

Costa Rica @prende  
e-learning Project  
Costa Rica- Korea Collaboration

**e-Learning Diagnostic  
of Costa Rica**



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## List of Acronyms

ADSL	Asymmetric Digital Subscriber Line
CAMTIC	Costa Rican Chamber of Information and Communication Technologies
CBT	Computer Based Training
CCSS	Costa Rican Social Security System
CDMA	Code Division Multiple Access
CECI	Intelligent Community Centers
COMTELCA	Regional Technical Commission of Communications
CRNet	National Research Network of Costa Rica
DIY	Demand in Yourself
ETRI	Electronic Telecommunication Institute Agency
FOD	Omar Dengo Foundation
ICE	Costa Rican Institute of Electricity
ICT	Information and Communications Technology
ICT4ED	ICT for Education
INA	National Apprenticeship Institute
ITCR	Costa Rican Institute of Technology
KERIS	Korea Education & Research Information Service
KOCCA	Korea Creative Content Agency
LAN	Local Area Network
LCMS	Learning Contents Management System
LMS	Learning Management System
MEP	Ministry of Public Education
MICIT	Ministry of Science and Technology
MIDEPLAN	Ministry of National Planning and Economic Policy
MINAET	Ministry of Environment, Energy and Telecommunications
MKE	Ministry of Knowledge and Economic
NIA	National Information Society Agency
NIPA	National IT Industry Promotion Agency
PCS	Personal Communication Services
PRONIE MEP-FOD	National Program of Educational Informatics Ministry of Public Education- Omar Dengo Foundation
RACSA	Radiográfica Costarricense S.A.
R&D	Research and Development
SNS	Social Networking Service
SWOT	Strengths Weaknesses Opportunities Threats
UCC	User Created Contents
WAN	Wide area Network
WBT	Web Based Training

## Executive Summary

Based on the Memorandum of Understanding (MoU) between the governments of the Republic of Costa Rica and the Republic of Korea, which was signed by the Ministry of National Planning and Economic Policy (MIDEPLAN) of Costa Rica and the Ministry of Knowledge and Economy (MKE) of Korea, Korea's National IT Promotion Agency (NIPA) dispatched a Korean expert team in order to foster the e-learning industry in both countries. NIPA's expert team has taken charge of the main role of this project as part of the Korean side, and a six-member e-learning collaboration committee on the Costa Rican side is in charge of coordinating data collection, analysis and supporting activities for the project. Costa Rica's national e-learning collaboration committee is led by MIDEPLAN, and its members are the Ministry of Public Education (MEP), the Ministry of Science and Technology (MICIT), the Digital Government Technical Secretary, the Chamber of Information and Communication Technologies (CAMTIC) and the Omar Dengo Foundation (FOD).

This report is the first product of the "Costa Rica @prende"<sup>1</sup> project and consists of the diagnostic of the status of e-learning in Costa Rica. It is expected that based on this diagnosis and the upcoming reports and expert advice on government policies generation, Costa Rica will be able to outline a national e-learning policy that includes standards, promotional activities, active advocacy of the e-learning industry, and the definition of a national strategy to accomplish goals that will lead to the implementation of a successful and efficient e-learning environment.

The first chapter includes the project's overview, background, goals, scope, methodology, schedule, and team members. NIPA's experts adopted diverse techniques of research and carried out interviews with representatives from institutions and schools, as well as corporate executives and government officials.

Chapter 2 covers the policies and laws related with Information and Communication Technologies (ICT) and the analysis of the ICT environment.

Chapter 3 includes the current status and implications of e-learning use in the education

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<sup>1</sup> Costa Rica @prende is the project's name selected by the Costa Rican e-learning Collaboration Committee.

sector, including its use within MEP, FOD and higher education institutions.

Chapter 4 covers the status and implications of e-learning use in the public sector of Costa Rica, including MICIT, the General Comptroller's Office of the Republic, National Apprenticeship Institute (INA), the Directorate General of Civil Service, the Costa Rican Social Security System (CCSS), and the Digital Government Technical Secretary, among others.

Chapter 5 covers the status and implications of the e-learning industry sector.

Lastly, chapter 6 includes final conclusions. In the conclusions chapter, Costa Rica's future e-learning vision will be enunciated: The e-learning vision is 'Costa Rica is taking full advantage of educational and learning opportunities for its people through intensive use of e-learning solutions based on state-of-the-art technology and articulated services'. And also general recommendation will be proposed to activate the use of e-learning and to foster the e-learning industry in Costa Rica.

To accomplish this proposed vision, the expert team will later on present strategies, a future plan, Research & Development (R&D) projects, and a roadmap. The expert team will make recommendations for the future e-learning successful implementation, which consists of mid-term projects that can be undertaken using the current ICT infrastructure, and long-term projects that require advanced ICT infrastructure.

NIPA experts are very grateful to work with the members of the Costa Rican e-learning collaboration committee and staff from many public, private and non-profit organizations to support and guide the team in understanding the status of Costa Rican education, the ICT industry sector, and the cultural, political, economic and legal environments. Specifically, the team is grateful for the organization of numerous meetings with many representatives from institutions, schools, universities, organizations and companies. The team firmly believes that through international cooperation and the collaboration between the government, academia and industry within Costa Rica, the Costa Rica @prende project will be very successful.

### **Illustration 1: Project Team**

Project Participants from Korea

Jae boo Oh<sup>2</sup> (General part)

Jong kap Lee<sup>3</sup> (System part)

Technical Team, Costa Rica e-learning  
Collaboration Committee

Leda Peralta (MIDEPLAN)

Antonieta Diaz (MEP)

Angelica Chinchilla (MICIT)

Sandra Aguilar (Digital Government  
Technical Secretary)

Silvia Rojas (CAMTIC)

Ana V. Quesada (FOD) July 2010- January 2011

Sylvia Jimenez (FOD)

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## 1. Overview

### 1.1 Background

Digital technology is already changing how we do business and live our lives. In developed countries most schools – and every university – now have broadband access. Teachers in those schools increasingly use information and communication technology (ICT) to improve their own skills and knowledge, and to bring their lessons to life. People working with children, families, adolescents, and adults are testing out new and better ways to deliver services with common processes supported by technology. The technology is making many administrative and assessment tasks easier.

Along with this trend, Costa Rican Educational Policy towards the 21<sup>st</sup> Century<sup>1</sup> is an innovative effort to establish a long term framework for the development of Costa Rican educational system, which helps to bring the constitutional mandate to the specific reality of today. Costa Rica's aims and objectives are to make education the core of sustainable development.

As a result of these efforts, Costa Rica has a relatively high internet penetration rate and has experienced success with e-learning projects. Costa Rica has good human resources and research experience in cooperation with foreign countries. In spite of this, Costa Rica is not yet considered an e-learning matured country, mainly because there is a digital gap between rural and urban sectors, and because the ICT infrastructure, which is the essential element in e-learning, is not sufficient for the e-learning service environment.

Over two decades ago, the Republic of Korea also suffered from the lack of educational ICT infrastructure, a similar situation to Costa Rica's current status. However, starting in late 1980s, Korea improved the ICT infrastructure status and developed advanced e-learning systems, contents, and services. The Korean expert team was dispatched to Costa Rica to share this experience and to help Costa Rica develop e-learning.

