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Modernization of the Canton of Belén through the Use of ICTs

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Abstract

The Municipality of Belén in Costa Rica is beginning to systematically investigate how information and communications technologies (ICTs) can best be used to improve the quality of life of its inhabitants, and has welcomed the participation of the Intel Corporation (known locally as Intel Components of Costa Rica) and the Costa Rican High Technology Advisory Committee (CAATEC) in this process. The results of the first stage of this investigation – a municipal "e-readiness" study and an action plan based on the findings of this study – are contained in this document.

Belén has not achieved anywhere near the level of ICT penetration and use that characterize some cities in more developed countries; on the other hand, it does not suffer from the almost complete absence of telecommunications and computer infrastructure that characterize the rural and/or poor areas in developing countries that are most often targeted by "digital divide"-oriented projects funded by international development agencies. Instead, it lies on the margins of the major metropolitan area in the country: 50% of households have fixed phone lines and 20% have computers, and the general level of awareness of ICTs (if not always actual experience with them) is high. In short, although individuals and organizations in the community need to markedly improve their access to and use of ICTs to really participate in digitalized "information societies", they are well-positioned to make substantial advances in this area in relatively short periods of time with proper resources and planning.

A series of citizen committees, or teams, were defined and assigned initial tasks in order to obtain these resources and stimulate their productive use. The teams are initially focused on six areas – providing more computers, providing better connectivity, providing properly equipped training facilities, training citizens in basic computer and Internet literacy, improving the use of ICTs in local schools, and increasing the effectiveness of ICT use in local government. In coming months, the results of these second-stage implementation activities will be monitored and analyzed by the community and representatives of Intel and CAATEC.

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Introduction

The citizens of developing countries are confronted with a rapidly globalizing marketplace in which their future role is often uncertain. The global marketplace is extremely competitive, and competitive advantages – higher labor productivity or organizational efficiency leading to lower prices, product quality, timeliness, value-added services – are at a corresponding premium.

A critical factor in competitive success in this new environment is the ability to create, maintain, and make use of information, either as a tool to guide one's own decisions, or as a product that may be bought and sold – a finding that has led to a characterization of modern economies as "information economies" or "knowledge economies". These economies are supported by a rapidly-evolving Information and Communications Technologies (ICT) infrastructure that can be used to improve the quality of life of its users in a multitude of economic and non-economic areas, but whose creation and maintenance may be extremely expensive, and whose best use will almost surely change through time.

Against this general background, the community of Belén is beginning to consider how ICTs can be used to improve the lives of its inhabitants. While successful participation in new global economies is extremely important to these inhabitants, not all of their interest in ICT deployment has to do with international, or even national, issues (there is a strong interest in strengthening local relationships and local economic activities), nor is it the case that residents of the community are only concerned with commercial problems (there is also great interest in fostering education for the community's children and adults, in making it easier to communicate with friends and family members, and in improving citizen security).

Belén has welcomed the participation of Intel and CAATEC in investigating how to best adapt itself to its changing environment, and in indicating the practical steps that can be taken to begin to achieve its long-term goals. The rest of this document presents the results of this cooperative effort, including findings and recommendations relevant to improving the quality of life of inhabitants of the community through the productive use of ICTs.

Community participation

Although it is natural to think first of the technologies themselves when considering how they can best be used, and reasonable to make an inventory of existing technological resources at the beginning of a project, actual planning in any ICT-related project must begin with a clear definition of the needs of the people that will be assisted by the technology. Once this is done, consideration is given to how existing technology can meet these requirements, and new technology acquisitions may be justified in light of demonstrated inadequacies in existing infrastructure.

While questions relating to technology may require the services of ICT providers and consultants, the determination of user needs must lie mostly in the hands of the users themselves – the members of the community. It was judged impractical to try to involve a large number of the community in the process of establishing community needs, or to carry out a systematic survey of

the population with this end in mind. Instead, a committee of residents of Belén, including representatives of the municipal government, of the private sector, and of organizations associated with local schools, was constituted to participate in preliminary user needs analysis. These citizens have not only provided their own insights on the needs of the community, but have whenever necessary sought other information and opinions in the larger community.

Citizen participation in the process of planning and adapting traditional telecommunications technologies has a long history – rural communities around the world, for instance, have often had to form committees and cooperatives to obtain telephone service. Similar community participation in the planning of computer and Internet use is not so widespread, even though it is every day more obvious that such activities are necessary if smaller communities are to have any substantial degree of control over their own futures. The necessity for such planning is as real for Belén as it is for those communities in more developed countries that have already begun "smart community" or "wired community" projects[1], and the present project has tried to provide a first step in the creation of an enduring culture of citizen involvement in this area.

A formal organization dedicated to citizen participation in ICT-related planning will greatly assist the Community in its efforts, and one of the major achievements in the last few months has been to begin the creation of BELETEC (Fundación para la Tecnología en Belén), a foundation that will provide a forum for ongoing community discussion of these issues, as well as being a legally-constituted entity that can seek funds from various agencies in order to carry out promising projects related to its areas of interest.

Important background factors

The state of certain factors in the present will play an important role in determining the success or failure of future initiatives, and must be taken into account when evaluating plans for the future. Based on the experience of CAATEC in national "e-readiness" studies in Central America, and the standard for methodologies for such studies used by the World Bank's InfoDev program and other international organizations[2], the working group chose to focus on the following general areas:

- *Existing ICT infrastructure*

  The degree to which existing ICT infrastructure can satisfy user needs must be established. In the area of telecommunications, the penetration of infrastructure is traditionally measured in terms of numbers of telephone lines, dedicated data connections, and the speed and costs of the transmissions that they provide. In the area of information technology, the most informative figure is the number of computers in the area, and what percentage of these computers are connected to telecommunications infrastructure. Beyond simple numbers, it is important to understand the geographical distribution of computers and transmission media, in order to correlate this data with social and economic data from outside sources.

[1] See, for example, <www.smartcommunities.org>, <www.natat.org/ncsc/Pubs/Getting Online/getting_online.htm>, etc.

[2] See *Illustrative Examples of E-Readiness Assessments and Assessment Methods* <www.infodev.org/ereadiness/methodology.htm>

- *Users and their activities*

  We would like to see the residents of Belén use ICTs in a natural way to carry out a wide range of activities that are important in their daily lives.

  Although this clearly means that users must have those general-purpose mechanical skills necessary to use computer networks ("computer literacy") and telephones, we should also try to specify which common citizen activities can be most effectively supported by ICTs, and what specific skills are necessary in these specific areas – what resources, experience and information are necessary to teach people how to communicate in new ways, and how to efficiently and effectively carry out tasks in the areas of local education, commerce, and government through the use of ICTs.

  Fomenting the use of ICTs is often closely associated with formal education systems, not only because the use of ICTs is often introduced to children in their schools (especially in environments in which computers in the home are rare), but also because ICTs can help to strengthen and enrich the teaching of other subjects in these schools. We must understand how computers and teaching are related in local schools in order to begin to plan for a stronger future for the pupils and their teachers.

- *ICTs and the larger society*

  Large businesses and financial institutions are leaders in the innovative use of ICTs. This means that many important commercial services from outside the community may already be available to local residents through the use of the Internet, offering them substantial savings of time and money if they know how to take advantage of these services. These same large businesses, both national and international, are often important sources of employment for educated and ICT-skilled "knowledge workers", and thought should be given to how to provide a supply of appropriately trained workers for this market.

  The smaller businesses that constitute a substantial portion of the local commercial sector will increasingly need the same kinds of basic ICT skills themselves, and with such skills may be able to extend their own services to not only local but increasingly larger, and even international, audiences. To do so, they may need to overcome problems of lack of resources and lack of familiarity with newer business strategies.

  The availability of government services offered through the Internet can be extremely convenient for local residents. Existing services at both national and local levels should be identified and taken advantage of, and the possibility of offering new municipal government services through the Internet should be investigated.

Community Assessment

We were not able to find all of the information we would have liked to have had in any of the major areas mentioned above, but we were able to find enough information in each of them to give us a good idea of what outstanding problems have to be overcome to begin the rational and productive extension of the use of ICTs in Belén.

Infrastructure

It is useful to begin the discussion of the state of ICT infrastructure with a consideration of available data for the country as a whole. We can do this at two levels – comparing summary statistics for Costa Rica to similar figures from other countries, and comparing figures for the canton of Belén and its component districts to those of the other cantons and districts of the country.

Appendix A presents data from the latest database from the International Telecommunications Union (ITU)[3] for the most basic telecommunications and computer indicators – the numbers of traditional "fixed" and more modern cellular telephones (as well as the total of these two figures), and the estimated number of computers and Internet users – all expressed in a standardized form of lines, devices, or users per 100 inhabitants.

Three groups of countries are presented in the table. The first group shows the top five countries in the World in each category to indicate the limits of current development; the second group consists of Central American countries, Panamá, and Belize, to show the current state of ICT infrastructure in neighboring countries; and the third group consists of Costa Rica and other world leaders in the exportation of coffee and banana, to allow us to compare Costa Rica to its traditional competitors in the agricultural marketplace.

It is obvious that Costa Rica has nowhere near the level of penetration of ICT infrastructure in any category that world leaders do – it has one-fifth the number of total telephone lines per 100 inhabitants that world leaders do, somewhat more than one quarter the penetration of computers, and one-sixth the relative number of Internet users. When compared to Central American countries, or to coffee and banana exporters, Costa Rica is at the top, or near the top, in all categories except that of cellular telephony – a situation that may have changed for the better in the last year due to the intense efforts that the Instituto Costarricense de Electricidad (ICE) has made to increase cellular penetration.

Even if Costa Rica were to regain its lead in this category among Central American and agricultural exporting countries, it would still be far from the levels of those seen in more developed countries. More to the point, none of the countries in the Central American and exporting groups have yet managed the transition to effective participation in Knowledge-Based Economies, and being the leader in a group of distant followers is no cause for satisfaction. Strong efforts must be made to overcome this gap between developed and developing countries, and the current project to improve the status of Belén is a small step in this direction; we can still see that there is little chance of converting the country in general, or Belén in particular, into a state-of-the-art consumer of ICT services in the near future.

