,038**

Estimated Cost of 2,385 Schools NOT Surveyed		
Computers	$	3,715,625
Internet Fees	$	2,903,600
Physical Improvements	$	3,570,000
Security		-------[27]
Training	$	238,000
Installation of Solar Panels	$	4,455,000
1 percent operation fee	$	148,822
Total:	**$**	**15,031,047**

Total Cost of Project		
Surveyed Schools (634 – 125 Surveyed)	$	68,497,039
Non-Surveyed Schools (2,385)	$	15,031,047
Total Cost of IFEP:	**$**	**83,528,086**

Source: Propuesta de Capacitación para Docentes y Técnicos, Panamá Diciembre 2002.

Financial Overview

The IFEP is being financed through the sale of land near the Panama Canal. The land is estimated to be worth hundreds of millions of dollars. This sale is planned to fund five public works projects:

1) Panama-Colón Highway
2) Cleaning of the Panama Bay
3) "Government City" project
4) Public housing
5) **Internet for Everyone Project**

While the financing mechanism is beyond the scope of this analysis, it is a critical component of the project and could play a significant role since any delays in funding or transferring of fees due to specially designed payment mechanisms could cause delays in services.

[26] Only 125 schools have been surveyed. The costs in the above graph are estimated costs of 509 (Total of 634) schools in the first phase of the project based on the average cost per school from the 125 schools surveyed. It is unclear how representative the 125 schools are of the 509 schools since they have not been visited.
[27] This figure was not included in the estimates.

Outcomes from Policy Workshop

To launch this consultancy, a policy workshop entitled ***"Design, Implementation and Follow-up of Information and Communication Technologies Projects: Risk Analysis and Factors for Success"*** was held on January 6-7, 2003. The objective of the workshop was to present experiences of similar projects around the world and discuss the IFEP within their context, with a particular emphasis on countries from the region. Topics discussed included teacher training, curriculum development, institutional models, community integration, maintenance options, and financial and other risks.

The participants expressed that the project should be broken down theoretically in two phases: *Design and Planning* and *Implementation and Management*. During the workshop, participants suggested that as they approached the end of phase one, the current structure and clout of the commission were incapable of addressing the issues in phase two. The commission agreed that a change to the institutional structure of the project is needed to move towards achieving the project's broader goals.

Figure 14

Phase	Dates	Tasks
Design and Planning Phase	July 2002 – April 2003	- Financial arrangements to transfer funds from land sale (MEF) - Open bids and procurement of hardware - Purchasing of software and licenses - Design of initial training program (MEDUC) - Technical specifications (SENACYT)
Implementation and Management Phase	April 2003 onward	- Design and Implementation of follow-up training - Carry out follow-up training - Community integration - Monitoring and evaluation - Long-term financial sustainability

Since the commission did not have sufficient authority to make the pending decisions, it was recommended that the outcomes of the workshop be documented in a briefing book that outlined the current status, risks, and recommendations for future steps to be presented to the Minister of Education. Consequently, a previous version of this document[28] was presented to the Minister of Education on January 21, 2003 (See Appendix I).

[28] For the report submitted to the Minister of Education see http://www.ksg.harvard.edu/students/lopesma/IPTHarvardBorrador.pdf

Questions that emerged in the workshop that need to be addressed:

1. Are the labs going to be open for community use?
2. Are the labs going to be open after school hours?
3. Are the Inter-Institutional Commission and the Ministry willing to consider giving part of the control for implementation of the labs to another institution?
4. How can the percentage of the budget be adjusted for training?
5. What is the National Strategy for ICT and Education? If one does not exist, can it be created?
6. Is MEDUC going to create a new teacher position for every school with a lab to teach computers?
7. Is MEDUC going to create a new position for every school with a lab to maintain the technical aspects of the computers?
8. Can the implementation of the project be slowed to give time for pilot projects to test the ideas and then incorporate lessons learned?
9. Can the project be implemented in more and smaller phases than currently planned? (i.e. begin with 50 schools, and add 50 schools every few months)
10. What is the methodology for teaching?
11. What is the plan to develop content? Who is responsible for content?
12. What is the strategy and educational philosophy for ICTs?

The Commission lacks both the authority and the human resources to research and then authorize decisions. With the exception of the director of the IFEP, the current commission is an ad hoc group made up of members who all have other full-time responsibilities. In addition, since none of the current members are permanent, any research capacity that is built up would likely be lost in any changeover.

Institutional Issues

While looking at the roles of the three institutions that make up the commission, one of the salient issues is that their tasks and responsibilities are not clearly defined. One attempt was made to formalize this beyond a gross breakdown of financial issues (MEF), technological issues (SENACYT) and educational issues (MEDUC). However, after initial correspondence, no action was taken.[29]

The collaboration between the three institutions that has taken place up until now has been carried out in spite of particular institutional interests. That is to say that it was often not in each institution's interests to collaborate and a strong effort was made to keep communication lines open.

- There is a tension between the three institutions and a sense of anxiety on the part of several of the members of the commission and an interest in more explicitly defining the roles and responsibilities of each institution.
- Two ICT and education projects within the Ministry, PRODE and IFEP, while different only with respect to financial streams, to date, there appears to be little or no coordination between the two projects. Given the similarities between the projects, a collaborative approach (especially in the areas of training, content, and hardware procurement) seems natural such that efforts can be standardized and lessons-learned built upon.