The expert team started their study on July 26<sup>th</sup>, 2010, and will complete it on July 25<sup>th</sup>, 2011. A Costa Rican e-learning collaboration committee was formed to jointly carry out project activities with the dispatched experts. The Costa Rican team provided support in identifying the main component to analyse the ICT and e-learning status of Costa Rica and was in charge of

seeking cooperation from the Costa Rican government institutions, private companies, and other key informants. The expert team has analysed e-learning, developed countries' cases, and is aiming to provide advice to establish a much improved e-learning use in Costa Rica.

## 1.2 Goal

In order to analyze the e-learning status, there are several things to be considered, such as the ICT infrastructure, the services needed by students, teachers, citizens and government officers, and the different types of contents needed by each sector or population group, as well as the delivering system of such services.

The main goal of the Costa Rica @prende project is to upgrade Costa Rica's overall competitiveness in the knowledge based economy through e-learning by bringing new waves of academic research and by stimulating the development of the e-learning industry. The final report will be comprised of the following components:

1. Diagnostic of the e-learning state in Costa Rica.
2. Defining the e-learning vision, strategy and framework.
3. Selecting major projects and drawing a development roadmap.
4. Defining the direction of the executive organization.
5. Defining the direction to restructure the legal framework.

## 1.3 Scope

The scope of the e-learning project is divided into the diagnosis of e-learning status, the design of the To-Be model, and the establishment of an e-learning development roadmap.

The preparation of the diagnosis of the e-learning status in Costa Rica includes the analysis of the following terms:

- Policy: laws, regulations, and policies.
- ICT infrastructure: hardware, software, internet access, and communication tools.
- Human Resource: teachers, IT specialists, and training opportunities.
- Educational Resources: curriculum, national standards for ICT use in teaching and learning, national standards for ICT literacy, and cyber ethics.
- Service: teaching and learning support systems, educational administrative information

services, development of educational resources, sharing, and distribution of digital resources.

- Impact: impact measurement and students' outcome.
- Usage: utilization of infrastructure, utilization of curriculum, utilization of online digital teaching and learning services, and utilization of digital educational resources.
- Equity: national ICT equity policy, incorporating gender, region, and special needs.
- Social, cultural, and economic status: socio-economic status, vision and plan for national development, finances, school systems, educational administration systems, and organizations.

The future of e-learning in Costa Rica will be designed in the "To-Be model" which will be followed by the establishment of a roadmap in order to achieve the e-learning vision.

#### 1.4 Methodology and approach

In general, e-learning is defined as the convergence of the internet and learning, or internet-enabled learning. It is also defined as the use of network technologies to create, foster, deliver, and facilitate learning, anytime and anywhere, including the delivery of individualized, comprehensive, dynamic learning content in real situations, aiding the development of knowledgeable communities and linking learners and practitioners with experts. E-learning is composed of contents, systems and services.

Content is a set of information which has meaningful resources. There are many teaching resources available for K-12, higher education, business education area, and life-long education areas. For example, there are resources in Mathematics, English, Social Studies, and Spanish available for any of those areas. Those subjects are sometimes taught by one teacher or by more than one teacher. Assuming, for example, that there are some underperforming learners, then teachers or educational policy makers will attempt to make an effort to help those students. At that time, they might make a decision to use information and communication technologies and design an e-learning solution. Content is then teaching materials provided to learners, for example, students, government officers, and citizens who would either want to learn or have to learn for work purposes.

System (solution) is a supporting system that allows e-learning to perform effectively. System includes authoring tools and learning support systems which enable evaluative and collaborative learning. They include learning management systems (LMS) which manage learner, teacher and learning processes and the learning contents management system (LCMS) which manages author, store, supply, and reuse of contents.

Services consist of educational portals, e-market places, and content syndication areas. An educational portal area operates and manages diversified contents. Almost all Ministries' websites or independent websites will be an example of an educational portal. In this place, end-users are linked to the content developer. In this portal, the provider can provide Demand in Yourself (DIY) contents.

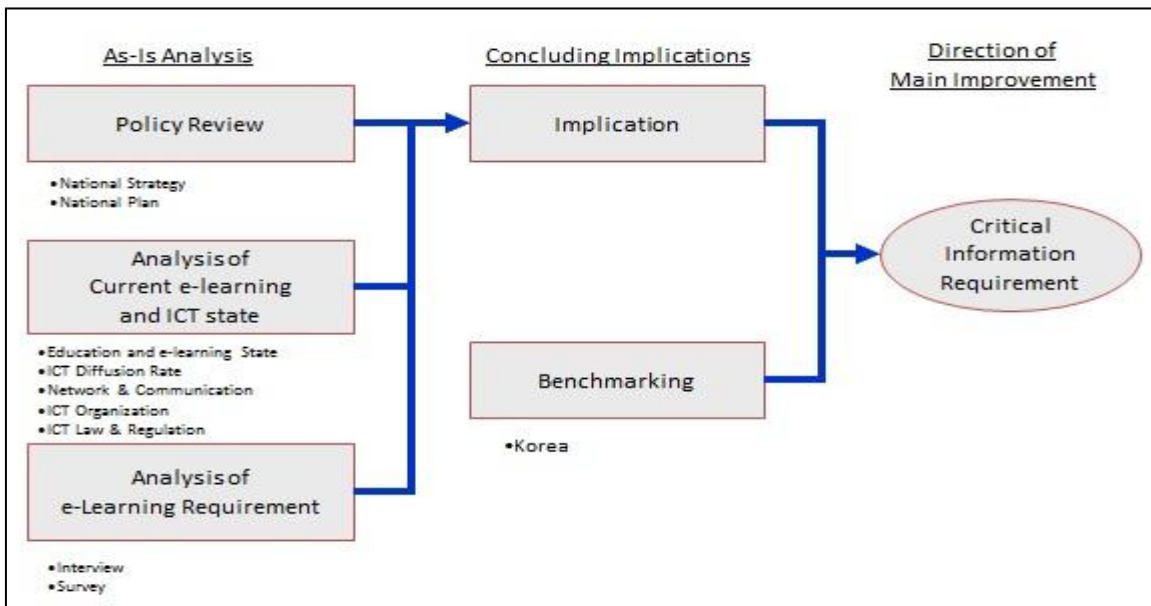
With these three views of e-learning, the expert team has studied Costa Rica's e-learning status. The expert team divided Costa Rica's e-learning status in three sectors: 1) education sector, 2) public sector, and 3) industry sector.

To analyse Costa Rica's current e-learning status, the expert team surveyed published data and websites and conducted interviews<sup>2</sup>. The expert team visited K-12 schools, higher education institutions, business and public education area, and life-long education areas.

The expert team surveyed the following information: 1) whether the organization has digitalized learning contents in order to achieve their goals in the learning process, 2) whether the organization has various supporting systems to perform e-learning activities efficiently: that is: authoring tools, evaluations, collaborative learning systems, and learning management systems that can manage learners, teachers, learning processes, and learning contents management systems, and 3) whether the organization's services are available online or provide web services.

The analysis methodology is depicted in Figure 1 as follows:

Figure 1: Data analysis framework.



The project schedule is divided into four major phases (see Figure 2).

The first phase is the “Preparation Phase,” which is about initiating the project, scheduling meetings with the Costa Rican counterparts and major stakeholders of the projects, and setting a common schedule and understanding of the project.