Focusing specifically on ICT penetration in the canton of Belén, the best data currently available is that of the National Household Census of 2000 (www.inec.go.cr), which gives figures for the number of households with fixed-line telephones and computers by districts (subdivisions of cantons), and data from the Internet site of ICE on the number of dial-up Internet accounts in different cantons (www.ice.go.cr/esp/tele/planinf/indic_racsa1.htm), supplemented by ICE figures from the same site on the number of telephone lines at a national level (www.ice.go.cr/esp/tele/planinf/indic_telecom0.htm).

[3] <www.itu.int>

Table 1: Percentage of homes with telephones and computers
(Nationally, for the canton of Belén, and for each of the three districts of the canton)
Source: National Household Census for the year 2000; www.inec.go.cr

	Costa Rica	**Belén** 19,834 inhabitants	**La Asunción** Urban periphery 3,891 inhabitants		**San Antonio** Urban (95%) 10,256 inhabitants		**La Rivera** Urban periphery 5,687 inhabitants	
			%	**# (*)**	**%**	**#**	**%**	**#**
Telephones	54.32%	74.02%	84.74%	22	74.95%	54	64.75%	109
Computers	14.06%	26.97%	47.89%	4	23.04%	49	19.30%	70

** the figures in the "#" columns in this and subsequent tables indicate the relative position of each district among the 459 districts in the country, in this case with regard to telephone and computer penetration*

The 2000 census figures (Table 1) for telephones show that more than 54% of all households in the country had a telephone, and that Belén was substantially above the national average, with 74%. It is interesting to note that the official national telephony figures from ICE for the same year were 23.5 lines per 100 inhabitants for national fixed-line telephony and 5.4 lines per hundred inhabitants for cellular telephony – approximately one-half of the census figure for households. Perhaps Costa Rican households really did have far more telephones per 100 inhabitants than the nation taken as a whole, and both sets of figures are valid, but this discrepancy indicates possible problems with directly comparing statistics from different sources, and in the present study we will limit ourselves to using household census values to estimate relative positions of Belén and other districts in the country, without trying to compare these values to national averages from other parts of the world.

At a more detailed level, the census figures show a substantial variation between districts in telephone penetration; the district of La Asunción is 22nd of 459 districts in the country in the percentage of households with telephones, while the district of San Antonio is 54th and the district of La Rivera is 109th in the same list. The very high figure for telephones in La Asunción is probably strongly affected by the presence of the high-income Cariari area within the district, and the 20% difference between La Asunción and La Rivera shows a mini-"digital divide" within the canton.

The national census figure for computers in Costa Rica (14%) in the year 2000 is extremely close to the ITU figure for the country for the same year, which almost certainly indicates that the ITU figure came from the census. Continuing to limit ourselves to using census figures for comparing districts within the country in relative terms, we can say that Belén has substantially more computers per 100 inhabitants than does the country as a whole, and that within Belén, La Asunción has far more computers than either of the other two districts – reinforcing our conclusion that a divide exists in availability of ICT infrastructure between districts of the canton.

In the context of extending access to computers in developing countries, it is always useful to have an idea of existing concentrations of computers that are, or might be made, available to the general public or groups of interested users that do not have their own computers. The two most

common sources of this kind of concentration are public schools and "Internet cafés", and we have found a total of 137 computers in such settings in Belén.

Table 2: Computers in schools and Internet cafés
Source: interviews with local sources

Schools (100 computers)		Internet cafés (37 computers)	
Escuela Fidel Chaves (La Rivera)	22	Belen Ciber Alfa	14
Escuela Manuel del Pilar (La Asuncion)	26	Belen Web Café	11
Escuela España (San Antonio)	18	La Rivera	5
Liceo De Belén	34	La Asuncion	3
		Eisa	4

Since the only available figures for dial-up Internet use are for cantons, there is not way to see if there is a large difference between Internet access account figures between the different districts of the canton, but the data in Table 3 do show that Belén enjoys a privileged position within the country in this regard; it is fifth among 81 cantons in the estimated relative number of dial-up access accounts, with the cantons rated above it containing either substantial concentrations of upper-middle-class inhabitants (Escazú, Curridabat), large universities (Montes de Oca), or many large businesses (San José).

Table 3: Percentage of dial-up Internet users by canton
Source: www.ice.go.cr/esp/tele/planinf/indic_racsa1.htm

Canton	%	#
Montes de Oca	7.48%	1
Escazú	5.53%	2
San José	4.98%	3
Curridabat	4.16%	4
Belen	3.98%	5

There is almost no reliable information available for the canton or its districts on the total number of dedicated high-speed "broadband" connections available for data transmission, which are critical for serious Internet initiatives of all sorts. We can safely say that the number of existing connections relative to the number of possible users is probably extremely small; the entire country of Costa Rica had approximately 6,000 dedicated data connections in the year 2001, including DSL and cable modem users [4] – approximately .15 broadband connections per 100 inhabitants, as compared to the 10-20 subscribers per 100 inhabitants in the cases of current global leaders such as South Korea, Hong Kong, and Canada[5]. The long series of delays and complications associated with the "Advanced Internet" project, which was to have provided

[4] *Infraestructura de Telecommunicaciones y Teledensidad*, in *Costa Rica hacia la Economía Basada en el Conocimiento*, Fundación CAATEC, San José, Costa Rica (2002).

[5] <www.itu.int/osg/spu/publications/sales/birthofbroadband/BoBexecsumm.pdf>

100,000 additional DSL access services for the country, has meant that broadband use has not grown significantly between 2001 and the present.

It is extremely important to note in this context that the infrastructure for DSL connections is being extended, even though more slowly than was planned with the Advanced Internet project, and that an access DSLAM that can serve up to 320 users is currently in place in La Rivera. Other hardware will be necessary before DSL connections can actually be deployed in Belén, and the question of who the users will be is ultimately in the hands of ICE, but this still represents the most economical[6] short-term alternative for providing broadband connections in the canton. It is extremely important to make the best use of this resource, and we will return to this subject in the concluding section on project planning.

Local user activities

There are some services available through the Internet that are so obviously useful and universally used that it would have been surprising to have found that they were not widely used in Belén. The most popular activity provided by the Internet is communication between people, using services such as e-mail, instant messaging ("chatting"), and "Internet telephony". Conversations with members of the community, including owners of local Internet cafés, have confirmed that person-to-person communication is one the most common uses of the Internet in Belén, along with "surfing" Web pages for information related to business, education, and entertainment.

However, we cannot always rely on generalities to suggest activities which might be important in Belén. More specific information about the community will also help us to specify certain areas which could be most usefully supported by ICTs in the near future, and to evaluate the adequacy of ICT infrastructure in the light of the importance of these areas. Lacking data from surveys carried out specifically for the current project, we have returned to the National Household Survey for the year 2000 for useful information.

The census data in Table 4 (on the next page) give us descriptions of Belén in several useful ways.

- Belén is almost totally urban or suburban in nature – far more so than the national average.[7]
- The canton has far less low-income households than the national average, although there are substantially more low-income households in the district of La Rivera than in La Asunción or San Antonio
- Almost all inhabitants are literate, and approximately one-third of them are receiving formal education

[6] Monthly costs for residential broadband access through cable modems and DSL connections are similar for a basic 64Kpbs/32Kbps connection ($30 for cable, $20 for DSL), but the prices diverge rapidly as connection speeds increase ($80 for a 256Kbps/128Kpbs residential cable connection [and $360 for a small business user], for instance, versus $40 for a similar DSL connection for any type of user).

[7] Using year 2000 population data from www.inec.go.cr, we also computed population densities for the 81 Costa Rican cantons, and found that Belén was the twelth most densely-populated canton in the country, with 1,632 inhabitants per square kilometer. Seven of the first twelve cantons were in the Greater Metropolitan Area, four (including Belén) were "Urban", and only one, La Unión, was "Rural".

- The percentage of inhabitants being educated corresponds closely with the number of people in their first two decades of life (ages 0-19 years). Belen is also close to the national average at the other end of the age distribution, with between 14% and 18% of the population 50 years old or older
- In terms of three complementary occupational categories (the total of the three values is 100%), we see that Belén has somewhat more than the national average of administrative and professional workers, an average number of sales and services positions, and a somewhat lower than average number of agricultural, construction, and machine operators. La Asunción has the highest number of administrative and professional workers, and La Rivera the highest number of agricultural, construction and machine operators.

Table 4: Background information

(Nationally, for the canton of Belén, and for each of the three districts of the canton)

Source: National Household Census for the year 2000; www.inec.go.cr

	Costa Rica	Belén	La Asunción		San Antonio		La Rivera	
			%	#	%	#	%	#
Rural population	40.97%	2.75%	0.00%	1 *	5.34%	68	0.00%	1 *
Population with low income	56.17%	17.10%	10.64%	39	10.86%	42	32.78%	97
Literacy	90.27%	94.05%	95.85%	20	94.08%	55	92.72%	86
Regular participation in education	33.59%	34.21%	34.27%	122	35.31%	84	32.19%	207
19 years old or younger	42.23%	37.80%	39.39%	--	38.30%	--	32.90%	--
50 years old or older	13.98%	15.23%	18.07%	53	14.79%	152	14.09%	179
Administrative and Professional	31.99%	44.21%	56.55%	22	43.41%	49	37.27%	72
Sales and services	14.07%	12.25%	7.88%	383	13.73%	176	12.64%	225
Agriculture, construction, machine operators, etc.	53.94%	43.54%	35.57%	31	42.85%	53	50.09%	97

- *indicates multiple districts with the same rank (tie)*

There are grounds for optimism in these figures. The population is highly literate, and one-third of them are in the process of receiving education, factors which together form a strong foundation for the generation of "knowledge workers". A large portion of the population is young, and the enthusiasm of the young for learning how to use the Internet is a phenomenon documented around the world[8], and seen every day in Costa Rica. The population is also sufficiently concentrated to make it possible to offer ICT access to large numbers of inhabitants from a few strategically-chosen locations (and schools are almost by definition located strategically).