[29] Internal correspondence of the IFEP

Training for the IFEP

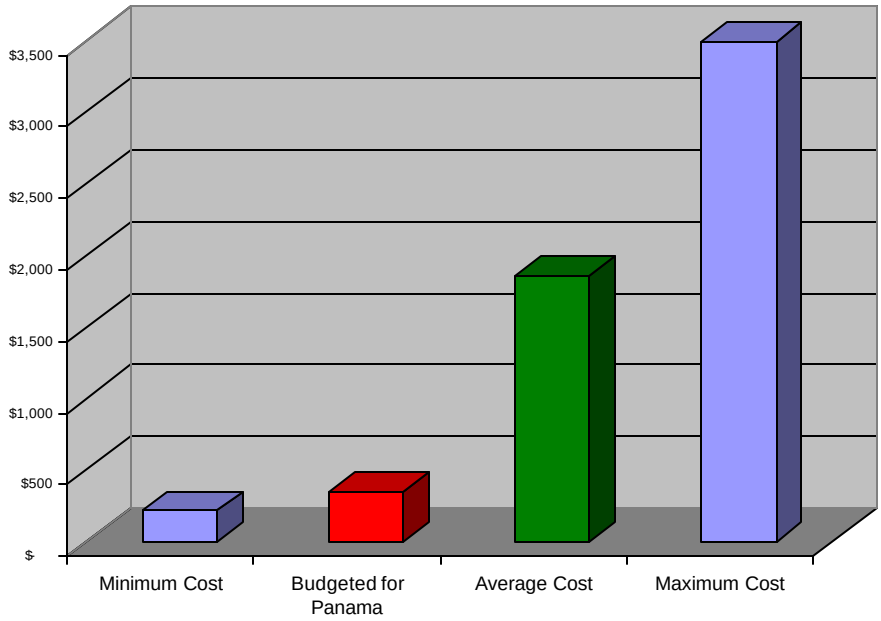
Part of the obstacle with training programs is simply devoting an appropriate portion of the financial resources to the task. The following pages contain a comparison of the budget estimates of the IFEP with what other countries in the region have budgeted for training, as well as with levels recommended by World Links for Development[30] and the Academy for Educational Development (Figure 17).[31] Comparing the estimated average cost *per teacher* we see that the IFEP estimates are within the recommended range (Figures 15). This does not mean that it is correct or appropriate; simply that it is *within the range* found to be appropriate in other countries also starting from scratch. Comparing the number of hours estimated to achieve a level of basic use,[32] we again see that Panama is *within the range* (Figure 16). However, comparing the total investment in training relative to the total budget, we see that at 4 percent, Panama is far below the recommended level of 30-40 percent. Given the experience of World Links and the Academy for Educational Development, combined with the documented experience in the Dominican Republic, it is strongly recommended that Panama increase the percentage of the budget allocated for training.

[30] The ICT for Education Program (Formerly called World Links for Development) Connects classrooms in more than 28 countries in the developing world with students and teachers in industrialized countries to develop collaborative research, teaching and learning programs via the Internet. http://www.world-links.org

[31] More information on the Academy for Educational Development at http://www.aed.org

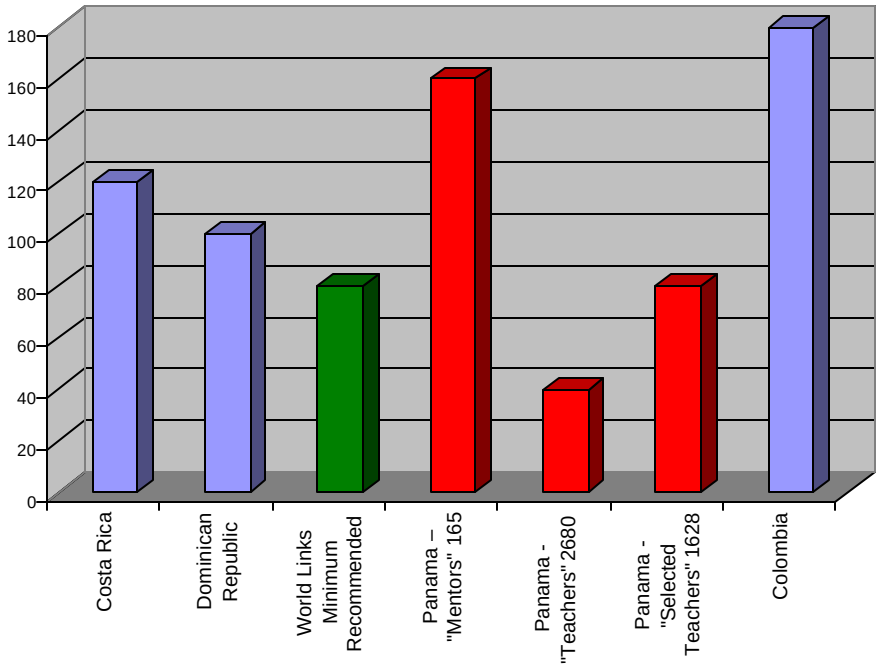
[32] "Basic Use" refers to simple operating skills like powering on an off, writing and printing a letter, and looking up basic information online.