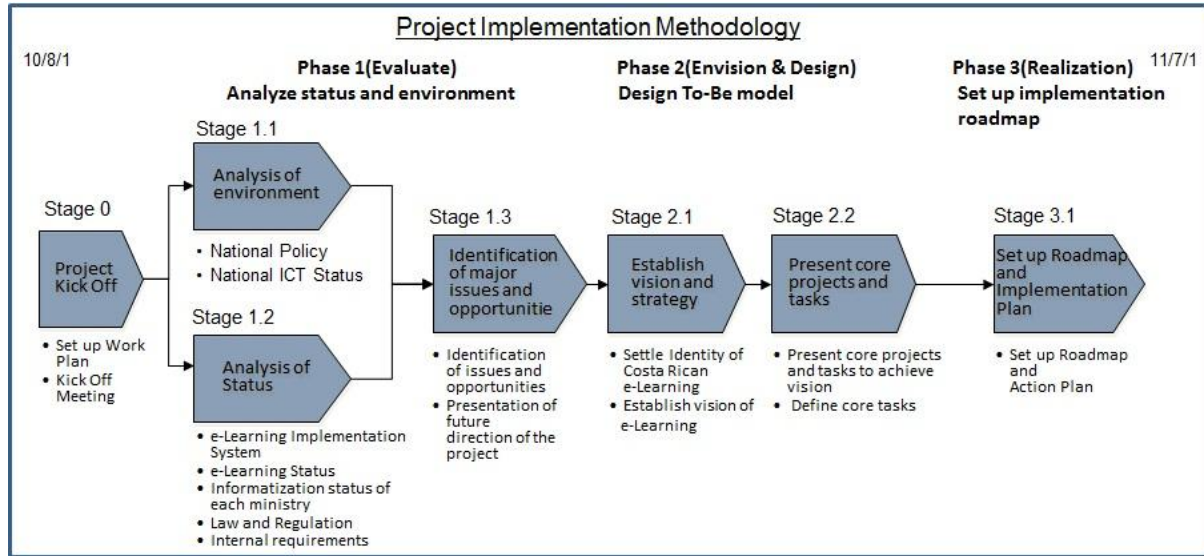
The second phase is the “As-Is Analysis Phase” that involves collecting and analyzing data such as government law, policy, regulation, informatization status, requirements of citizens, business and civil servants, and benchmarking.

Third, is the “To-Be Model Establishment Phase”, where visions and strategies are set up based on data analyzed in the second phase and where projects are selected and their priorities are defined.

The last phase is the “Action Plan Establishment Phase” where the action plan for major projects defined in the third phase is prepared.

The project takes one year, from the preparation phase to the final roadmap establishment phase. Preliminary reports as well as a final report will be prepared.

**Figure 2: Project’s Working Framework.**



## 1.5 Project Team

MIDEPLAN and MKE are responsible for implementing the Memorandum of Understanding on behalf of their countries. MIDEPLAN had designated the Technical Secretary of Digital Government and MKE had designated NIPA as co-secretaries to facilitate communication and assure that all cooperative projects proceed smoothly. NIPA dispatched two experts to Costa Rica on July 26<sup>th</sup>, 2010 and Costa Rica formed a National Collaboration Committee, which is integrated by six public, private and non-governmental organizations (see Figure 3).

The e-learning Collaboration Committee members was tasked to provide current status information, arrange interviews, accompany the experts to the interviews, and advise them on vision and process as well as examine the first versions of the diagnostic and the To-Be model prepared by the expert team. The Korean expert team was responsible for analysing the current status, conducting interviews, building the vision process, preparing the diagnostic, designing the “To-Be Model”, and establishing a roadmap.

Figure 3: Project Team Organization



## 2. Analysis of ICT Environment

### 2.1 Overview

Information and Communication Technology (ICT) has been successfully and widely adapted for education and training purposes. The availability of the necessary tools and the widespread awareness of the potential of such technologies have resulted in a spurt of activities especially in the area of e-learning.

E-learning often is an approach to facilitate and enhance learning through the use of devices based on computer and communications technologies. Such devices would include personal computers, CD-ROMs, digital television, PDAs and mobile phones. Communications technologies enable the use of the internet, email, discussion forums, and collaborative software.

E-learning covers a wide set of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, and CD-ROM.

Therefore, ICT infrastructure is an indispensable resource in e-learning usage. In the implementation step of e-learning, the network speed determines the type of e-learning service, content, and system to be implemented. All e-learning components are dependent on ICT infrastructure.

The expert team examined Costa Rica's current ICT status and how it is closely linked with education and training. In the first part, the general ICT state was analyzed such as the backbone network status, telecommunication status, internet penetration, and computer supply status. Also the ICT environment of public and private sector were investigated. General ICT state was analysed based on the 'Study Costa Rica: Access and Use of Information and Communication Technologies in Public Institutions' published by Network Management and Telecommunications Systems Management Information Society in May 2010, and 'UNESCO Institute for Statistics initiatives for standardization of Information and Communication Technologies (ICT) use in Education indicators' published by UNESCO Institute for Statistics Communication and Information Statistics Unit in 2009.

Along with this analysis, methodologies such as interviews, surveys, document and website reviews were used to grasp the required information from the identified fields.

## 2.2 General ICT State

Regionally, Costa Rica's network is interconnected to the other five Central American countries by a terrestrial telecommunications network coordinated by the Comisión Técnica Regional de Telecomunicaciones (COMTELCA). This broadband network links the region's capital cities with the networks of Mexico, Belize and Panama.

The country has two Intelsat satellite earth stations and three submarine fiber optic cables in service, such as Hawaii Americas-1, MAYA-1, and ARCOS-1 (See Note 2).

Radiográfica Costarricense S. A. (RACSA), a publicly-owned subsidiary of Costa Rican Institute of Electricity (ICE), provides telex, telegraph, video conference, data transmission, internet access, facsimile, data and value-added services. It also acts as a regional data network for neighboring countries (El Salvador, Honduras and Nicaragua) without packet switching networks. RACSA offers value added services through its ISDN network which permits users to connect to the internet, transmit data, and have teleconferences with other users of the network.

RACSA has the only national Frame Relay network of the region. The network has a minimum throughput of 64 Kbps and a maximum of 2 Mbps. The network is distributed throughout the most important commercial areas of the metropolitan area. RACSA plans to expand it through the entire country in the near future.

There are two backbone networks, i.e. CRNet (National Research Network of Costa Rica) Backbone 1997 and CR2Net Backbone 2005.

According to BuddeComm's September 2010 report on Costa Rica's Telecoms, Mobile and Broadband status, mobile telephone subscribers in Costa Rica are rapidly increasing and reached 78.9% in 2010 (Paul Budde Communication Pty Ltd., 2010). Specifically, mobile telephone use is expected to grow strongly in accordance with the upcoming opening of the telephone market to competition. Costa Rica is also starting to see the use of "mobile intelligent" devices like Blackberry and iPhone, although there is lack of many new services that

can take advantage of the advanced capabilities of these devices. These mobile subscribers will become smart phone users and will use internet services through their mobile telephone.

As mobile telephones are used more and more, it is expected that the country will enter into the so called era of mobile or u-Learning era. It is very important that academia, industry and government sectors learn how to cooperate to prepare e-learning and u-learning services for this new era. However, there are obvious barriers to the country's use of smart phones because of slow internet access speed.