[8] <communication.utexas.edu/college/digital_divide_symposium/papers/e-ForAll.pdf>, <www.natat.org/ncsc/Pubs/Getting Online/getting_online.htm>, <www.cnn.com/2001/TECH/internet/06/25/internet.iran/index.html>, <www.latimes.com/travel/la-tr-estonia18aug18.story>, etc.

The high proportion of people in the process of being educated leads us to ask if there is any information about the content of this education that is relevant to our study. The best readily available information in this area comes from data provided by the Ministry of Education's Fundación Omar Dengo (MEP-FOD), which is in charge of most computer training in public elementary schools. Three of Belén's four public schools – the Escuela España in La Asunción, the Escuela Fidel Chaves Murillo in San Antonio, and the Escuela Manuel del Pilar Zumbado in La Rivera – have FOD computer laboratories in which basic computer skills are taught, students are introduced to Microsoft Office and Encarta, and the "Micromundos" product is used to develop logical thought and problem solving skills as the students are taught the basics of computer progamming[9].

In terms of the penetration of such basic ICT training, the FOD data show that more than 85% of the elementary students in these schools have received such training as of the year 2003; using census population figures from the year 2000, we can crudely estimate that even if all students in these three schools received training, this would still represent only one-fifth of all elementary education students in San Antonio and La Rivera, and one-third of all elementary education students in La Asunción. While these figures are far better than those from many other developing countries, and the inclusion of figures from Belén's five private schools would undoubtedly sustantially increase the final numbers, it is still obvious that much remains to be done to introduce students to computer and Internet use in Belén, while even more needs to be done in order to raise the level of skills in these vital areas among adults who passed through the formal educational system before such training was available.

We finished our study of statistics for Belén with a closer look at the census data for relative employment in different economic sectors. Table 5 presents a summary of the ten most important sectors.

Table 5: Percentage employment by sectors
Source: National Household Census for the year 2000; www.inec.go.cr

	Belén	**La Asunción**	**San Antonio**	**La Rivera**
Manufacturing	30.76%	25.21%	32.15%	32.09%
Wholesale and retail sales, vehicle repair, appliances, personal products	17.61%	14.98%	18.70%	17.52%
Hotels and restaurants	6.86%	6.06%	7.06%	7.07%
Construction	6.28%	4.76%	6.17%	7.51%
Transport, storage, and communications	5.84%	5.08%	5.83%	6.37%
Private homes with domestic service	5.48%	11.01%	3.59%	5.00%
Real estate, offices and rental	5.21%	7.36%	4.71%	4.61%
Teaching	4.88%	5.86%	4.89%	4.21%
Agriculture, forestry, animal husbandry	4.51%	3.71%	4.25%	5.49%
Public administration and security, obligatory social security	3.42%	4.76%	3.52%	2.37%

[9] See <www.fod.ac.cr/programas>

The first two categories in this list account for almost one-half of all employment, followed by a number of other areas whose values range between 7% and 2% (with the exception of a value of 11% for domestic services in La Asunción – another indicator of the elevated economic status of at least some areas within the district). It is noteworthy that manufacturing and sales are among the most highly ICT-dependent sectors in the developed world, especially as they relate to manufacture and sales of high-technology products such as the integrated circuits manufactured in the Intel plant in Belén. This fact reveals both an opportunity and a need for the community – an opportunity to improve itself in economically important areas, and a challenge to not fall behind competitors in these sectors in other countries.

ICTs and the larger society

Although Costa Rica was once a regional leader in the use of the Internet, and its educational system is one of the best in Latin America, the country is not currently highly ranked in studies of national preparedness for Knowledge Economies, and has actually fallen several positions between 2002 and 2003, to 49th place among 82 countries, in the World Economics Forum's Network Readiness rankings[10]. Nonetheless, there are a number of Internet services that are currently available to the residents of Belén, and a number of businesses within the canton which should be able to make use of ICTs to extend their services to audiences within and outside the community.

National

The largest Costa Rican users of ICTs, and those which offer the most sophisticated services to the public through the Internet, are financial and government institutions, as is the case in most other Central American countries[11]. The most common Costa Rican Internet financial services are corporate and personal "home banking" applications, which are offered by almost every major bank in the country[12]. Both the banks and their clients can gain greatly from the use of these services – the costs of an online transaction for the bank are a very small fraction of the cost of a similar transaction carried out personally in a bank office, and the bank clients can not only save the time and money involved in traveling to a bank to carry out their transactions, but can also have immediate access to their account information, as well as making preliminary applications for credit or other services, at any time of day or night.

The Costa Rican government has supported the extension of government services to citizens through the Internet during the past and present presidential administrations. The government has pushed for the creation of a number of public Internet access "telecentros" under the "Comunicación sin Fronteras" program, provides e-mail accounts free of charge to any Costa Rican citizen through the Web site at <www.costarricense.cr>, and has created a national government portal site at <www.go.cr> which provides links to most of the major online government services. Although there are still relatively few major government Internet services now online beyond those offered by state banks[13], some of those that do exist are extremely

[10] <www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2002_2003/GITR_Rankings.pdf>

[11] Cf. *E-readiness Assessment of Honduras and Nicaragua*, a World Bank working paper prepared by CAATEC (12/04/2/02).

[12] See <www.bncr.fi.cr >, <www.bancobcr.com>, <www.banex.com>, <www.bancosanjose.fi.cr>, etc.

[13] See <comprared.hacienda.go.cr>, <www.haciendadigital.go.cr>, <www.registronacional.go.cr>, <www.ins-cr.com>, etc. It is also important to mention that the municipal government of Belén has a well-

useful, and more are becoming available every month. There is no doubt that creating a culture of using these services, as well as those banking services mentioned in the last paragraph, is one of the most promising short-term strategies for improving the daily lives of the residents of Belén through the use of ICTs that we have encountered.

There are no data available that specifically concern the use of the Internet to provide services from Belén to the rest of Costa Rica and the World, but the results of a previous CAATEC study of the use of computers and the Internet by those micro-, small, and medium-sized enterprises[14] (MSMEs) which make up the majority of the Costa Rican economy, plus the comments of local experts in providing value-added Internet services, give us good reason to believe that while interest in the creation of Internet services by businesses in Belén is high, the overall level of expertise and experience in this area is relatively low.

Findings of CAATEC's national study that are relevant to our project include the following:

- 59.7% of Costa Rican MSMEs do not have computers in their workplaces (due to perceived high costs, lack of knowledge of how to use them, or lack of perceived need)
- 71.6% of all MSMEs consider that the Internet is important for their business future success, and 61.7% of all MSMEs would like to offer transactional Internet services if they had adequate technical and financial assistance
- 22% of all MSMEs have Internet or e-mail access; access penetration is strongly affected by the size of a business, with 78% of micro-, 53% of small and 17.1% of medium Costa Rican businesses lacking connectivity. Within the 22% who do have access,
  - E-mail is the most commonly used service (89.8%, or 20% of all MSMEs), followed by searching for information about competition and the markets for, and prices of, products (73.6%, or 16% of all MSMEs)
  - There is substantial use of the Internet to manage payrolls (INS/CCSS) through Costa Rican banks, as well as to pay public utilities or make bank transfers (45.5%, or 10% of all MSMEs); of those small businesses that do not yet use banking services, almost two-thirds expressed interest in doing so in the short term
- 4.7% of all MSMEs studied claimed to have a Web page, but only 9.2% of them (less than one-half of one percent of all MSMEs) used their Web pages to receive payments from clients.
- Only 8% of MSMEs said they knew of any institution or program that might help them begin to offer e-commerce services

This study indicates that Costa Rican MSMEs are in general terms aware of the potential of using computers and the Internet, but that lack of technical expertise and financial resources are preventing them from taking advantage of this potential. In the case of Belén, a strong interest in

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designed Web site at <www.belen.go.cr> which offers basic services including the ability to download official forms which can be printed and filled out before going to the municipal offices to turn them in.

[14] *Grado de Preparación Electrónica de las PyMEs*, in *Costa Rica hacia la Economía Basada en el Conocimiento*, Fundación CAATEC, San José, Costa Rica (2002).

making use of the Internet for commerce was obvious in all of the meetings of the people involved in the planning process, and it was agreed that strong steps should be taken to provide information and resources to advance local online commercial offerings.

International

Residents of Belén with Internet access already search for information in Web pages from sites throughout the world, and we know that at least some residents of them are already involved in making purchases from other countries through the Internet, since Costa Rican companies offering convenience post office boxes in the United States (a commonly-used strategy for managing mail-order delivery of products purchased on the Internet) have told us that they have clients from Belén.

Although we have no good information on the number of such clients, nor information on the types of purchases that they make, based on comments by the management of the largest local mail-forwarding company we can assume that they tend to be middle- and upper-middle class residents receiving such items as magazine subscriptions, books, music, clothes, and smaller items that can be more easily found, and/or more economically purchased, through the Internet than through local merchants (classic examples are hard-to-find replacement parts for cars and appliances). The tendency towards wealthier users is especially understandable when we remember that most Internet purchases are paid for with international credit cards, which are not held by many people in the country.

It is also possible for residents of Belén to offer their own products and services to international clients. In the development of Internet commerce in Costa Rica over the last decade, the pioneers in sales to international audiences have been the tourism and real estate industries (which were already focused on wealthy international clients); both of these areas are represented in Belén, as we can see from Table 5. Manufacturing for exportation also focuses on foreign clients, but Costa Rican manufacturers have in general been slow to adopt the Internet for international trade.

When asked about this situation, manufacturers have indicated that they often do not sell directly to final users of their products, but rather to a relatively small number of agents, resellers, or large corporate clients, with relationships managed personally and a great value placed on trust and reliability. Placing this traditional framework on a computer network represents a great challenge, but the latest trends in "business-to-business" commerce, customer relationship management, and supply change management make it increasingly attractive, and perhaps necessary, for local manufacturers to begin to adopt new techniques.