Figure 15: Cost of training per teacher



Panama is within the recommended range of world averages of World Links Program

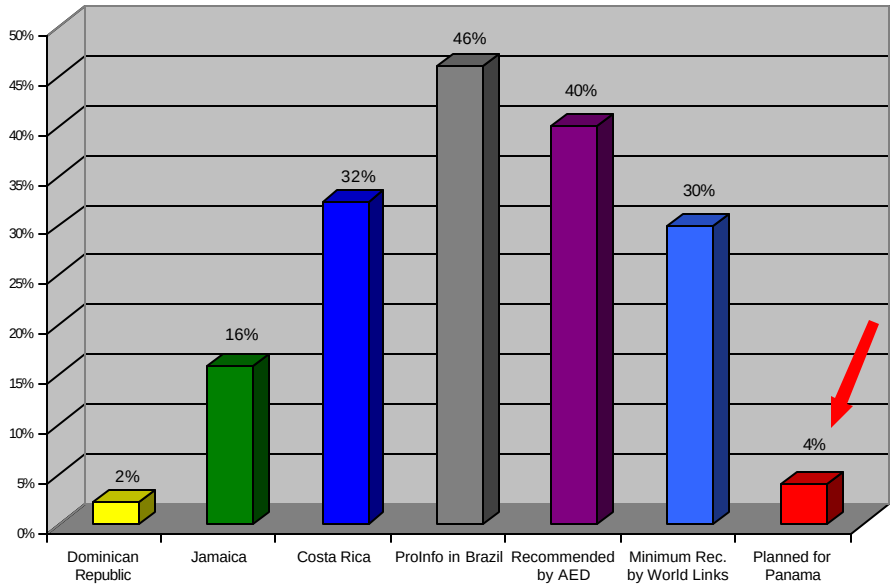
Figure 16: Number of hours planned for training for basic level of use



Estimated training time in hours required to achieve a basic level of use are within the range recommended by World Links for Development.

* “Mentors” in the above graph refers to 165 teachers, “Teachers” total 2,680, and “Selected Teachers” 1,628.

Figure 17: Percentage of total budget dedicated for training during the first stage.



At 4 percent of the total budget dedicated towards training, Panama is well below the recommended range of 30-40 percent.

Timeline and Scale of the Internet for Everyone Project (IFEP)

The IFEP is without precedent in scale and aggressiveness of the implementation period. Panama is planning on implementing over five times the average of what other countries in the region have done in their first year. Considering the limited institutional capacity, small staff, cost of project, technical complexity of off-grid electrification, unclear goals, and failure to demonstrate the inclusion of lessons learned from past projects in the current design of the IFEP, the scale and pace of the project are cause for grave concern.[33]

[33] Past projects refers to the 30 labs implemented in the PRODE schools, the Infoplazas and the various other isolated initiatives involving donated computer labs in public schools throughout the country.

Solar Energy

The IFEP plans to implement solar energy units for computer labs at an unprecedented scale and pace by installing 153 (24 percent of the 634 total schools in this phase) Photovoltaic (PV) solar energy systems in schools throughout the country.

The financial risks of this portion of the project are particularly large. The solar energy installations are estimated at over USD $30,000 per school. Since these units will be installed in "off-grid" communities, the impact and community perception of the systems is unknown, it is recommended that the IFEP project reevaluate the plan for solar energy provision to ensure that the investment will be effective. Considering the high number of systems Panama is considering installing, planners should dedicate more resources to research alternatives and begin with modest small pilot projects in varied regions throughout the country and then increase the number of systems as appropriate.

Project Risks

Financial Risks:

At a total cost of $83 million dollars for the first 3 years of the project,[34] one of the largest risks for the IFEP is financial. While careful treatment of these risks goes beyond the scope of this analysis, a few budget-related items are of particular concern and deserve mentioning.

- The Panamanian private sector has never provided hardware and connectivity at this scale.

[34] Financial projections are only for the first three years of the project – the average lifespan of the hardware. No plans are currently in place to finance the replacement of damaged or obsolete computers.

- Only one company bid for the service component of the project.[35]
- Computers are budgeted at $1,200 each. This figure seems to be approximately double the figure that is estimated in other projects involving the procurement of such a large number of computers. A 50 percent reduction of this figure would result in an immediate savings of USD $8,000,000.[36]

As was the case in the Dominican Republic, periods of non-use due to unforeseen delays can be very costly. The VSAT contracts in the Dominican Republic did not have built in safeguards against non-use. Consequently, while labs remained boxed up and costly hardware depreciated, the government continued to pay for the VSAT for all the labs, an annual bill of over USD $1,000,000.[37] If Panama experiences even half of the delays that the Dominican Republic did, it risks losing 30-50 percent of the initial investment in:

- The cost of the VSAT connection that may go unused.
- Hardware depreciation.
- Inefficient or ineffective training programs due to poor planning.
- Damaged equipment due to inadequate technical support.
- Stolen equipment due to lack of community integration.