A 2010 research report by Radiografica Costarricense S.A. (RACSA, 2010) indicates that 53% of the population uses the internet, representing a total of 2,435,494 people (Previous years figures were 45%, in 2009 39% in 2008, 35% in 2007, 26% in 2006, 22% in 2005, and 20% in 2004). More than one million people access the internet from home (this figure in 2009 was about 700,000 people), with an average daily browsing of 3 hours and an average of 3 people per household using the service, with 29 years being the average age of users. Other places where people access the internet are in study centers (including schools), workplaces, internet cafes, and public Wi-Fi points.

In Costa Rica, the average bandwidth speed is 512kbps in households and 1 mbps in the commercial sector. However, rural Costa Rican households similar to other developing countries show a relatively low proportion of internet access and even lower broadband penetration rates than that of urban households. To have more internet access in rural areas, there needs to be public internet access points (preferably high-speed), which is related to many fundamental aspects of social interaction, including questions of privacy, community, cultural exchange, ownership of knowledge, and governmental control of information.

'Study Costa Rica: Access and Use of Information and Communication Technologies in Public Institutions' (Telecommunication Rectory, 2010) shows that 79.25% of public institutions have computers with internet access. In public institutions, the ratio of internet access and computers available to connect to the internet are in a very good state compared to other sectors. On the other hand, a national survey (MINAET, 2010) shown that 63.3% of households have at least one computer. It should be noted that a significant percentage of households in the sample (36.1%) do not have a computer.

## ■ Implications

The country's annual growth of internet usage has reached annual rates of 7 to 8%. Compared with the total number of subscribers in 2009, mobile penetration rapidly increased to 79% in 2010. In 2012, after the telephone market is opened, the mobile subscribers are expected to grow significantly. Cellular phone usage would be transformed into smart phone which can more efficiently receive e-learning services.

The figure of internet access in rural areas is very low compared to that of the urban area. Generally, internet access in rural areas is an indispensable infrastructure to strengthen their economic development. Also, these infrastructure conditions are indispensable resources of e-learning applications that aim to support rural area students.

Based on the above analysis, we recommend:

- ▶ Building an effective infrastructure in accordance with a rapidly increasing mobile telephone environment.
- ▶ Introducing wireless services which are suitable for the geographical state and the number of users to improve internet access in a rural area.
- ▶ Building a national standard for e-learning services and introducing interchangeable systems for connectivity and compatibility in order to prepare for the opening of the telecommunications market.

## 2.3 ICT environment in the educational sector

E-learning is no longer confined to the definition of a learning process through IT techniques. Rather, it has become a basic term for the sharing of knowledge and skills in educational atmospheres to enhance productivity levels, make people acquainted with new skills, upgrade the standard of global education, and maintain uniformity of education.

The role of e-learning in the education sector is perhaps more important than any other sector. There are many educational resources in an e-learning system, such as an ICT infrastructure, a computer system, an educational content, and human resources.

For the efficiency of information gathering, the expert team first investigated the ICT and e-learning environment in the education sector, mainly in primary and secondary schools. Secondly, the team examined MEP's and FOD's ICT and e-learning policy and strategies. Lastly,

the team investigated the higher education sector, namely four of the five public universities.

The National Committee for the project “Costa Rica @prende” invited several universities (private and public) to a focus group session on August 26<sup>th</sup> in 2010. After that activity, the National Committee decided to include only four public universities in the sample instead of all public institutions, and more than fifty private universities due to time constraint and considering the project’s scope.

The expert team investigated ICT infrastructure, such as network status and computer penetration. The expert team examined the existence and status of: 1) digitalized learning contents in order to achieve learning goals in the learning process, 2) various supporting systems to perform e-learning activity efficiently, that is, authoring tools, evaluation and collaborative learning systems, learning management systems to manage learners, teachers and learning processes, and learning contents management systems, 3) services like online or web services, and 4) human resources, i.e., teacher’s ability to use ICTs.

To analyse the current e-learning status, the expert team surveyed, interviewed, and examined published data and websites. The expert team visited K-12 schools, higher education institutions, as well as organizations that work on life-long education.

The December 2010 statistical report of the National Program of Educational Informatics Ministry of Public Education- Omar Dengo Foundation (PRONIE MEP-FOD, 2010) shows that 83.9% of primary school students who benefited from the this program have connectivity. Across all public primary schools in the country, 62.8% of students have internet access. Also over 90% of primary school students use ADSL, and 80% of primary school students access the internet with a connection speed lower than 1024bps at school.

About 15.5% of the public primary and secondary school teachers were trained in year 2010 to teach basic computer literacy. Because this relatively low number of teachers received basic computer literacy training in this year, we can see the need for expand teachers’ ICT training programs to benefit more teachers.

A website is a channel that can play an important role in the exchange of educational information among students, between a student and a teacher, and among teachers. The total

number of educational institutions with a website in Costa Rica, an important community service for students, teachers and parents, is very low reaching only 2.7%, 8.5%, and 13.8% in primary, secondary and technical vocational schools, respectively.

- As a result of the analysis, these are the main recommendations from the standpoint of the ICT environment in the educational sector:
  - ▶ Build an ICT infrastructure for e-learning in the rural school.
  - ▶ Create a government committee that promotes the effective usage and/or sharing of ICT facilities.
  - ▶ Apart from network infrastructure, e-learning services need to be provided, such as standalone LMS and CD-based teaching system.
  - ▶ Develop a common school website system and make it available to all schools.
  - ▶ Consider extending teachers' training using government offices, schools, and other facilities which can use internet and computer access in each region's hub city allowing teachers to use the nearest public sector facility with access to computers and the internet if they have no access at school or at home.

### 3. Education Sector use of e-learning

Entering the 21<sup>st</sup> Century, the information society, driven by the popularity of computers and the Internet, is developing into a knowledge-based society that uses information to generate new knowledge. ICT are widely used in every part of society, accelerating changes and innovation within society. The way people communicate and disseminate knowledge is changing very fast and it is all based on informatization.

Such dramatic changes in paradigm require the educational system to change accordingly. MEP has made extensive efforts to establish long-term policies to develop a new educational system that actively use information (MEP 2010a). As a part of these efforts, MEP is improving the quality of education and promoting equal education conditions by using ICT, especially e-learning. The purpose of MEP's educational policy is to make education the key element of sustainable national development. The educational policy includes the following aspects: narrowing the divide in the quality of education between urban and rural areas, bridging the educational divide between urban and rural schools, nurturing globally competitive human resources, nurturing well-rounded workers, ensuring educational diversity, and enhancing the responsibility of each individual for economic and social development balanced with natural and environmental preservation premises.

MEP is using the education portal, Educ@Tico, to make the new learning tools more accessible and to encourage learning activities. This portal is the basic platform for e-learning that allows individuals to access information posted by the administrators and encourages learning by enabling collaborative activities. Educ@Tico provides technical training and courses on entrepreneurship for teachers and vocational schools including industry (21), commerce and service (23), agricultural (7), and projects and programs (13) courses. An annual teacher training program is also provided in hub cities for all teachers across the country.

#### 3.1 E-learning for primary and secondary schools

MEP is promoting policies for equal education opportunities and improved quality of education. Through these policies, MEP is implementing an innovative educational support plan that provides user-centered and interactive learning environments built on the openness,

flexibility, and dispersibility of e-learning so that they can be accessible to anyone, anytime, and anywhere. E-learning is generally defined as the convergence of various types of applications and processes, such as long name (WBT), long name (CBT), and virtual-classes. E-learning provides contents via various types of media, such as the Internet, satellite broadcasting, IPTV, and CD-ROM. As the definition of e-learning has been broadened to include education based on electronic networks, as well as all forms of education that promote ICT based education and interaction, the concept of e-learning is currently inclusive of many similar concepts, such as remote learning, online learning, and cyber learning. Nowadays, mobile learning is also included in e-learning as portable displays, such as mobile phones and PDA's, have become more popular.