Defining initiatives

The previous discussion gives us sufficient information to begin to define and evaluate initiatives that have the potential to raise the level of acceptance and productive use of ICTs in Belén. There are several general principles that we will bear in mind when evaluating initial proposals for initiatives:

- **Be realistic**. Many ICT-related community initiatives in the developing world have not had the positive effects that were forseen, often because their goals were extremely general ("bringing the community into the 21st century", "combating poverty", etc.) and expectations poorly defined. Really improving the quality of

life of users requires taking local realities into account before implementing new technologies and new uses of these technologies.

- **Help as many people as possible**. Changes need to affect many people, and we want to reach as many of them as possible. This principle is often in conflict with a desire to be economical.
- **Be economical**. We prefer initiatives that deliver the most benefit per colón invested. Closely related to this, we have a preference for starting small and growing intelligently – for beginning with projects with minimal initial investments that may be increased as their value becomes evident through time (that are "scalable").
- **Take advantage of what already exists**. There is no good reason to think that a successful modernization initiative must be created from the ground up. In fact, the art of creating good projects has much to do with making the best use of resources already at hand – making the project more economical, lowering implementation time and enlisting the support of existing organizations.

In what follows, we will group our discussion of initiatives into the same three areas we have used previously – infrastructure, uses of this infrastructure within the community, and relationships of citizens with the outside world.

Infrastructure

Belén needs an adequate number of telephones and computers, and enough communications media (copper wires, fiber-optic cables, the electromagnetic spectrum) to connect them. Belén is one of the leading cantons in the country in terms of existing ICT infrastructure, and Costa Rica is a leader among Central American and agricultural exporting countries in this regard, but this is no cause for complacency – none of these countries, and very few of these cantons, have a significant fraction of the ICT infrastructure that is present in more developed countries.

We believe that the available evidence shows that increases in almost all types of devices and transmission media are necessary. However, we cannot arrange for simultaneous increases in all areas of ICT infrastructure at once, and must decide which particular areas of infrastructure should receive the most emphasis at this time.

Connectivity

Any consideration of how to increase connectivity in Belén must begin with a single outstanding fact – agencies of the national government are the only legal providers of national and international telephony and Internet access (Grupo ICE), and access to the electromagnetic spectrum. Bearing this in mind, we must not only ask which kinds of communications infrastructure may be most useful to residents of Belén, but must also often ask which kinds of infrastructure are most likely to be provided or allowed by the government under current conditions.

Fixed telephone lines are the common currency of connectivity, serving not only for telephone conversations but also for temporary dial-up Internet connections. Given the high level of penetration of such lines in the canton of Belén relative to the rest of the country, and the lack of expressed demand by community members for more telephone lines, we do not believe that it is

necessary to focus in the short term either on stimulating local demand, or requesting more infrastructure of this sort from Grupo ICE.

If a person or organization in Belén intends to establish a presence in the Internet (with, for example, their own publicly-available Web site), to navigate in the Internet on a frequent basis, or to maintain constant communication between users or between offices, then an "always-on" data connection is necessary. Ways in which these connections can be supplied include both traditional high-speed data connections for larger corporate clients from Grupo ICE (E1 and fractional E-1 connections, Frame Relay, etc.), and newer types of high-speed data connections using more widely available and economical transmission media, including cable TV infrastructure, traditional fixed telephone lines (using "Digital Subscriber Line" [DSL] technology), and the atmosphere itself (for wireless data transmission).

Because of the vital importance of full-time participation in data networks, we immediately decided that any final list of initiatives should include at least one directed at increasing the availability of permanent data connectivity in the community, and of planning for intelligent use of such connections as they become available. Because the newer alternatives are far more economical than traditional dedicated connections, we focused immediately on this area. Since the private-sector owners of the cable TV infrastructure are already making substantial efforts to extend its coverage, we did not feel any pressure to work in this area, although we did note that the residents of Belén should be educated on the advantages of this and other types of permanent connectivity to stimulate demand. Instead, we focused on the possible extension of DSL and wireless connectivity, and produced two candidates for formal initiatives.

The most urgent of these is increasing the use of DSL technology. Grupo ICE has recently installed a DSLAM (a local aggregation point for DSL lines) in La Rivera, with a capacity of 320 separate connections, most of which are still available. *As our first connectivity initiative, we propose an initiative to coordinate with Grupo ICE in order to reserve the allocation of at least some part of these connections for users who are especially likely to make the best use of these connections in terms of their economic, educational, governmental, and social impact on the community, and to make sure that these users are actually connected.*

We cannot rigorously define at this moment who the "best" users of these connections might be in the present and in the future, but we are in substantial agreement that initial priority should be given to those organizations and facilities that serve many users from throughout the society (notably schools and Web cafés), local small businesses, larger businesses that employ many local residents, the municipal government, and those facilities which serve citizens with problems of health and mobility (including senior citizens' homes). The people in charge of this initiative should continually define and refine criteria for selecting high-priority candidates to receive permanent high-speed data connections, which will require continuous communication with the community at large and Grupo ICE.

High-quality data connections is extremely important for local schools: the ability to use the Internet will be vital for the citizens of Belén in the future, and schools should be providing access and training for their students from their earliest years in the educational system. Unfortunately, not all public schools have this type of connectivity – in the case of the local FOD schools, low-speed connections were provided for a short period of time with connectivity costs covered under an agreement between ICE and the MEP, but these connections were cut when the agreement lapsed. *Restoring and extending this type of connectivity should receive high priority: BELETEC should investigate the current status of negotiations between the MEP and ICE to*

restore connectivity, and should also consider supplying high-speed connections to local schools as a part of the DSL initiative mentioned above.

Small businesses that want to take advantage of the Internet may not need their own dedicated connections to carry out their plans, since they can often simply contract the services of Internet Service Providers (ISP) for Web page design, page hosting, and transaction support and security services, with the sites and their services made accessible to the public from ISP computer centers with their own high-speed Internet connections. In those cases in which the businesses themselves need high-speed connections, an especially efficient way of using scarce resources is to connect office centers to the Internet with a single high-speed connection, and share the capacity of the connection among the inhabitants of the center. Local ISPs and office centers should therefore receive serious consideration when determining priorities for allocation of connections.

Some hardware must still be purchased before local DSL connections can actually be installed, including integrated circuit cards for the local DSLAM, routers, and modems. The prices of this equipment are beyond the reach of many of our suggested pioneer users, and the committee has requested donations of such equipment from large international companies with presences in the country, receiving in turn promises of donations that will permit more than 20 organizations to be connected in the near future without worrying about hardware startup costs.

With regard to wireless connectivity, we have discarded as unproductive any emphasis on providing direct wireless connections to local businesses and homes in the near future (even though this is one of the most rapidly developing areas in telecommunications technology) and have instead discussed the possibility of providing local-area connections to the Internet through the use of "Wi-Fi" technology, which provides wireless connectivity between a local receiver/transmitter and users with properly equipped computers who are within a short distance of this unit (the area covered by the transmissions is referred to as a "hot spot"). The technology is being very widely used in more developed countries in office buildings, airports, hotels, and public areas, and is relatively economical to deploy, but is intended for use mostly by persons with portable computers – a relatively small and unrepresentative segment of the local population. Nonetheless, we found several reasons to favorably consider the creation of hot spots in Belén;

- International business travelers (and some tourists) may well have those portable computers, and providing Wi-Fi connections in hotels and public areas might be very attractive to them (in fact, Intel provided temporary Wi-Fi infrastructure in a large local hotel for an international congress, and the hotel management has urgently requested that the infrastructure be left in place due to its popularity with the majority of guests).
- Creating a hot spot in the local municipal government offices would not only provide simple Internet access as a municipal service to those citizens who do have portable computers and come to the offices, but it would also allow those citizens to quickly access government services, eliminating paperwork and time waiting in lines.
- The simple presence of such connectivity would do much to establish Belén in the public mind as a progressive community, making it more attractive for local and international businesses.

We therefore recommend as a second connectivity initiative (although with lower priority than the DSL initiative) the investigation of appropriate locations for establishing Wi-Fi hot spots in the community, and the creation of such access points when one or several suitable locations are decided upon.

Computers

The residents of Belén must have widespread access to computers if they are to participate in information societies. We can discuss possible strategies for extending access in two areas – improving access to already existing computers, and providing new computers.

Relative to the rest of Costa Rica, the municipality has relatively high computer penetration, especially in the district of La Asunción (due primarily, we suspect, to computers in the high-income Cariari neighborhood). To the degree that these computers are in homes and offices, there is little that we can do to increase access to them. Likewise, we can do little directly to increase access to computers in public-access Web cafés (beyond educating the public in the value of using the Internet to stimulate demand), since it is the responsibility of the café owners themselves to arrange for increased use of their facilities.

The case of public schools is somewhat different. As mentioned previously, there are four public schools with a total of 100 computers in laboratories, which are only intermittently used for specific classes within regular school hours. Since these schools are located in areas of high population concentration, and the educational system has a traditional orientation towards training and community service, we felt it to be natural to ask if these computer laboratories could be opened to wider access – if not simply made available to the public in non-school hours, to at least made available for occasional training of residents of the community when availability allowed, which would help to solve one of the major practical problems to be overcome in the overall project – finding facilities in which training of residents can take place.

It is in fact necessary for BELETEC and community representatives to immediately begin an initiative aimed at obtaining the use of adequate facilities for training community residents. Some training may simply involve seminars given in auditoriums, but the most important training is practical, and will require facilites with multiple computers and an Internet connection, and the greatest part of the work of the members of this team will concern finding and making available these more elaborate facilities. Whether they should include public school computer laboratories is not as obvious as we first thought might be the case, for a variety of reasons.