[35] Brathwaite, Enrique Luis, *El Panamá América,* "Un cuarto de millón de balboas para laboratorios escolares" December 10, 2002.
[36] MEDUC: Internet Para Tod@s Presentation, May 2002, Page 24.
[37] *Inversión en los Laboratorios de Computadoras*, Al 16 de Agosto del 2000, Secretaría del Estado de Educación

Community-Level and Other Risks:

With so much enthusiasm among the population and the relative size of the IFEP's investment in schools' infrastructure, a project that suffers long delays and operational barriers can cause disillusionment and frustration at the community level and make communities reticent to participate. Anecdotal accounts in the Dominican Republic show that it is much more difficult to capture and maintain local interest without the confidence and support of the community. Also in the Dominican Republic, administrators have noticed that theft occurs less frequently in areas where the community actively participates in the management of the lab.

Given that the IFEP is one of the largest and most visible public sector investment projects in schools with participation of the private sector, results of the project will be highly visible. Considering the interest on the part of teachers, students, and the population in general in the success of the project, even small delays and problems may be amplified and their effect may be widespread.

Recommendations

The following recommendations are offered according to the current stage of the project. They are divided into the following broad sections with subsections.

1. **Create an Institutional Platform to Administer the IFEP**
    a. Autonomous Foundation
    b. Implementing Agency within Ministry
    c. Government Ministry (Current Structure)
2. **Build Local Support to Implement and Sustain Educational Improvements**
3. **Increase Partnerships with Civil Society and the Private Sector**

Create an Institutional Platform to Administer the IFEP

Considering the unprecedented amount of financial and human resources needed to administer the IFEP, it is recommended that the Commission focus on an improved institutional base to implement and manage the IFEP. While there are many crucial details (financing mechanisms, technical design, training) that need to be addressed, there first needs to exist an institutional base with which to build capacity.

Options for Institutional Platforms:

1. **Autonomous Foundation**
2. **Implementing Agency within Ministry**
3. **Government Ministry (Current Structure)**

Regardless of which platform is chosen, it should have the following characteristics:

Mission & Vision: Currently, the IFEP has no stated mission or vision to serve as a compass for decision-making. Given that the selected area of priority of the project will dictate different decision-making paths, it is important that the mission and vision be clearly and publicly articulated. For instance, if the labs are meant to serve as community resources, this will entail a different implementation and institutional strategy than if the labs were restricted to schools use.

Political Autonomy: Given that experience in other countries shows that lack of political autonomy can cause significant interruptions and even abandonment of projects across changes in government administrations, considering the size of the investment and its inherent long-term scope, mechanisms need to be put in place to ensure that the project will move forward according to *state* goals and not *administration* goals.

Paid Staff Positions to Maintain the Labs: In spite of the increase in costs for the Ministry of Education, it is critical for the long-term success of the project that qualified professionals be

hired to ensure full use of the labs. Local individuals need to be held accountable for their successful integration.

Financial Structure: Financial flexibility is a key component to ICT and education projects. Given the high cost of hardware and the recurrent costs of maintenance and training, a flexible and responsive financial system can help facilitate smooth purchasing and upgrades.

Long-Term Planning: Designate a team of people to develop a national ICT strategy for ICT and education. This along with the Mission and Vision of the IFEP will help organize initiatives around a common set of goals.

Curriculum Development Team: Establish an interdisciplinary team containing curriculum development specialists and technological experts to be in charge of incorporating the Panamanian curriculum in the labs and conducting regular evaluations to ensure goals are being achieved.

Incentive-Based Planning: Adopt an incentive-based strategy for teachers. The project should be designed considering the abilities of not the most motivated teacher but rather the average teacher. This will help more realistically determine outcomes and contribute to more sustainable policies that the more motivated teachers can build upon.

Autonomous Foundation

The option that may automatically align some of the incentives such that it conforms to the framework of a successful institutional platform (outlined above) is that of an Autonomous Foundation like that of the Omar Dengo Foundation in Costa Rica or the City of Knowledge in Panama.

The foundation would receive funding primarily from the Ministry of Education and work very closely with the Ministry but with an autonomous board of directors (With representation by the Ministry) responsible for the management of the program.

Figure 18

Internal and external examples that may serve as sources of information for Panama

- Indicasat Panama
- City of Knowledge - Panama
- Infoplazas - Panama
- Colombia – Conexiones
- Chile – Fundación Chile
- Argentina - Educar
- Brazil - ProInfo
- Costa Rica – Fundación Omar Dengo
- El Salvador – Infoplazas
- Mexico - UNETE

Possible composition of the board of directors in Panama

- Minister of Education: MEDUC
- Minister of Finance: MEF
- Secretary of Science, Technology and Innovation: SENACYT
- Minister of Labor
- University Deans
- Financial Sector Representative
- City of Knowledge Representative
- Private Sector (IT and other Sectors)
- Civic Groups
- Representative from IT Society
- Representative from COSPAE
- Representative from Civil Society
- Representative from the Press

Implementing Agency

This mechanism can help streamline some administrative processes and adapt the design of the labs more easily than the way the project is currently run. The drawback of this type of arrangement is that it is contingent on strong and uninterrupted support from the Ministry. As was the case in the Dominican Republic, a lack of institutional support from the Ministry can render the implementing agency ineffective.[38] In addition, because the unit resides within the bureaucratic umbrella of the Ministry, the procurement process is not necessarily improved. In the Dominican Republic, the implementing agency suffered procurement delays which crippled the integration in many schools and left local officials unable to move forward. Finally, since the implementing agency is under the Ministry it remains susceptible to political pressures and changes across administrations.