From Internet-based learning to offline learning using CD-ROMs, e-learning requires ICT infrastructure, including Internet connectivity and computer equipment. With the ongoing efforts of the Costa Rican government to establish ICT infrastructure, more primary and secondary schools have Internet connection and PCs available for their students. In the case of the primary schools sponsored by PRONIE MEP-FOD, 83.9% of students can access the Internet and 90.4% do so through an ADSL connection. The Internet speed in those schools is 512 bps or faster for 56% of them. In terms of the use of computers in those schools, and the student per computer ratio was 26% (See note 2). However, the Internet subscription rate of the general public was only 37% and as of 2010, only 63% of households had computers.

Until now, e-learning has mostly offered push-type programs through LMS or similar systems. However, it is constantly evolving due to the changes in the social environment, educational paradigms, and the development of ICT. Recently, e-learning tends to combine with the elements of Web 2.0, such as blogs, podcasting, media sharing, and social networking. This is why the latest e-learning is called e-learning 2.0. The current internet subscription rate, internet speed, and PC availability in Costa Rica is not sufficient enough to accommodate e-learning 2.0, and this is one of the most urgent problems that needs to be solved.

In Costa Rica, computer education has been implemented by the National Program of Educational Informatics (PRONIE MEP-FOD), jointly founded by MEP and the Omar Dengo Foundation. PRONIE MEP-FOD and FOD's innov@ Institute offer programs for teachers,

students, and citizens, and these programs combine traditional lectures with e-learning. In particular, experienced teachers of primary and secondary schools and related experts are working together to train teachers to improve the quality of education. The Labor@project for secondary school students, for example, offers comprehensive programs that cover everything from opening a business to managing it. Teachers, students, local banks, and other related organizations and companies participate in such programs that allow students to acquire experience in operating a simulated company (See note 2). These programs are ideal, but they cannot accommodate many students due to limited resources. Further investigation of this issue would be beneficial to allow more students to participate in these programs. For example, it can be divided into two steps. The first step would consist of e-learning classes, with general lessons of each participant who is playing the role of a banker, a company officer, or government officer etc. After the e-learning courses finish, students would be selected to participate in the second step that follows a method similar to the current one, but with the possibility of more students taking part in the program.

The recent statistics of intra-annual drop-out (MEP, 2010b) and repetition rates (MEP, 2010c) show that academic education is also in need of educational support. According to these, 17.8% of 7<sup>th</sup> grade students dropped out of school and 14.3% failed in 2009. In the case of 8<sup>th</sup> grade students, 10.2% dropped out of school and 14.5% failed. This point out the need to have a cyber home learning system available, a learning support system with regular curriculum materials designed for the dropouts and failing students.

To provide more advanced educational support for primary and secondary education through e-learning, Costa Rica needs the following instructional support services:

- A National teaching and learning center, consisting of an individualized portal service in which an individual user can freely choose and restructure information.
- A Cyber home learning system that eliminates the educational divide by providing students with supplementary learning contents to study voluntarily at home via the Internet.

- Digital textbook which includes the contents of the existing textbooks, reference and exercise books, and glossaries and that integrates such contents with multi-media, such as video clips, animation and virtual reality.
- A Digital Library System for School Libraries.

### 3.2 E-learning for Higher Education

Costa Rica is one of the many developing countries where distance education is playing an increasing role in educating not only for rural populations, but urban populations as well. The Costa Rican government established the first at-distance university (State At Distance University UNED) in the 1970s to educate rural populations, stifle the migration of youth to larger cities, and educate people in specific areas, such as education and health. This university has been over 30 years of continuous improvement within their educational system.

The larger four state universities have much experience in distance education, mobile learning, LMS and similar platforms area. Also they have been developed many contents. They have good experience to manage e-learning systems, and provide operational training on the use of Moodle and Blackboard. They operate academic websites which are a resource available to all faculty, researchers and students at the these national universities.

The Costa Rica's Institute of Technology (ITCR) has a close relationship with the industry sector. They provide professional resources and infrastructure to the industry sector and promote e-learning industry through incubating small and medium enterprises. They promote the creation of competitive enterprises through a network of technical, managerial, administrative and financial services aimed at promoting industrial activity. They provide the experience in doing research projects and developing real systems to through the Center for University-Industry Linkage (See Note 2 ).

In order to increase the strength of Costa Rica's universities, it is necessary to strengthen the ICT infrastructure for data communication, wireless communication, and computers. The traditional educational model should be replaced with a newer model that expands the use of newer technologies, and promotes the sharing of experiences by the entire educational sector, from primary education to higher education. There must be no discrepancy between the manpower required by industries and what is being nurtured by higher education. Another

urgent problem to solve is the training of teachers to keep up with the development of information and communication technologies.

In the future, higher education is headed toward ensuring the competitiveness of colleges by improving the quality of lectures and research using the information and communication technologies such as Web 2.0. In order to convert the passive teaching method of lectures into the student-directed active learning method, it is required to establish learning networks that allow two-way communication. Mobile computing will greatly contribute to this conversion into creative learning. Also, learning is expected to develop into networked and community learning beyond man-to-man and evolve into lifelong learning and ubiquitous learning beyond lecture rooms. Other forms of learning would be considered complex learning, including knowledge, attitude, and cognition using multimedia technology, experiential learning, and self-directed learning based on open learning resources and network-based learning support.

In a higher education, there are general obstacles are well known and can be summarized as follows: the lack of institutional and administrative support, a lack of student preparedness for online learning, a lack of technological competence on the part of professors, a need for technical support, and academic integrity concerns. But a new generation of students is demanding that new technology, including e-learning technologies, be integrated into all courses, even traditional courses that are held in a classroom with a professor and students physically present. The development of ubiquitous and relational technology implies that the computer gradually disappearing and is allowing people to interact with information and with others through various digital devices. As technology evolves at the brisk pace of universities adopt e-learning technologies according to a slow pace—the pace of resistant institutions that are being forced to accept a e-learning new paradigm.

One of the key problems that we see with systems like Moodle and FirstClass is that the technologies do not match the everyday technological ecologies of students who, when they are not at school, communicate and collaborate with their family and friends with tools like Skype and Facebook. Today's students have integrated these networking technologies in their daily lives; they now make up part of the fabric of everyday experience in terms of both work and play. Thus, the technologies that we use for e-learning in the university setting are, in a

significant sense, inaccessible, even if the university gives students access to them free of charge. For these reason, university authorities should be considered current trends of a ICT technology, a goal of e-learning, and sustainable funding etc. to establish new e-learning systems

It would be difficult for colleges to improve the quality of education, save the cost of education, and reduce lecture times to spare more time for research using the previous method of education. However, constant research is required to make all this possible through the strategic use of the latest information technology and redesigning of curriculums for active learning.

#### 4. Governmental sector use of e-learning

With the development of science, especially the information communication technology, the lifecycle of knowledge and technology has been shortened and the administrative environment is changing fast. To keep up with the environment and to provide quality services for the competitiveness of the nation, it is necessary to have systemized self-development programs for government officials. The concept of learning is being expanded not only to self-directed learning activities for better service and group learning, but also to various self-development and policymaking activities, including e-learning, career workshops, and visits to legislators.