Conversations with officials of the FOD have produced the information that any official teaching of computer skills to public school students using computers supplied by the FOD must be done by a public school teacher who has been trained and certified in the FOD methodology, and who uses the FOD curriculum. The only official cases of FOD computer laboratory use for non-student training seem to be "special projects" offered by FOD professionals to community members; according to FOD officials, these courses include several areas of interest to us (as will be discussed below), including basic computer literacy, basic Internet use, and basic e-commerce or e-business.

In cases such as that of the donation of computers to several local schools by Intel, control over the quality of teachers by the MEP is still necessary, but the teachers do not need to be certified in the FOD methodology or use the FOD curriculum, thus possibly allowing a certain degree of freedom in the specification of the content in which the students will be trained, as well as a

higher degree of access by non-FOD teachers for the training that we suggest in following sections.

BELETEC and educational authorities should obviously investigate the full range of possibilities available for facilities. This would include FOD laboratories for training by FOD staff, non-FOD school laboratories for training by FOD or non-FOD staff, and the use of facilites other than those of public schools – including Internet cafés, municipal government offices, and perhaps even facilities of larger local businesses, who might be persuaded to contribute the use of some of their own facilites, equipment and even staff time as a gesture of community solidarity. A point that makes this investigation of alternatives especially important is the fact that most FOD schools are not currently connected to the Internet, and Internet use is one of the most important areas that must be covered.

Turning to the subject of actually increasing the number of computers in the community, *we recommend that schools (and other public and non-profit organization)s make strong efforts to request new computers from possible donors such as international development agencies and multinational corporations* (the Liceo de Belén, for example has just received a gift of 17 computers from Intel); given the fact that the majority of public school students still do not have access to computers in schools, this effort is clearly necessary. We must bear in mind that acquisition of computers implies that the recipient schools have a place to put them, a way to maintain them, and someone to teach courses that make use of them; providing new computers for schools that already have computers, and have therefore already have the necessary infrastructure and organization, is far less complicated that putting computers into schools for the first time.

We do not believe that it is either useful or appropriate to request contributions or subsidies to increase the number of computers in private-sector hands. Instead, we are enthusiastic about the possibility of forming buyers' cooperatives, in which local individuals and organizations aggregate their demand for new computers in order to negotiate lower prices and better service contracts for volume purchases. *We strongly support an initiative to investigate the details of how such buyers' cooperatives can be established, how specifications for the computers to be purchased will be established, and who should be responsible for managing the bidding and purchasing processes and their transparency*

Local user activities

<u>General ICT Literacy</u>

Most residents of Belén are aware of the great impact that ICTs are having in the modern world, and believe that their use in Belén should be encouraged. However, there is a gap between having a general belief in the advantages of ICT use, on the one hand, and actually using the technology productively, on the other, that is only partially bridged by the introduction of more and better ICT infrastructure that we proposed in the last section.

In this section, we will mention several possible initiatives that might lead to more productive community ICT use. They often involve user education – a theme that has arisen again and again in our meetings and discussions. This education needs to take place at at least two levels:

- To acquire and practice the general-purpose mechanical skills needed to use computers and networks (typing, use of a computer mouse, creating and saving

files, navigating on the Internet, etc.), residents of Belén need "ICT literacy" training, such as that offered by the FOD in public schools

- To make the *best* use of computers and networks, residents need to understand how they can be used productively in daily activities in the home, school, and workplace (for lack of a better term, we can refer to this as "life skills" training in ICT use)

Our assessment of demographic, economic, and other aspects of the community has given us information that helps to specifically define the kinds of "life skills" education that might be offered to substantial local audiences, and these needs for more specific training will be mentioned when they arise in later discussion. Even before reviewing any of this evidence, however, we can *immediately recommend an initiative dedicated to planning and offering basic computer and Internet literacy courses to any member of the community that wishes to participate.* This kind of training fits perfectly with our intention to serve the largest possible audience, and having these ICT literacy skills underlies almost everything that residents will do that involves modern ICT use.

Those in charge of these initiatives will have to create, select, or approve the content which will be used to educate participants. Teaching how to navigate in the Internet, and how to use e-mail, should now be considered absolutely basic skills for ICT use, and should be included in literacy training. E-mail accounts for any user that does not have one can be obtained free of charge at the government's <www.costarricense.cr> site, and we are currently talking with the administrators of Costa Rica's top-level .CR domain to see if it is possible to arrange a special BELEN.CR domain to use for residents' e-mail accounts as a signal of community identity and participation. We also believe that the Internet components of this basic training should emphasize the use of important local sources of information and services, such as Web sites of newspapers, banks, and government agencies, in order to clearly establish in participants' minds the real utility of daily Internet use (see the discussion of training in the use of Internet banking systems in the next section).

Hopefully, some printed materials can be produced that can be studied wherever a student happens to be, but other content will need to be transmitted to students through "live" training in appropriate facilities. The necessity for arranging such facilities was discussed in the previous section; without them, basic or any other kind of training cannot take place.

Commercial use of ICTs

Belén has several hundred small businesses with yearly incomes that range between tens of thousands and a few million dollars, and numbers of employees that range between less than five and a few hundred – with a very strong numerical bias towards the lower ends of these ranges. These businesses form a substantial part of the local economy, and supporting their increased use of ICTs is vital to the community.

Given their lack of resources and experience, the widespread use of ICTs in local small businesses will not occur quickly or easily. We cannot simply copy "cutting-edge" technology use in developed countries for use in Belén, but looking for inspiration to "developing country" initiatives focused on bringing rudimentary telecommunications services to isolated rural areas is also inappropriate for Belén – a moderately industrialized area on the periphery of the major metropolitan area in the country, whose citizens are well-educated and aware of the need to

modernize the ways in which they participate in the larger society. We have to look for our own solutions, that match the circumstances of the community.

Several of the initiatives that we have defined previously have the potential to improve the circumstances of even the smallest businesses – increasing economical data connectivity, lowering the prices of computers through volume purchasing, and basic ICT literacy training. Beyond working in these basic areas, we must also ask how local small businessmen can make best commercial use of ICTs once the infrastructure is at least potentially available.

There is no single answer for this question – as we have seen, there are a number of economic sectors represented in the community, and local businesses in these different sectors have a wide range of purposes and strategies. Returning to our guidelines of trying to benefit a maximum of residents with a minimum of cost, we asked if there was some service that could be provided that was widely useful, while still focusing on specifically commercial issues. *The best short-term solution that we could arrive at, and one that we recommend here, is to provide general introductions to the challenges and benefits of ICT-facilitated business practices – "e-commerce" and "e-business" – for businessmen and businesswomen in Belén*.

This could involve the preparation of documents as well as seminars, and would necessarily involve active support from the local businessmen themselves – not simply forming a passive audience, but rather providing such resources as facilities for meetings, presentation of successful local strategies to their neighbors, and perhaps ongoing participation in Internet forums, e-mail lists, and other forms of maintaining online communities of interest. In any case, members of BELETEC would have to serve as organizers, points of contact, and evaluators of the quality of the materials being offered and the impact of training.

There is a high level of awareness of the concept of "e-commerce" in the community – online retail sales through a Web site which provides publicity, product and service descriptions, interactive transactional services and perhaps rudimentary customer support. Suggestions about e-commerce training for local businessmen were enthusiastically received; beyond the typical discussions of Web site design and publicity, the we suggest that these courses should also at least mention the complexities involved in being able to receive online credit-card payments, and to efficiently deliver goods (logistics).

It is extremely important to discuss the use of service providers in this area. Businessmen who do not have the resources to maintain their own computing centers and technical staff will have to make use of providers of remote server computers and software, programming, Web page design and hosting, payment and security services, and e-mail and messaging services; they should be well aware of what kinds of services are offered, why they are useful, and how to evaluate the quality and costs of services that they receive.

The idea of "e-commerce" was far more familiar to the members of the committee than that of "e-business", which deals with the integration of ICTs into all areas of a business, rather than the specific area of business-to-customer sales. Once this idea was introduced, we agreed that smaller local businesses could profit from learning something about the use of ICTs within offices and between offices, and that introductions to these topics should be included in BELETEC-sponsored training – touching at least superficially on subjects such as computer hardware, local networks, and office applications (including systems for such areas as inventory, accounting, and human resources).

The greatest benefits of e-business strategies often occur in large companies who learn how to take best advantage of their costly computer centers and technical staff. Although there are large businesses in Belén[15] which would certainly be interested in seminars specifically oriented towards e-business, we do not give this the same high priority as assisting smaller businessmen, who have relatively less resources to dedicate to modernizing their organizations.

Beyond training, Belén needs successful local examples of use of the Internet for commercial purposes. One project that has been persistently discussed during the last few months has been the creation of an online job marketplace, providing an Internet version of a job and job-seeker information service currently sponsored by the Municipality. The general idea is attractive, since the services offered are eminently local in focus, serve both businessmen and employees, and mirror those of large "career networking" services in developed countries[16] which are among the most successful businesses based on use of the Internet. On the other hand, the costs of offering sophisticated services such as automated demand matching and databases for curriculum vitae can be extremely high, and we believe that this is a case in which the best strategy is to begin small, posting text lists of offers and demand in a simple "static" Web page and carefully monitoring site activity and results to see if a real demand for the site services can be demonstrated before considering the implementation of more advanced services. *Nonetheless, we do recommend that BELETEC seek resources to help make a basic job market site available, not only as an example of local initiative on the Internet, but also as a civic service with a reasonable potential for growth.*

ICTs in the formal educational system

The support of formal education is a topic of great importance to members of the community, and we frequently discussed finding ways to improve education in childrens' schools through the use of ICTs. In previous discussions, we mentioned the need to increase the number of computers in these schools, and to increase the number of active Internet connections to them. After dealing with the ICT infrastructure itself, we asked if there were some way to improve the results of teaching that was done using this infrastructure; participants in the planning process made two general recommendations that might improve the impact of ICT training.

The first recommendation is that whenever Internet connectivity is available for students, they should be immediately introduced to basic Internet navigation as one of the most important skills that they will need in their future lives as ICT users. Among the committee members, representatives of CAATEC also recommend that this introductory training should include looking for types of information, services and sites that are chosen for their specific attractiveness and interest to students – which might include such subjects as popular music, sports, and entertainment.