[38] Rodríguez, Dr. Luis, Informe Final, República Dominicana, June 2002.

Government Ministry (Current Structure)

While this is fastest of the three options, in its current form, it is an insufficient institutional base to manage the project. Barriers include the lack of designated and permanent staff, low political autonomy, and a time-consuming procurement process. Considering the many competing priorities teachers already face and the absence of financial or other incentives, it is unrealistic to assume that even the most ambitious teacher will sustain the additional duties required under this framework to make the project a success.

The chart on the following page outlines broadly the trends, tendencies, and observed characteristics of the three institutional mechanisms with respect to the needs of ICT and education projects. The chart is based primarily on the experiences in the Dominican Republic and Costa Rica along with anecdotal experiences from similar projects in Latin America. While it is a very rough generalization and clearly not true in all cases, it may serve to help bring together the experiences from similar projects and highlight empirical trends in the region.

Figure 19

Characteristics of a successful institutional framework	Autonomous Foundation	Implementing Agency	Government Ministry
Politically autonomous	Often	Rarely	Rarely
Able to contract consultants in a timely manner	Sometimes	Rarely	Rarely
Effective financial mechanisms	Often	Sometimes	Rarely
Effective at integrating local communities	Sometimes	Sometimes	Sometimes
Influential in schools	Sometimes	Sometimes	Often
Strong relationships with private sector	Often	Sometimes	Sometimes
Collaborative relationships with civil society	Sometimes	Sometimes	Rarely
Relationships with local communities	Sometimes	Sometimes	Sometimes
Able to raise outside money	Often	Rarely	Rarely
Incentives to collaborate	Often	Sometimes	Sometimes
Long-term vision	Often	Sometimes	Sometimes
Incentive to pilot projects	Often	Sometimes	Rarely
Able to retain institutional knowledge	Often	Sometimes	Rarely
Level of change within Ministry required for model to be effective	Low	Medium	High
Level of commitment from Ministry to be effective	Low	High	High
Able to convene stakeholder groups	Sometimes	Sometimes	Often
Able to receive loans from international development banks	Rarely	Rarely	Often

Build Local Support to Implement and Sustain Educational Improvements

Given the scale of the project and the additional burden it will put on an already strained institution, the IFEP needs to engage local communities to work together with school administrators for the day to day maintenance of the labs. This community-based approach will help with logistical details, increased use and security, and allow for local fundraising activities.

1) **Open the labs to the Community:** To spread the benefits of such an ambitious investment in the educational and technological infrastructure of the country, it is strongly recommended that local communities also be able to benefit from the labs.

2) **Provide Access Outside School Hours:** Ensure that access is extended more broadly to after school hours, weekends, and during vacations. This will allow the communities to use the labs to communicate with family or friends or complete administrative tasks thereby providing an incentive for local communities to support the labs.

3) **Community Integration:** Local communities should be viewed as a resource for the project to help with security, fundraising, maintenance, and logistics.

   a) **Technology Dialogues:** One form of community integration is to hold community meetings to announce the project and solicit feedback from local communities and then integrate this feedback into the design of the project.

   Participants can include:
   - Parents Associations
   - Local Business Associations
   - Rotary Clubs
   - Youth Groups
   - Mothers Groups
   - Church Groups
   - Sports Clubs
   - Agricultural or other Cooperatives

4) **Local ICT Committees:** Locally-determined members elected to plan for the use of the lab and its integration into the local community. Experience in the Dominican Republic shows that much time and resources can be saved if integration takes place *before* the labs are installed.

5) **Research Local Content:** Designate a team of people to research and recommend local content for the labs. This could include bringing together ideas through voluntary submissions from around the country or through the use of focus groups or other mechanisms to solicit input on the needs and interests of schools and communities.

Increase Partnerships with Civil Society and Private Sector

For the IFEP to achieve the intended improvements in education, the Commission needs to be inclusive and create an environment that enables interested stakeholders in the private sector and civil society to participate actively. When combined with careful analysis of lessons learned from similar projects this approach will give the IFEP a base of knowledge and resources upon which to build a sustainable program.

Fundación Galindo: - With extensive experience with ICT and schools in Panama in addition to experience designing and administering teacher training programs, the Fundación Galindo would be a excellent organization with which to form either a formal or informal partnership so that lessons learned can be incorporated into the design of the IEFP.

U.S. Peace Corps:[39] With over 100 volunteers in the country, many of whom are specialists in education and have high computer skills and live in both urban and rural communities throughout the country, volunteers can often help with training and community integration of the labs. Volunteers are serving similar roles around the world as well as in countries in the region like the Dominican Republic, Paraguay, Bolivia, El Salvador, Honduras, and Belize.

Collaboration with Universities: As with the *Enlaces* project in Chile. Universities can help support projects of this type in the areas of content development, curriculum design and technical support. In Paraguay, an effort was made to develop an internship program for university education students whereby students spend their last year of study to help integrate the computers in rural and underserved schools. While the project is in its initial stages, early anecdotal reports indicate that it is moving along well and the collaboration is beneficial for both the school and the university students.