The ICT infrastructure in the public sector is considerably well-developed compared to other sectors (See note 2 for sources of information). In terms of infrastructure, the public sector can benefit most from e-learning. Currently, MICIT, the General Comptroller's Office of the Republic, the National Apprenticeship Institute (INA), the Directorate General of Civil Service, the Costa Rican Social Security System (CCSS), and the Digital Government Technical Secretary are offering e-learning programs for the public and for government officials. MICIT also offers the Intelligent Community Centers (CECI) Program to bridge the digital divide in rural area. In particular, the CECI Program promotes educational equity, which is one of the fundamental objectives of e-learning, and requires active training through e-learning. The General Comptroller's Office of the Republic provides public procurement training for government officials and other Supreme Audit Institute members through remote learning via a virtual campus. INA is a training institute that offers national vocational training to nurture qualified human capital, and its programs include e-learning programs via online or CD-ROM and hands-on training. The Directorate General of Civil Service provides technical and service training required for efficient public administration to provide quality services for the public. CCSS offers human resource training for public health, including medical tips via video conferencing. These programs believe that human resources are their greatest assets and provide training to improve their capabilities. What these institutes and governmental entities have in common is that they have multiple groups of learners that are scattered across the country. Therefore, e-learning is the most suitable type of education for them, as it is accessible

regardless of time and place, allows two-way learning between instructors and learners using tools, such as bulletin boards. E-learning is also learner-directed for learners to choose the content, level, length, speed, and number of courses, it is less costly compared to offline learning that requires lecture rooms, and it is quicker to update the latest contents.

Public sector is an e-learning consumer, and also a policy maker to establish e-learning policy. They have strong will to accept a new paradigm of e-learning. They have experiences in operating e-learning and video conferencing. These strengths will act the biggest force to promote the e-learning in Costa Rica.

On the other hand, the weakness of public sector is lack of national-wide e-learning policy. They have no integrated education headquarters, and each institution operated independently. This can lead to each institution to approach only their own view of e-learning, and redundant investment. Other weaknesses are the lack of a political supporting, an awareness of officials about the e-learning, professional human resources, and infrastructures in rural area.

The objective of the training for officials is to improve the efficiency for the civil services which are being offered regardless of the time and place. These changes of public service environment need a new trend of training. There is an opportunity in these new trends of training and technical paradigm shift. Public sector can adopt new e-learning technology with lower cost than past. And they can establish the national wide coordinate institution which is considered the pedagogical, industrial, and technological aspects.

As in any other sector, there are threats in the implementation of e-learning. The e-learning technology trends are change rapidly, and are needed much budget to establish e-learning system. Therefore policy makers should be considered technology trends, adaptive technology, suitable technology for ICT environment, and sustainable budgets to establish the e-learning system.

As seen through the SWOT analysis, the following are required. Education in the public sector requires strengthening the ICT infrastructure, including internet access and PCs, to all officials. Integrating the educational systems which are independently operated by each institute can be more efficient in terms of cost, professional manpower, and educational contents. Therefore, it is necessary to establish an office that can administer education within

the public sector and within the entire country in the long-term. Public sector should promote the following to improve and develop e-learning:

1) Improve services to citizens by:

- Establishing an integrated educational portal which can be accessed easier, and can provide more information to citizens.
- Providing convenient access to various books, lectures, and broadcasting resources generated by public sector via e-learning platforms to reuse knowledge (one source multi use).
- Making available easy guide to civil policies in welfare, education, taxes, etc. through e-learning (or e-book).

2) Promote e-learning industry by:

- Establishing the standard of e-learning solutions, contents, and services to promote efficient development and use of e-learning components.
- Facilitating the introduction of e-learning in the private and public sector to spread e-learning, and create demands.
- Establishing infrastructure, regulation systems, quality certification system, and policies to protect intellectual property rights.
- Converting a certain portion of training offered by the public sector into e-learning.
- Supporting international collaboration in e-learning, international standardization of e-learning, and joint R&D projects to activate related industry.

## 5. Industry Sector use of e-learning

The global e-learning industry is a high value-added, knowledge service industry that combines information technology (IT) and education and which shows a rapidly growing global market share. According to Global Industry Analysts, Inc. (See Note 4), the world's e-learning market would achieve USD 107.3 billion in scale by 2015 with various benefits, such as decrease in operating cost, flexibility of learning activities, and simplified training programs. Therefore, many countries are developing the e-learning industry as the one of the major industries that promote national development.

In Costa Rica, there are about 200 ICT companies. Among them, 10 companies are directly related to the e-learning industry. Among these companies, one has more than 1,500 hours of experience in development, one has completed more than 500 projects and developed a 100% web-based publishing tool, one has developed a mobile learning service based on marketing and social networking services, one offers consulting and advice for virtual learning and develops learning strategies, portals, and platforms, and one is developing a game-based learning service for its original game engine. Although a few e-learning companies are present in the market, they are actively participating in various e-learning projects locally and abroad.

Just like in any other countries in the early stage of ICT industry development, the e-learning companies in Costa Rica are facing challenges. First, the current ICT infrastructure state presents itself as major challenge as viewed by the low Internet subscription rate and limited overall use of computers. Second, the industry lacks experienced professionals specialized in Instructional Design and lack of educational institutions that offer Instructional Design programs. Third, the industry does not have the test bed to develop and test products with new technologies. Fourth, Costa Rican society is not yet ready to accept e-learning. These are the main reasons why e-learning is not quickly developing in Costa Rica.

There are a number of local market factors that have the biggest impact on the development of e-learning companies. In the public sector, the potential clients of e-learning companies include the National Comptroller's General of the Republic that trains government officials in procurement, the Directorate General of Civil Service that offers public administrative training to provide the public with quality services, and CCSS that provide training for the health

services and pension system, and the Digital Government Technical Secretary that offers the 'Conozca y sea parte del Gobierno Digital' program. In the educational sector, there are e-learning content development projects outsourced by universities; including the four larger state universities that offer e-learning courses; the learning contents development projects promoted by e-learning institutions for primary and secondary schools, and other content development projects promoted by vocational and lifelong learning institutions. Public and private corporations also outsource projects to develop learning programs and contents.

Next, we should discuss the technological trends of the world's e-learning industry to understand the technical standards of e-learning companies in Costa Rica. In 2009, Stanford Research Institute<sup>5</sup> divided the development of e-learning industry into three stages: 1) the information society of the 1990s, 2) the knowledge-based society of the 2000s, and 3) the intelligent society of the 2010s. In terms of contents, the first and second stages provide courseware contents, whereas the third stage provides on-demand contents. For the network environment, the first stage offers standalone or online environment, the second stage offers high-speed Internet environment, and the third stage offers m-learning or u-learning environment. The one-way delivery of knowledge via the Internet in the early stage evolves into two-way and ubiquitous systems that allow personalized and creative learning (Korea E-learning Development Committee, 2010).

The latest trends in e-learning technology have surpassed simple one-way dissemination of information via videos or flash animations and require high-quality e-learning contents that fit the needs of new digital user environment using CG, 3D videos, augmented reality, virtual reality, or simulation technology. With the emergence of the constructivist paradigm where each individual constructs their own learning experience and knowledge, the market is seeking new learning methods and e-learning technologies (ETRI, 2010a).