CAATEC certainly does not believe that all Internet navigation in schools should be for games and entertainment, or that it is not important to use the Internet to support education in standard courses; it does, however, think that the students should quickly and clearly see that the Internet will be useful and important in all aspects of their lives, not simply in the context of completing

[15] There are more than 30 industries with between 250 and 2500 employees in Belén <www.belen.go.cr/perfilcanton.html>; names of some of the larger businesses are available at <www.belen.go.cr/comercioeindustria.html>.

[16] <www.monster.com>, <www.jobs.com>, etc.

schoolwork, and that letting students determine to some limited degree what kind of subjects are "interesting" may actually make it more attractive for them to learn how to use the Internet.

When students have access to the Internet from their schools, and when they have the basic skills necessary to begin to navegate in the Internet, they can also be given tasks and projects that make specific use of the Internet – including simple assignments such as searching for information about current course material, or sending e-mails, or creating content (writing, drawing) for simple Web pages. Related to the last point, it was frequently mentioned that it would be useful to create small school Web sites which contained selected student work, school newsletters, and other themes of interest. This would involve expenses for page hosting, site design, and content maintenance, but perhaps support for these expenses could be found in the business community or among different national and international development agencies.

The FOD curriculum has modules that deal with basic Internet training, and the use of the Internet for educational purposes. Unfortunately, these modules are not being currently applied in the FOD laboratories in Belén due to lack of Internet connectivity, and a number of students do simply do not participate in the FOD program. Since we are interested in taking the best possible advantage of existing initiatives, we will investigate the degree to which the FOD programs actually contribute to the type of learning that we wish to promote; however, we must also try to facilitate this kind of learning in schools outside the FOD program, and to consider the flexibility in learning options that may be available in cases in which school computer use is not governed by the FOD.

Our second suggestion is that attempts be made to stimulate and recognize excellence in the learning and use of ICTs among students. One common way to do this involves "computer fairs" or "olympics" in which public recognition is given to outstanding student projects and abilities (such as the national computer fairs for FOD students, or the national mathematics olympics); we think that the possibility of these fairs and competitions within and between local schools, covering both computer and Internet use, should be investigated. Several roles for BELETEC members might be possible in this process, including coordinating activities between schools, helping to arrange for appropriate facilities for the events, and perhaps participating in the search for judges and local technical support for students in the academic and business communities.

ICTs and local government

Local government is one of the main agents of community solidarity and development. The municipal government of Belén is already a user of computers and local networks for internal support, and has started to offer services to the public though its own Web page at <www.belen.go.cr>. We strongly support the extension of municipal government services through the Internet, and *suggest that the government consider raising the level of the existing Internet resources through the creation of truly interactive and transactional services, rather than the more limited texts, directories, and downloading of forms currently offered.*

This could involve relatively large initial expenses for the creation of databases, programs, and planning of official proceedures and regulations, but would in turn offer substantial advantages to residents who would no longer have to go to municipal offices in person, as well as to the government itself, which would realize the same types of savings in transactions as the banks which so enthusiastically promote "Internet banking". Given the relatively small number of current Internet users in the community, and the amount of initial investment necessary, we cannot give this initiative highest priority, but we are convinced that truly interactive and

transactional government services will rapidly become a necessity, and that the government needs to plan now for such a transition in the near future.

Representatives of the community have often mentioned the concept of using ICTs to monitor activites in the community, with examples including traffic monitoring for major highways and intersections, and monitoring areas with high risks of crime. Many networked traffic monitoring systems aready exist, although they are often extremely expensive and not highly oriented towards the Internet; a technically far simpler solution to the traffic monitoring problem, as well as the crime monitoring problem, would be to place "Web cameras" in critical locations in the community, with the "snapshots" (rather than continuous "movies") that they record passed to central government offices.

These Web cameras would need physical security, maintenance, connectivity, and a computer to store their output, but their most important requirement is that someone, at some time, must review this output. To the degree that what is being monitored is important, or even threatening, this revision should be as close to constant ("real-time") as possible, and might require staff specifically dedicated to this task – a problem for the municipal government in terms of either reassigning responsibilities among existing staff, or finding the money necessary to hire new staff for this purpose.

On the other hand, it is difficult to think of situations in which camera output does not need to be frequently revised, but is still interesting or important; suggestions have included occasional municipal events such as community meetings, sports events, and fairs, but even though this kind of material could certainly be used in Web sites to promote community spirit and news coverage, we do not consider this to be a promising enough area to justify its own initiative at this time.

ICTs and the larger society

National

Businessmen use the services of banks, and increased integration of ICTs into businesses may actually create demands for new financial services – the ability to receive credit card payments through the Internet in e-commerce, for instance, or the ability to manage account information and transfer funds through the Internet. Given the well-developed Internet banking systems of most Costa Rican banks, it was natural to ask if businessmen could be trained in the use of these systems, providing not only a valuable example of the use of Internet business services, but also concrete benefits in terms of minimizing the effort necessary to track and administer funds, and to make utility (electricity, telephone, etc.) and certain other payments online.

The fact that the banks themselves are deeply interested in training people to use these systems (in order to minimize their overall transaction costs) and often have staff in their offices dedicated to training users to use the systems, led to a useful convergence of interests. Representatives of the largest bank in the country (the BNCR) have already expressed strong interest in sending staff to Belén to train residents in the use of their systems, and were even open to the possibility of providing other kinds of resources to help make facilities available for this training.

It seems extremely likely that other banks with Internet systems will wish to do the same – given not only the financial advantages of moving their clients to the Internet, but also the initial presence of the BNCR – and given the general and long-lasting benefits to all parties involved, *we strongly recommend that an inititative be undertaken to contact major banks and arrange for*

training in the use of various Internet banking systems, offered in facilities in Belén by by staff of the different banks involved. BELETEC members will have to coordinate the availability and use of these facilities, as well as some local publicity (while the banks themselves could also be asked to contact their local clients about the availability of training).

Beyond the financial sector, the largest single national provider of Internet services that could be highly useful to the residents of Belén is the national government. We are currently investigating the possibility of having representatives from government agencies such as the Finance Ministry visit Belén to present and explain how to use their online systems, but we have not received nearly as enthusiastic a response as we have from banks, and can only recommend that attempts to arrange such visits be continued in the future, and that residents of Belén be made aware of the existance of the larger and more useful government services now available through the Internet.

International

Much of the interest that local residents show in the subject of commercial Internet use has to do with the subject of access to large numbers of relatively affluent clients through international e-commerce. The systematic introduction to the areas of e-commerce and e-business for local businessmen that we proposed earlier covers the most basic areas of Internet commerce, but did not originally include an introduction to the challenges and opportunities involved in providing international servicess; *we therefore propose an addition to the original project definition – that a special introduction to international e-commerce be included in training for local businessmen, including descriptions of audiences, coverage of local success stories and discussion of international trends in e-commerce.*

While such training might be interesting to almost any businessman, it would be most immediately useful to local representatives of those business sectors with traditional interests in international clients (tourism and real estate, for instance, as well as manufacturers of export goods). Members of BELETEC should investigate the composition of the local business sector in order to be able to identify and contact such businesses, uniting their representatives in groups of participants that would be especially well-served by such training.

In addition to being *providers* of products and services to clients within and outside the country, residents of Belén can also use the Internet as *clients* for products and services that originate outside the country, and some interest was shown in the possibility of offering training in how to search for and purchase international goods and services on the Internet. While this topic is undoubtedly interesting to many residents, and will certainly be increasingly important to them as time goes on, we believe that relatively few residents are likely to actually make international purchases at this time (due to lack of appropriate credit cards, problems with delivery, etc.), and those that are interested in doing so would be better served by going to the local offices of the mail-forwarding services mentioned earlier, some of which have staff that are dedicated to exactly this type of training for their clients. In the future, it may be worthwhile to invite these companies to send representatives to introduce their services and the experiences of their clients to groups of local residents, but we do not see a convincing present need for our own initiative in this area.

The implementation plan

BELETEC was formed to allow the community a forum for continuing discussion and action in the area of ICT implementation for community betterment, and it will be BELETEC members who begin the process of project implementation, who coordinate activities, and who help to search for necessary funds and resources to carry out projects. To give BELETEC efforts an initial direction, we must try to determine how the initiatives presented in the preceeding section relate to each other, what priorities we place on them, who should be involved in the projects that carry out these initiatives, and what resources may be required to do so. We cannot specify many details exactly, but a good start can be made with the information that we now have.

Relationships between initiatives

Our final goal is clear – improving quality of life through the use of ICTs. If there were no computers or networks in Belén, the steps that we would have to take to achieve that goal would have a natural order:

- We would need an analysis of user needs.
- Then we would need computers (which are useful by themselves, and necessary for Internet use)
- Once we had computers, we would need to make sure that people know how to use them to help with their daily activities.
  - This would begin with acquiring certain physical skills (typing, using a mouse), which are necessary to then acquire…
  - further skills, such as creating and managing files, that would permit users to …
  - learn and use the applications on their computer (word processing, spreadsheets, databases, etc.) that support their activities.
- By itself, having computers and skilled users produces extremely valuable results. However, the greatest advantages to the use of ICTs are increasingly in the area of accessing resources through the Internet; to do so, there must be a physical connection between local computers and the Internet.
- Once the physical connection existed and users could access remote resources, they would have to learn how to use them. Assuming that users already had basic physical and file-mangement computer skills, then the task would be one of introducing users to the resources available (Web sites, information systems, etc.), and showing them how to use them.

In reality, of course, there are already a number of computers and Internet connections in the community, and different levels of skills among their users. This complicates planning enormously, but we can still see that certain of our initiatives may depend on others – we can't teach how to use the Internet without an Internet connection, we can't have a useful Internet connection without computers, and so forth.