[39] The U.S. Peace Corps in Panama can be reached at (507) 269-2100 or http://www.peacecorps.gov

ICT for Education Program at the World Bank:[40] The ICT for Education Program could help Panama integrate the labs into the learning process and provide a structure under which to provide learning incentives to students and teachers.

Organizational Collaborations: Forging collaborations with local organizations or community groups will help establish a conduit for learning across projects, develop and maintain community relationships, as well as help promote the project.

[40] The ICT for Education Program (The pilot project of which was called *World Links for Development*) connects classrooms in more than 28 countries in the developing world with students and teachers in industrialized countries to develop collaborate on research, teaching and learning programs via the Internet. For more information see http://www.worldlinks.org

Appendix I: Workshop Participants

Participants in the workshop on January 6 & 7, 2003:

Name	Institution	E-MAIL
José R. Checa	MEDUC	jcheca@meduc.gob.pa
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David Bósquez	SENACYT	dbosquez@senacyt.gob.pa
Kathya S. Hart	SENACYT	khart@senacyt.gob.pa
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Diana Candanedo	SENACYT	dcandanedo@senacyt.gob.pa
Fernando Perez	MEDUC	fperezo@hotmail.com

Presentation to Dóris Rosas de Mata, Minister of Education

The following people were present on January 21, 2003:

Name	Institution
Doris R. de Mata	Minister of Education
José R. Checa	MEDUC
Ricardo Rodríguez C.	MEDUC
Kathya S. Hart	SENACYT
Luis Donderis	SENACYT
Sixto Ruedas	MEDUC
Gerardo Rodríguez	MEF
Luis Cisneros	SENACYT/INFOPLAZAS
Fernando Perez	MEDUC
David Bósquez	SENACYT
Orlando Dubois	SENACYT
David Peñaloza	MEDUC
Luis Mitil	MEDUC
Carmen Tapia Díaz	PRODE-MEDUC-IDB
Moisés Hannono	World Bank Panama

Appendix II

Berkman Center for Internet and Society, International Technologies Group, Harvard Law School

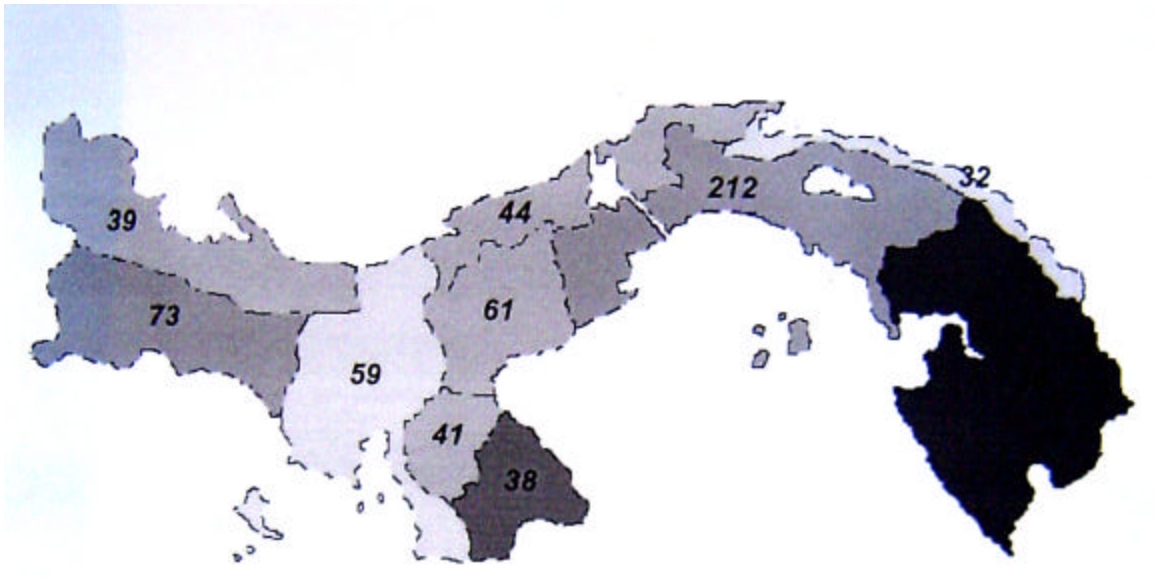
The Berkman Center for Internet and Society[41] is a research group within Harvard Law School made up of academics and practitioners whose mission is to explore the interaction of ICTs and society in various ways. The International Technologies Group (ITG) at Berkman focuses on the public policies of ICTs, particularly with respect to social and economic development abroad. Until last year, ITG resided at the Center for International Development at the John F. Kennedy School of Government at Harvard University, led by Economist Jeffrey Sachs.

ITG recently published the *Global Information Technology Report 2001-2002: Readiness for the Networked World (GITR),*[42] in collaboration with the World Economic Forum and the Center for International Development (based on a previous publication called *Readiness for the Networked World: A Guide for Developing Countries*). The GITR is an ambitious analysis containing 12 chapters regarding ICT for development using current data on 75 countries. The group also has extensive experience in the use of ICTs in Latin America and Caribbean in projects such as the Andean Competitiveness Project and the Harvard Dominican Initiative. ITG also has experience in India, Mozambique, Ghana, Malaysia, and the Philippines. ITG is currently involved in a project to develop a global database of IT and education activities.