The new trends of e-learning, and the fast-growing IT technology and infrastructure are expected to haul the e-learning industry to new paradigms (such as Smart Technology) and increasing demands. The development of web 2.0 technologies, such as User Created Contents (UCC) and Social Networking Service (SNS), and cloud computing will encourage participation in learning and knowledge sharing. Also, realistic and experiential e-learning will be popular using

newer technologies, such as 3D virtual reality and augmented reality (ETRI, 2010b).

As e-learning devices have expanded from PC's to Smart phones, e-learning will be available anytime, anywhere. Learners will no longer be on the receiving end of information, but they will demand high-quality interactive e-learning contents which they can participate in and experience (KOCCA, 2010).

These changes in the global e-learning environment and technologies should be actively supported by the infrastructure, contents, market, professional manpower, and government support for the development of e-learning industry.

The most urgent factor required for Costa Rica's e-learning industry has a lot of secure user who use the e-learning product in a nice ICT infrastructure. Infrastructure is not easy to develop in a short period of time. The government should closely collaborate with the private sector to utilize e-learning services based on the CD-ROM using standalone LMS and establish mid- to long-term plans to develop the learning service platform to provide e-learning, m-learning, and u-learning services in the future.

In terms of contents, Costa Rica's e-learning companies have experienced with various contents, including mobile and gaming contents and there is a strong foundation for contents development. On the other hand, they lack experiences with 3D virtual reality that applies the body tracking and gesture recognition systems on learners' bodies and combines augmented reality and virtual reality to bring learners into a virtual space designed for learning, augmented reality that brings multimedia elements, such as virtual graphic objects, sounds, and videos, into the real space you can see, or experiential e-learning that uses computer technologies to experience what cannot be experienced in reality for simulation learning that allows analysis and anticipation of consequences or traits.

The e-learning market in Costa Rica is not very active due to the weakness of ICT infrastructure which has a negative impact on e-learning companies' profit structure and lessens their investment in new technology development. The ICT technologies applied to e-learning develop very fast, and it is very hard to keep up with them once you fall behind. Fortunately, Costa Rica's e-learning companies are close to many potential markets that share the same language and culture and to the U.S. market, which is one of the largest e-learning markets in

the world. If these companies can take advantage of these merits and collaborate with other countries that have the latest technologies, it would be easier for them to acquire new technologies and explore the world market.

One of the examples of such collaboration would be Korea's ETRI. ETRI used the CDMA technology of Qualcomm USA and succeeded in providing the PCS and digital cellular services based on standard digital cellular systems for the first time in the world. This success has led Korea's cellular phones to achieve No. 2 market share in the world market. It was, of course, supported by the Korean government's powerful leadership and tremendous investments in information technology, e.g., a comprehensive center to promote information communications with a test bed for new technologies and expensive equipment available for related businesses to share.

The competitiveness in the market is based on professional manpower. Generally, universities play the central role in nurturing advanced manpower. In addition to traditional education, companies and schools should jointly develop and operate various training programs. Also, schools should provide professional training focused on new technologies, standards, and market trends for the existing manpower so that they can grow into the most capable experts. The programs should include vocational courses concentrated on e-learning planning, consulting, instructional design, content development, system development, and service operation. Industrial-academic joint projects should be developed and mentoring systems should be supported to nurture industry-friendly manpower with hands-on skills and allow the participating companies to hire trained manpower. The experience and performance of professional manpower should be managed using learning history management systems and professional certification systems should be established to certify e-learning experts. By doing so, the professionals in the e-learning industry should be able to develop their capacities and be rewarded properly.

The role of the government is very important for the development of e-learning industry. The Costa Rican government should develop policies to make e-learning mandatory in public education, revitalize e-learning development outsourcing, standardize intellectual property rights issues, establish systems for standardization of e-learning, and provide corporate tax

support for the e-learning industry to generate high value added. The government should also support industrial-academic collaborative programs for e-learning companies to develop new source technologies. The government should be able to support expensive research equipment for research activities in the academic sector and allow the companies to share the facilities for small fees for the development of e-learning industry.

## 6. General conclusions and recommendations

E-learning has many benefits, such as cost-effective learning, convenience and accessibility, interactivity, flexible learner-centered learning platforms, and easily updated contents, and this is why many students and parents, as well as educational institutes, public organizations, and private companies, are showing interest in it. For successful e-learning, many elements should mutually support one another, including quality learning contents based on the instructional design developed for the given educational objectives, system configuration of LMS, LCMS, and publishing tools, infrastructure of instructors, operators, and working environment, and operation policies and strategies. Mass-produced low-cost contents which do not consider these components of e-learning, one-way systems which do not offer any management services for each learner, and e-learning services that rely too much on instructors may be successful for a certain period of time, but they will not contribute to the balanced development of the e-learning industry and e-learning technology in the short to long-term perspective.

### Key observations

The intent of this diagnostic is to analyze the state of e-learning in education sector, public sector, and industry sector use of e-learning, and from these to develop understanding of current status, successes, barriers and trends. In this analysis process, the following points are identified:

In general ICT status, it is needed to build an effective infrastructure including wireless services in accordance with a rapidly increasing mobile telephone environment, and a national standard for e-learning.

In the educational sector, it is needed a governmental committee to promote the effective usage of e-learning resources, a suitable strategies for current e-learning environments, and extending teachers' training. And also it is needed to provide more advanced educational support for primary and secondary education through e-learning. Costa Rica needs the following instructional support services: a national teaching and learning center, cyber home learning system, digital textbook, and a digital library system for school libraries.

In public sector, there are two types requirements of e-learning usage. One is to improve services to citizens by establishing an integrated educational portal, providing convenient access to various resources generated by public sector via e-learning platforms, and providing an easy guide to civil policies in welfare, education, taxes, etc. through e-learning. The other is to promote e-learning industry by establishing the e-learning related standard, spreading e-learning, establishing infrastructure, regulation systems, and quality certification system. And also it is needed a policy for converting a certain portion of training offered by the public sector into e-learning, and supporting international collaboration in e-learning, international standardization of e-learning, and joint R&D projects to activate related industry.

In industry sector, it is needed to develop the learning service platform to provide e-learning, m-learning, and u-learning services in the future. And also it is needed to develop current trend of technology, such as 3 dimensional virtual reality, augmented reality, and experiential e-learning. Specially, it can be replaced PC based e-learning with m-learning.

To activate the use of e-learning and foster the e-learning industry in Costa Rica, the expert team recommend the following;

- Establish:
  - ▶ ICT infrastructure to promote e-learning.
  - ▶ short term policy: can be executed by change the policy, such as sharing contents and hardware, developing common contents, and integrating center etc.
  - ▶ long term policy: need to budget, such as establishing high speed networks, test-bed, and high cost hardware etc.
  - ▶ an integrated education center in the public sector.
  - ▶ an integrated education center in the educational sector.
- Cultivate the human resources of e-learning.
- Research e-learning services suitable for the new generation environment – that is, new IT environment and educational environment – include personalized learning, u-learning, collaborative learning, T-learning, edutainment, and VR-based learning.