Definition of projects and priorities

If we were to use the ideal scheme presented in the last section to determine priorities for the initiatives we have discussed previously, we would produce something like the list shown in Table 6:

Table 6:
"Natural" priorities for initiatives

Make computers available

1 Cooperative computer purchasing project (general community)
2 Obtaining new computers for schools
3 Convincing owners of existing computers to let them be used for community training (facilities project)
4 Computer literacy training for citizens
5 Computer literacy training for students

Make connectivity available

6 DSL connectivity project (general community)
7 Increasing school connectivity
8 Convincing owners of existing computers with Internet access to let them be used for community training (facilities project)
9 Wi-Fi hot spot
10 Basic Internet training for citizens
11 Basic Internet training for students

Advanced Training

12 Advanced citizen training (e-commerce, banking, etc.)
13 Rewarding effort and excellence in schools -- special projects, fairs

Miscellaneous

14 Improving municipal government Web site
15 Creating online job market

When we look at this list, we can see that modifications are possible: computer literacy and basic Internet skills could be taught consecutively, for instance, if adequate facilities were already available; arrangements to reserve and allocate some DSL connections should be undertaken as quickly as possible, before the capacity of the local DSLAM is exhausted; the BNCR is anxious to begin training local citizens as quickly as possible, with minimum expense to the community; and so forth.

In addition, it does not seem necessary to have as many official projects as there are points in the list; a single project dedicated to finding adequate facilites for training in both computer literacy and Internet use is obviously sufficient, and the fact that improving computer access, Internet access, and training in schools will all involve the participation of local educators surely indicates the advantages of having a single "formal education" project. Taking these and many other complications into account, we have produced the information in Table 7, in which priorities of initiatives have been somewhat modified and responsibility for various initiatives assigned to one or more of six general project teams.

Table 7:
Modified priorities and definition of projects

Initiatives	Project / team: Computer Coop	Connectivity	Training Facilities	Citizen Training	Formal Education	Government
High priority initiatives						
Cooperative computer purchasing	**Major**					
DSL connectivity		**Major**				
Computers for schools	**X**		**O**		**Major**	
Connectivity for schools		**X**	**O**		**Major**	
Training facilities	**X**	**X**	**Major**	**O**		
Medium priority initiatives						
Online banking training			**X**	**Minor**		
Citizen ICT literacy (computers and Internet)			**X**	**Major**	**X**	
Student ICT literacy (computers and Internet)					**Major**	
Advanced citizen training (e-commerce)			**X**	**Minor**		
Low priority initiatives						
Wi-Fi connectivity		**Minor**				
Advanced citizen training (internat. e-commerce)			**X**	**Minor**		
ICT fairs for students			**X**		**Minor**	
Improved municipal government site						**Major**
Job market site						**Minor**
Major -- major project goal (read in columns)						
Minor -- minor project goal (read in columns)						
X - helps achieve another project's goals for this initiative (read in rows)						
O - helped by achieving another project's goal for this initiative (read in rows)						

Once we have summarized the initiatives, defined their priorities, and related them to projects, we can at last specify the general structure of an implementation plan, which is presented in Table 8. We will conclude this document with a short discussion of how the various projects in this plan would actually be carried out, making reference to the people involved, the initial resources needed, and the tasks and their priorities within the various projects.

TABLE 8:
Projects, participants, resources, and tasks

PROJECT	NECESSARY BELETEC MEMBERS	INITIAL RESOURCES NEEDED	PRINCIPAL TASKS	PRIORITY (Lo/Med/Hi)	COORDINATE WITH *
Computer Cooperative [CCP]	Someone with good basic knowledge of computers, prices; financial administrator	Office and Web site, part-time employee, publicity services; unpaid BELETEC and community labor	Determine community demand for computers (and stimulate demand through publicity)	H	General population, schools and possible training facilities
			Establish specifications for computers	H	Buyers, providers
			Contact providers	H	Providers
			Manage bidding and purchasing with transparency (involves management of funds)	H	Providers
			Monitor distribution of computers	H	Buyers, providers
Connectivity [CP]	Someone with good basic knowledge of telecommunications	Money or donors to provide end-user hardware for DSL; unpaid BELETEC and community labor	Arrange reservation of DSL ports	H	ICE
			Help to obtain necessary end-user hardware, DSLAM cards	H	Donors
			Define criteria for selecting candidates for connections	H	Community, [TFP]
			Assist schools to obtain connectivity (DSL or other)	H	[FEP], MEP, ICE
			Study feasibility of Wi-Fi implementation and possible hot spot locations	L	Technical experts, local businesses, etc.
Training Facilities [TFP]	Someone with experience in training in ICT use	Unpaid BELETEC and community labor	Coordinate with [CTP] to determine needs	H	[CTP]
			Search for available training facilities	H	Local businesses, Web cafés, schools, training specialists
			Pursue the use of school laboratories for citizen training	H	School officials, [FEP]
			Provide help with locating facilities for scholastic ICT fairs	L	[FEP], schools

** Names in brackets (such as [TFP], the "Training Facilities Program") refer to other projects in the Belén Modernization Program*

TABLE 8 (cont.):
Project, members, resources, and tasks

PROJECT	BELETEC MEMBERS	RESOURCES NEEDED	PRINCIPAL TASKS	PRIORITY (Lo/Med/Hi)	COORDINATE WITH
Citizen Training [CTP]	Experts in computer literacy training, e-commerce and e-business	Money for publicity, facilities rental and professional instructors; unpaid BELETEC and community labor	Determine community need for training	M	Community
			Coordinate with providers of training facilities	M	[TFP]
			Approve electronic banking course content	M	Bank training staff
			Create, select, or approve ICT literacy course content	M	Private training organizations, FOD, [FEP], ICT experts
			Create, select, or approve e-commerce / e-business content	M	Private training organizations, ICT experts
			Provide publicity for courses	M	Community, publicity agencies
			Create, select, or approve international e-commerce content	L	Private training organizations, experts
Formal Education [FEP]	Representatives of local schools	[Teachers and facilites paid through school budgets]; money for experts in course content and methodology design; unpaid BELETEC and community labor	Help schools to improve computer / connectivity infrastructure	H	Schools, MEP, FOD, ICE, [CCP], [CP]
			Help schools to create innovative content and methodologies for ICT training	M	Schools, FOD, educational and ICT experts
			Help [CTP] to design course content	M	[CTP]
			Help schools to create programs to stimulate and recognize excellence in ICT use	L	Schools, FOD, educational and ICT experts
			Provide help with locating facilities for scholastic ICT fairs, if necessary	L	[TFP], schools
			Help to search for judges and technical support for students in ICT fairs and competitions	L	Community
Government [GP]	Representatives of local government	Money for professional systems design and programming	Perform user survey and internal analysis to determine most useful transactional services for municipal Web site	L	Community
			Establish costs, times for implementing new site	L	Government ICT staff, professional programmers
			Investigate costs, times for implementing job listing site	L	Government ICT staff, professional programmers

Project descriptions

Project #1: Cooperative purchase of computers

The goal of the Computer Cooperative project is to arrange for the acquistion of new computers for the community under the best possible terms (in terms of price, quality, and service contracts).

In order to accomplish this, it will be necessary to inform the people of Belén of the existance of the program to determine how many computers of certain standardized specifications are needed. When a buyer requests a computer, information must be recorded about names, purchase details, and payments. Possible providers will also have to identified and notified of details through well-specified Requests for Provision of Goods and Services, with terms specifying minimum acceptable delivery times, quality of merchandise, and levels of post-sales service.

A bidding process will have to be maintained, and purchasing decisions made on clear grounds. Winning bidders will be notified, and delivery of computers to buyers will be made (either by direct delivery from the provider to individual clients as a term of the winning bid, or to a central location managed by the Cooperative).

All of these tasks have high priority – reaching the goal is urgently needed if we are to provide a wider base of computers in the community as a precondition to carrying out daily activities in a modern way. The project staff should include someone understands something about computer hardware and software specifications, and someone who has the skills necessary to administer finances (although experts in these areas can always be contracted if necessary). The project probably requires an office in which providers and buyers can register, inspect documents, and make transactions, although a Web site should also be created in which all activities except the actual delivery and reception of computers could be carried out. Additional resources will include the unpaid labor of BELTEC and other community members, and possibly the services of professionals in publicity to notify the community of the existance and advantages of the project.

Project #2: Connectivity

The goal of the Conectivity project is to arrange for widespread connectivity infrastructure in the community, with an emphasis on newer and more economical technologies such as DSL, cable modems, and wireless transmission.

The project has two high-priority tasks. The most immediate is to coordinate with Grupo ICE to reserve a certain quantity of communications ports in the new DSLAM in La Ribera for the use of the modernization program. The project members should develop a set of criteria for finding the "best" users of this connectivity (in terms of reaching the most users, reaching the most productive users, etc.), and arrange for those users to be connected – which may involve the purchase or donation of equipment for the users' offices and for the DSLAM itself.

The second high priority tasks involves making a special effort to provide assistance to local schools to help restore their inactive Internet connections, or to obtain new ones (perhaps through the assignment of a DSL connection). Finally, there is a lower-priority task that involves the investigation of the possibility of implementing local Wi-Fi hot spots.

The project staff should include someone who is reasonably knowledgeable in the area of telecommunications, someone who is capable of requesting and obtaining support (in terms of

subsidies or donations) from outside organizations, and (unpaid) concerned members of the community. As always, it is possible to contract the services of specialists if necessary.

Project #3: Training Facilities

The goal of the Training Facilities project is to assure that proper facilities are available for the education of residents of Belén in the productive use of ICTs. In some cases, this may be as simple as arranging a conference room for the presentation of a seminar; in more complicated cases, this may involve the user of facilites with multiple computers and an Internet connection for "hands-on" training. These facilities are in short supply, and strong efforts must be made to find them, and to help to create them, in order to train residents.

The principal client for these facilities will be the Citizen Training project (see below), and members of the Facilites program will have to coordinate tightly with this other group. A search must be made for existing facilites with sufficent computers and connectivity; candidates would include not only Web cafés and specialized training centers, but possibly also facilities which are not usually open to the community, such as training or computer centers in private businesses whose owners might be persuaded to offer their use.