[41] http://cyber.harvard.edu
[42] http://www.cid.harvard.edu/cr/gitrr_030202.html

Appendix III: Map of Coverage

Projected installation of 643 labs by department:



Source: Controlaría General del Ministerio de Economía y Finanzas, 2002

Bibliography

Books, Articles, and Reports

Agenda de Conectividad, Informe de Avance Bogota, Noviembre 28 de 2001

Brathwaite, Enrique Luis, *El Panamá América*, "Un cuarto de millón de balboas para laboratorios escolares" December 10, 2002.

Brazil ProInfo, National Curricular Parameters, Ministry of Education Brazil, 2000.

Brinkerhoff, Derick and Crosby, Benjamin, *Managing Policy Reform: Concepts and Tools for Decision-Makers in Developing and Transitioning Countries*, Kumarian Press, 2002.

Brinkerhoff, Jennifer, *Partnerships for International Development: Rhetoric or Results?* Kumarian Press, Nov. 2002.

Carlson, Sam and Gadio, Cheick Tidiane *Teacher Professional Development in the Use of Technology*. UNESCO and Academy for Educational Development, 2002.

Cisler, Steve, *Schools Online: Planning for Sustainability, How to keep your ICT Project Runnin*g. 2002

COLNODO: Unidades Informativas Barriales en Colombia, http://www.wri.org, January 2003

Computers in Schools: A Qualitative Study of Chile and Costa Rica, Education and Technology Series, World Bank Human Development Network.

Draft of Panama Information Technology Strategic Plan, March 12, 2002

Easterly, William, *The Elusive Quest for Growth: Economic' Adventures and Misadventures in the Tropics*, MIT Press Cambridge, 2001.

Haddad, Wadi and Draxler, Alexandra Edited. *Technologies for Education, Potential, Parameters, and Prospects*, UNESCO and Academy for Educational Development, 2002.

Incorporación de Nuevas Tecnologías al Currículo de Matemáticas en la Educación Media de Colombia Promotor: Ministerio de Educación Nacional – Dirección de Calidad de la Educación.

Informe de Progreso Educativo Panamá, Programa de Promoción de la Reforma Educativa en América Latina y el Caribe (PREAL), 2002.

Khelladi, Yacine, World Resources Institute, Community-Based Content: The Infocentros Telecenter Model, A World Resources Institute Digital Dividend Case Study July, 2001

Kirkman, Geoffrey, Ed. *Global Information Technology Report 2001-2002,* Harvard University. World Economic Forum.

Kirkman, Geoffrey, et. al. *Networked Readiness in the Dominican Republic,* Harvard University. Oct. 2002.

Navarro, Juan Carlos and Verdisco, Aimee, *La capacitación docente: Qué funciona y qué no, Innovaciones y tendencias en América Latina,* Online: http://www.teknologia.org

Navarro, Raúl Fuentes, Escuelas de Comunicación y Brechas Tecnológicas en México.

Panama Poverty Assessment, Priorities and Strategies for Poverty Reduction, World Bank, April 2000, Document #20307

Quality Consulting and Development Inc. Informe Final: *Estudio de factibilidad, estudio y planos para un sistema de comunicación inalámbrica en comunidades rurales.*

UNDP Human Development Report, 2002

Verdisco, Aimee and Navarro, Juan Carlos. *Costa Rica: Capacitación docente para la tecnología educativa*

Wazlawick, Raul Sidnei, *Advances on Computers in Education in Brazil.* Brazilian Computer Society, 2000

Wolff, Laurence, *Costa Rica: Are Computers in School Cost-effective?*

World Bank Human Development Department. Education and Technology Series Volume 1 Number 3 1996 *Cost Analysis of Information Technology Projects in Education: Experiences from Developing Countries*

World Bank, World Development Report, 2002.

Presentations

Chile Red Enlaces, Chilean Ministry of Education, 2000 ISBN: 956-7933-28-6

Doryan, Eduardo. Former Minister of Education; *Technology For Basic Education: A Luxury Or A Necessity? The Choice to Make: The Case of Costa Rica* Presentation World Bank Unitar, July 29, 2002

Fundación Gabriel Lewis Galindo, Perfil del Proyecto Tecnológico "El Salón del Siglo XXI," January 2003

Lewis, Jessica. *The Impact of ICTs in Latin America*, The Americas Society New York April 12, 2002

Lopes, Mark - *Design, Implementation and Follow-up of Information and Communication Technologies projects: Risk Analysis and factors for success for the Internet Para Tod@s Project*. City of Knowledge, Panama City, January 6 and 7, 2003

Lopes, Mark, *ICT and Education in the Dominican Republic In Practice*, Preliminary Conference of the World Summit on Information Society (WSIS). January 8, 9 2003 Santo Domingo, Dominican Republic.

MEDUC, *Internet Para Tod@s* Project Training Plan, Presented at Ministry of Education, January, 2003

Rusten, Eric. *Turning the Promise of Computers in Education Into Reality: The Case of ProInfo*, Brazil's Ambitious National Initiative

Victoria, David Daniel. *La Estrella de Panamá.* Date approximately late 2002.