## Notes

1. The “Educational Policy towards the 21<sup>st</sup> Century” is a groundbreaking effort to establish a long term framework for the development of Costa Rican education system which helps to bring the constitutional mandate to the specific reality of today. It was approved by the Higher Education Council in session No. 82-94, 8 November 1994. It was presented to the Council by the then Minister of Education Mr. Eduardo Doryan. The legal framework of the Educational Policy towards the twenty first century it is the Constitution of Costa Rica, the Fundamental Law of Education. Downloaded from <http://www.mep.go.cr/acercadelmep/politicaeducativa.aspx> on 31/05/2011.
2. An unpublished manuscript prepared by the authors contains the statistical information collected by the expert team based on published data, websites reviews, and information provided during interviews. The key statistical data used in this report and their sources the following:
  - Costa Rica key telecom parameters (2009–2010):
    - BuddeComm, Costa Rica - Telecoms, Mobile and Broadband, September 2010.
    - Columbus Networks Connecting Americas, 2006, See <http://www.columbus-networks.com/>
  - Proportion of rural and urban households with Internet access, 2007-2008:
    - ITU World Telecommunication/ICT Indicators database, 2007-08.
  - Number of computers with Internet access in public institutions, December 2009: Authors' calculations based on consultation with director of Telecommunications at Public Institutions (2009).
  - Percentage distribution of number of computers per household (June 2010):
    - Survey on ICT Use in Costa Rica, June 2010, by MINAET.
  - Institution and ICT Facilities, computer availability, ICT4ED indicators in Costa Rica:
    - Data gathered by the Ministry of Public Education and the Omar Dengo Foundation for the Analysis Report of Global ICT4ED Readiness, Korea Education and Research Information Service, 2010.

- Institutions and students benefited from the PRONIE MEP-FOD (Primary), plus data on region, connectivity and infrastructure (December 2010):
  - PRONIE MEP-FOD, Statistical report covering of the National Educational Informatics Program MEP-FOD for Preschool, I, II and III cycles, Special Education and Special Open Classroom, December 2010.
- PRONIE MEP-FOD Projects (February 2011):
  - See PRONIE MEP-FOD Modalities of Attention at <http://www.fod.ac.cr/?q=pronie02>
- Benefit people by Labor@ project (2010):
  - Statistical report and coverage PRONIE MEP-FOD, September, 2010.
  - Labor@Data Operation Center Platform 2010, Statistical report and coverage PRONIE MEP-FOD, September, 2010.
- FOD's CCM, LIE, CIRE and EMPRODI projects:
  - Interviews with FOD's staff (2010).
- "See and be part of Digital Government module" in [www.gobiernofacil.go.cr](http://www.gobiernofacil.go.cr), March 2011.
- Percentage of Repetition at Costa Rican Public Schools:
  - See [http://www.mep.go.cr/Indicadores\\_Educativos/REPITENCIA.html](http://www.mep.go.cr/Indicadores_Educativos/REPITENCIA.html).
- Percentage of intra-annual Dropout at Costa Rican Public Schools
  - See [http://www.mep.go.cr/Indicadores\\_Educativos/DESERCIÓN\\_INTRA.html](http://www.mep.go.cr/Indicadores_Educativos/DESERCIÓN_INTRA.html)
- ITCR, Technology Foundation of Costa Rica (FUNDATEC):
  - See <http://www.tec.ac.cr/Fundatec/Paginas/default.aspx>
- ITCR, Business Incubation Center (CIE-TEC):
  - See <http://www.cietec.org/cie.htm>
- ITCR, Linking University – Business:
  - <http://www.tec.ac.cr/sitios/Vicerrectoria/vie/cit/vinculacion/Paginas/default.aspx>
- MICIT, The map of intelligent community center:
  - see <http://www.micit.go.cr/index.php/mapa-de-ccis.html>

- List of Institutions/companies/organizations interviewed:

	Date	Place	Strategic area	Name	National Committee CR Aprende representative
1	Oct. 21th, 2010	Móvil Multimedia S.A.	Company	Milena Schroeder	Sylvia Jiménez
2	Nov. 3rd, 2010	Mysterious Development	Company	Jolon Bankey	Sylvia Jiménez
3	Nov. 4th, 2010	CENFOTEC	Private- high education	Priscilla Chaves	Sylvia Jiménez
4	Nov. 5th, 2010	PRONIE- Academic Area	ODF	Magally Zúñiga	Sylvia Jiménez
5	Nov. 5th, 2010	RBX Global Company	Company	Brian Hochhalter	Sylvia Jiménez
6	Nov. 23th, 2010	Social Health Services (CCSS)	Government	Laura Morales	Leda Peralta
7	Nov. 26th, 2010	Imago Comunicación Interactiva	Company	Karla Camacho Laura Montoya	Leda Peralta
8	Jan. 26th, 2011	National Comptroller (CGR)	Government	Carlos Borbón	Leda Peralta
9	Jan. 27th, 2011	Civil Service (Servicio Civil)	Government	Top level representative	Leda Peralta
10	Feb. 1 <sup>st</sup> , 2011	INA: National Institute of Learning	Public- Technical education	Wilberth Ramírez	Sylvia Jiménez
11	Feb. 3rd, 2011	MEP	Government	Antonieta Díaz	Antonieta Díaz
12	Feb. 15 <sup>th</sup> , 2011	CAMTIC	Industry Chamber	Otto Rivera	Sylvia Jiménez
13	Feb. 23th, 2011	CENAT (Centro Nacional de Alta Tecnología)	High education organization	E-leaning representative	Angélica Chinchilla
14	Feb. 24th, 2011	UNED (Universidad Estatal a Distancia)- Distance University	Public university	E-leaning representative	Angélica Chinchilla
15	Feb. 24th, 2011	TEC (Instituto Tecnológico de Cartago)	Public university	E-leaning representative	Angélica Chinchilla
16	Feb. 25th, 2011	MICIT	Government	Top level representative	Angélica Chinchilla
17	Feb. 28th, 2011	UNA (National University)	Public university	Willy Castro	Angélica Chinchilla Sylvia Jiménez
18	Mar.3rd, 2011	UCR	Public university	E-leaning representative	Angélica Chinchilla
19	April 29 <sup>th</sup> , 2011	RACSA	Government	Top level representative	Sandra Aguilar Sylvia Jiménez

3. MEP (2009), National Policy on Application of Information and Communication Technology in Education. Retrieved from

<http://www.mep.go.cr/CentroDeInformacion/DOC/Politica%20Nacional%20aplicacion%20TICS-292009104731.pdf>

4. Global Industry Analysts, Inc., <http://www.strategyr.com/default.asp>:

Global Industry Analysts, Inc., (GIA) offers one of the world's largest portfolios of research reports in terms of topics covered, geographic regions analyzed, companies profiled, and pages published. Our current portfolio consists of more than 1500 large Global Strategic Business Reports (large multi-client research programs) and Global Industry Outlooks; 65,000+ Market Trend Reports; and 125,000+ Market Data Capsules encompassing all major industries worldwide. All this content can be searched by using the search feature on the home page.

5. Stanford Research Institute International, <http://www.sri.com>:

SRI International is an independent, nonprofit research institute conducting client-sponsored research and development for government agencies, commercial businesses, foundations, and other organizations. SRI also brings its innovations to the marketplace by licensing its intellectual property and creating new ventures.

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**ETRI (2010b).** A Technical Trend Analysis of Telecommunication and communication. Next Generation e-Learning Service: Focused on e-Learning System. Seoul. Korea. 159-165p.

**KERIS (2010).** Adapting Education to the Information Age. Seoul. Korea. 22, 38, 46p.

**Korea E-learning Development Committee (2010).** The Basic Plan for E-learning Development and Activation. 2-4p.

**MINAET (2010).** Evaluation of the Digital Divide in the Use of Telecommunications Services in Costa Rica. San Jose. Costa Rica. 21p.

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