Efforts should also be made to assist in the improvement of existing facilities through coordination with the public and Computer Cooperative and Connectivity projects – helping Web cafés and others to grow through the purchase of computers, and through the extension of connectivity to new locations. As a special item of interest, a serious investigation should be made of the possibilities for, and the barriers to, the use of local school computer laboratories as training facilities for members of the wider community.

All of these tasks have high priority. A final minor responsibility relates to a task of the Formal Education project (see below); computer fairs and competitions in the use of ICTs in schools may occasionally need the same kind of multi-computer Internet-connected facility that we need for citizen training, and if such a need occurs, members of this project should help to arrange their use.

The project staff should include someone, contracted or not, who has a good idea of the kinds of computer and Internet infrastructure that is necessary to simultaneously train multiple users, as well as concerned members of the community who are able to understand the nature of the problem and participate in contacting and negotiating with providers of various services. Few other resources beyond labor are needed for this project.

Project #4: Citizen Training

The goal of the Citizen Training program is to assist in the education of residents of the community in the productive use of ICTs. This involves determining the needs of the residents for education in various relatively general areas, arranging (creating, selecting, or approving) the content for courses to meet these needs, finding teachers, and arranging for the facilities in which training will take place and the participation of the residents that want to be trained (which may involve something as simple as notifying them of course offerings through e-mails or posters in public places, or more complex publicity campaigns)

Several general course areas have already been defined, including basic computer and Internet skills, basic e-commerce and e-business, and more narrowly-focused courses on Internet banking services and international e-commerce. It may be possible to offer e-commerce, e-business and

Internet banking training as simple seminars in conference rooms, but the basic computer and Internet skills must be taught in laboratory settings, and members of this project will have to coordinate with members of the Training Facilities project, as well as with professional educators (quite possibly including members of the FOD), and local experts.

All of these tasks are shown in Table 8 as having medium priority. This is within the context of the larger program, and simply reflects the priority we place on providing infrastructure as quickly as possible; within the project itself all tasks should be see as urgent, with the exception of the international e-commerce course, which has a more limited audience.

The project staff should include someone, contracted or not, who has a very good idea of the content and teaching methodologies necessary to train residents in basic ICT skills, and of the nature of basic e-commerce and e-business, in addition to interested community members. The resources needed do not include a fixed office, but do include the funds necessary to contract facilities, teachers, and course design specialists. All possible efforts should be made to obtain subsidies and/or donations of facilities and services from outside organizations.

Project #5: Formal Education

The goal of the Formal Education project is to assist the formal educational system to offer effective and stimulating training in the use of ICTs to its students. In most cases, public or private, the schools have already developed curricula for ICT or ICT-based training; the job of the project staff is to assist schools to obtain necessary resources to teach these subjects effectively, and to suggest additions to these curricula which may improve their results.

Efforts to assist schools to obtain computers and connectivity have the highest priorities within this project, and members of the project will have to cooperate closely with members of the Computer Cooperative and Connectivity projects to accomplish this goal. In cases where the necessary infrastructure exists or can be relatively quickly provided, members of the project should try to assure that basic ICT skills training is implemented as quickly as possible; in cases in which no curriculum is currently implemented, efforts should be made to help the schools to quickly develop and/or implement such curricula.

With lower priority (which is to say, when infrastructure and basic skills exist), programs to stimulate and recognize excellence in the use of ICTs such as computer fairs and competitions should be organized. The coverage of such fairs and competitions should be municipal (involving all local schools), and efforts should be made to find local experts and technical support for students, and to find highly qualified judges. Finally, assistance may be offered to provide facilities for these events through coordination with the Training Facilites project.

Representatives of local shools must be members of this project in order to assure effective results. Other participants may include parents of students, members of local school boards, and experts in educational ICT use, contracted or not (if contracted, their salaries would represent the major financial resource necessary).

Project #6: Government

The goal of the government project is to improve the level of services provided by the municipal government to the residents of the community through the effective use of ICTs. Two general initiatives have been proposed – increasing the effectiveness of the current municipal Web site to

include actual transactions between the government and citizens instead of simply downloading municipal forms, and the creation of a job market Web site.

Creating a transactional municipal Web site will involve a study of the services currently offered by the government to determine which of them could be offered effectively through the Internet, and a study of user needs and preferences, which could begin with a study of the most popular services currently offered in person in the municipal office building. The next step is to obtain estimates of costs and times involved in systems design, programming, and testing to actually create the site.

Creating the job market Web site should theoretically begin with the same user needs analysis and audience determination. Such an analysis does not exist, but the decision has already been made to simply transfer the lists of job offerings and applicants that are already maintained by local job market staff onto the Internet in the form of very basic texts, without any attempt made to provide advanced interactivity or transactional capabilities. This will be a relatively inexpensive task, involving the hosting of a static Web page, a basic graphical and structural design, and the formatting of exiting text files in HTML format, as well as the possible use of e-mail lists; the greatest expense would be the salary of the person who receives e-mail replies from interested citizens or organizations, passes information between the two sides in the job search process, and updates the texts. A salary is already being paid to maintain the information on a computer; a slight expense to cover the responsibilites of maintaining the site content might be needed.

The persons involved in this project must obviously involve the ICT staff of the municipality and the administrator of the job market data, and interested citizens may also participate in order to help determine the services that should be offered. They will coordinate with professional systems designers and programmers; these technical workers may be from the municipality itself (if the decision is made to develop systems "in-house"), or may be contracted from the commercial sector.

The priority of these tasks is indicated as "low" in Table 8; this reflects the fact that they have their maximum effect when widespread ICT infrastructure is available to the public, and when that public has good basic computer and Internet skills. Within the project, both tasks should be seen as very important – the effective use of the Internet for government is potentially a very effective way to use ICTs to improve the daily lives of residents.

Appendix A: Comparative International ICT figures

(expressed in terms of lines, computers, or users per 100 inhabitants)

Source: International Telecommunications Union (ITU) World Telecommunication Indicators Database, 7th edition (2003)

	Fixed line subscribers			Cellular subscribers			Total telephone subscribers			Computers			Internet		
	Country	**2001**	**2002**	**Country**	**2001**	**2002**	**Country**	**2001**	**2002**	**Country**	**2001**	**2002**	**Country**	**2001**	**2002**
World Leaders	Gibraltar	89.17	..	Taiwan	96.55	106.45	Luxemburg	169.99	..	San Marino	75.85	75.98	Iceland	59.93	60.76
	Guernsey	87.50	..	Luxemburg	92.00	101.34	Jersey	155.24	..	USA	62.50	--	S. Korea	52.11	55.19
	Bermuda	86.92	..	Israel	90.66	95.45	Norway	154.67	157.31	Sweden	56.12	--	Sweden	51.63	57.31
	Cayman Isl.	84.92	..	Italy	88.33	92.65	Taiwan	153.89	164.78	Denmark	54.15	57.68	San Marino	51.30	53.11
	Jersey	84.79	..	Iceland	86.46	90.28	Sweden	152.94	160.53	Switzerland	53.83	--	USA	50.15	53.75
Central America, Belize, and Panamá	**Costa Rica**	**25.00**	**27.00**	Panamá	16.40	--	**Costa Rica**	**34.00**	**42.00**	**Costa Rica**	**17.02**	**--**	**Costa Rica**	**9.34**	**--**
	Belize	14.29	12.51	Belize	15.88	20.75	Belize	30.17	33.26	Belize	13.38	--	Belize	7.30	8.70
	Panamá	12.99	--	El Salvador	13.40	13.76	Panamá	29.38	--	Panamá	3.79	--	Panamá	4.14	--
	El Salvador	10.15	10.34	Guatemala	9.70	--	El Salvador	23.56	24.10	Nicaragua	2.49	--	El Salvador	2.34	4.65
	Guatemala	6.47	--	**Costa Rica**	**9.00**	**15.00**	Guatemala	16.17	--	El Salvador	2.19	--	Guatemala	1.71	--
	Honduras	4.74	4.80	Honduras	3.64	4.86	Honduras	8.37	9.67	Guatemala	1.28	--	Nicaragua	1.44	1.68
	Nicaragua	2.94	3.20	Nicaragua	2.96	4.47	Nicaragua	5.90	7.66	Honduras	1.22	--	Honduras	1.38	2.98
Coffee and banana exporters	**Costa Rica**	**25.00**	**27.00**	Brazil	16.73	20.06	Brazil	38.51	42.38	**Costa Rica**	**17.02**	**--**	**Costa Rica**	**9.34**	**--**
	Brazil	21.78	22.32	Philippines	14.96	17.77	**Costa Rica**	**34.00**	**42.00**	Brazil	6.29	7.48	Brazil	4.66	8.22
	Colombia	17.22	17.94	Guatemala	9.70	--	Colombia	24.85	28.56	Colombia	4.21	4.93	Colombia	2.70	4.58
	Ecuador	10.37	11.02	**Costa Rica**	**9.00**	**15.00**	Philippines	19.20	21.95	Ecuador	2.33	3.11	Ecuador	2.59	3.89
	Guatemala	6.47	--	Colombia	7.63	10.62	Ecuador	17.04	23.08	Philippines	2.17	--	Philippines	2.56	--
	Philippines	4.24	4.17	Ecuador	6.67	12.06	Guatemala	16.17	--	Guatemala	1.28	--	Indonesia	1.91	3.77
	Vietnam	3.76	6.85	Indonesia	3.12	5.52	Indonesia	6.57	9.11	Indonesia	1.10	--	Guatemala	1.71	--
	Indonesia	3.45	3.60	Kenya	1.92	4.15	Vietnam	5.30	9.19	Vietnam	0.86	0.98	Kenya	1.60	--
	Kenya	1.04	1.03	Vietnam	1.54	2.34	Kenya	2.96	5.18	Kenya	0.56	--	Vietnam	1.24	1.85