Government Documents – Dominican Republic

Inversión en los Laboratorios de Computadoras, Al 16 de Agosto del 2000, Secretaría del Estado de Educación, Republica Dominicana

Rodríguez, Dr. Luis, *Informe Final*, Republica Dominicana, June 2002.

Government Documents – Panama

Hundreds of confidential correspondence documents of the Internet for Everyone Project

Organo Ejecutivo Nacional Decreto Ley No. 6, Panama, February 10, 1998

Speeches

Stiglitz, Joseph (1998) '*Toward a New Paradigm for Development: Strategies, Policies and Processes."* 1998 Prebisch Lecture, UNCTAD, Geneva, 19 October. Available online at: http://www.worldbank.org/html/extdr/extme/prebisch98.pdf

Internet Sources

(By date accessed from November 2002 through March 2003)

Partnership for Educational Revitalization in the Americas
http://www.preal.org

The Acacia Initiative - Studies and Outputs
http://www.idrc.ca/acacia/studies/ir-unes5.htm

World Policymakers - Resources - Category 4 Strategic Planning, Page 1
http://www.worldbank.org/worldlinks/policymakers/html/pol_resources_cat4_pg1.html

UNESCO INSTITUTE FOR INFORMATION TECHNOLOGIES IN EDUCATION
http://www.iite.ru/iite/index

IITE - Publications - On-line Publications

IITE ISITE - Information System on Information Technologies in Education
http://is.iite.ru/cgi-bin/rub.pl?action_=list&table=thema&id=1

Argentina EDUCAR
http://www.educ.ar/educar/index.jsp

World Bank - Economics of Education
http://www.worldbank.org/education/economicsed/research/publications/publications_index.htm

Teaching & Learning Design
http://www.uned.ac.cr/servicios/global/politica/default.html

World Bank - Economics of Education 2
http://www.worldbank.org/education/economicsed/tools/training/training_index.htm

USAID Intersectoral Partnering - Links
http://www.usaid.gov/pubs/isp/links.html

ICT for Development
http://www.educoas.org/portal/en/redes/red2/docs_recom.aspx?culture=en&tabindex=54&childindex=0

Inter-American Development Bank Sustainable Development Department
http://www.iadb.org/sds/SCI/publication/publication_761_2690_e.htm

A Cidade Que a Gente Quer
http://www.blikstein.com/smesp/

U.S. Dept. of Commerce Telecom and Tech
http://www.telecom.ita.doc.gov/ot/latinam.nsf/cfc20144ef0690ef8525662700611784/01c4e98bded9e88d8525672a006c4035!OpenDocument

Panama Zone
http://www.sunglobefiber.com/panamnap.htm

Information Technology - Communication Cluster - International Technopark of Panama
http://www.ciudaddelsaber.org.pa/en/technopark/communication_cluster/information_technology.html

Conectandonos al Futuro - Infocentros http://www.conectando.org.sv/Infocentros.htm

UIB Documentos & Materiales http://www.uib.colnodo.apc.org/videos.html

Schools Online Connecting the world... One school at a time
http://www.schoolsonline.org/whatwedo/index.htm

Infoplazas
http://www.senacyt.gob.pa/g_sinformacion/infoplazas/faq.php

CIA World Fact Book 2002
http://www.cia.gov/cia/publications/factbook/geos/pm.html

Semi-Structured Personal Interviews

Alvarado, Marta, United Nations Development Program, January 23, 2003
Arosemena, Jorge, Cuidad del Saber (City of Knowledge), January 22, 2003
Badilla-Saxe, Eleonora, Massachusetts Institute for Technology, January 15, 2003
Baer, Allan, SolarQuest, January 14, 2002
Bosquez, David, SENACYT, January 14, 2003
Candanedo, Diana, SENACYT December 4, 2002
Cardoze, Marta, Fundación Galindo, January 21, 2003
Carlson, Sam, ICT for Education (Formerly World Links for Development), January 12, 2003 (Email)
Carranza, Fabio, Ministry of Education (MEDUC) January - February 2003
Casas, Vilma Altet, Cuban Ministry of Information and Communications, March 2003
Checo, Jose, Ministry of Education (MEDUC), January 2003
Cisneros, Luis, Infoplazas January 2003
Cooper, Blair, United States Agency for International Development, (USAID) – Panama, January 23, 2003 (Phone)
Cordoba, Dr. Gonzalo, Secretary of Science, Technology and Innovation, (SENACYT)
Ganev, Iveta, Inter-American Development Bank Panama, February 18, 2003 (Phone)
Garriott, Gary, United Nations Development Program, Panama, January 18, 2003 (Phone)
Halman, Irvin, COSPAE, Panama January 21, 2003
Hastings, John, Inter-American Development Bank Panama, January 23, 2003
Johnson, Eric, Enersol, Dominican Republic (Email)
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Rodriguez, Gerardo, Ministry of Economy and Finance (MEF), December – January, 2003
Rodriguez, Ricardo, Ministry of Education (MEDUC) January 2003
Ruedas, Sixto Ministry of Education (MEDUC) January 2003
Rusten, Dr. Eric, Academy for Educational Development (Email)
Solis, Galileo, Infoplazas January 2003
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*All photos taken by Mark Lopes

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